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IN BUILDING AND CONSTRUCTION**
CIB W070 FACILITIES MANAGEMENT AND ASSET MAINTENANCE
CIB W092 PROCUREMENT SYSTEMS
CIB TG72 PUBLIC PRIVATE PARTNERSHIP

Proceedings of the
JOINT CIB W070, W092 & TG72
INTERNATIONAL CONFERENCE ON
FACILITIES MANAGEMENT, PROCUREMENT SYSTEMS
AND PUBLIC PRIVATE PARTNERSHIP

DELIVERING VALUE TO THE COMMUNITY

DEPARTMENT OF CONSTRUCTION ECONOMICS AND MANAGEMENT
FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT • UNIVERSITY OF CAPE TOWN

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23rd – 25th January 2012

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**JOINT CIB W070, W092 & TG72 INTERNATIONAL CONFERENCE ON FACILITIES
MANAGEMENT, PROCUREMENT SYSTEMS AND PUBLIC PRIVATE PARTNERSHIP**

Delivering Value To The Community

**Proceedings of the Cape Town 2012 Joint CIB W070, W092 & TG72 International Conference,
held at the Graduate School of Business, V&A Waterfront, Cape Town, South Africa.**

23rd – 25th January 2012.

Edited by Associate Professor Kathy Michell, Professor Paul Bowen and Professor Keith Cattell, Department of Construction Economics and Management, University of Cape Town.

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All papers submitted to this CIB W070, W092 and TG72 International Conference were subjected to a double-blind (peer review) refereeing process, at both the abstract and final paper stages. Referees were drawn from an expert panel, representing respected academics from the built environment research community. The conference organisers wish to extend their appreciation to the following members of the panel for their work, which is invaluable to the success of the conference.

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FOREWORD



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Joint Coordinator

CIB Working Commission W070 - Facilities Management and Asset Maintenance

This is the 12th year of my role as Coordinator or Joint Coordinator of CIB Working Commission W070. During this period, our bi-annual international symposia have been held in different corners of the world:

2000 – Brisbane, hosted by Queensland University of Technology, Australia.

2002 – Glasgow, hosted by Glasgow Caledonian University, Scotland.

2004 – Hong Kong, hosted by The Hong Kong Polytechnic University, China.

2006 – Trondheim, hosted by The National University of Science and Technology, Norway.

2008 – Edinburgh, hosted by Heriot-Watt University, Scotland.

2010 – Sao Paulo, hosted by University of Sao Paulo, Brazil.

I am particularly pleased that the 2012 CIBW70 Symposium is in Cape Town, hosted by the University of Cape Town, spreading the influence of CIBW70 to yet another continent – Africa. More significantly, this is the first time Working Commission W070 has joined with W092 (Working Commission for Procurement) and TG72 (Task Group for PPP) to stage an International Conference with a theme embracing *Facilities Management, Procurement Systems and Public Private Partnership*. This concentration of international expertise and research exposure offers a unique opportunity to explore how the development, procurement delivery and management of built assets and facilities can deliver value to all stakeholders, including the wider community. I understand from the host that we have more than a hundred papers accepted for presentation and publication. Credit for this achievement must go to the host institution, The University of Cape Town and efforts by the panel of international reviewers of abstracts and the full papers. Having organised four W070 symposia myself in the past, I know the massive effort involved and the ever worry of financial viability of the event. In this respect, Eddy and I, as Joint Coordinators of CIBW070, would like to extend our special Thank You to three individuals, Associate Professor Kathy Michell, Professor Paul Bowen and Professor Keith Cattell, for their ‘can do’ attitude in taking on the task of organising and hosting this international event. A quick scan of the topics of accepted papers will reveal that the coverage of this joint conference is both specific and wide ranging, covering essentially three related areas that are central to the design, procurement and whole-life management of built assets and facilities in the urban environment that we inhabit: 1. Physical Asset Management; 2. Workplace Management, and 3. Facility Services Management. Taken together, they reflect the need for more collaboration and discussions across traditional disciplines. In my opinion, this joint conference of CIB W070, W092 and TG72, has achieved these objectives admirably.

**Danny Then
December 2011**

FOREWORD



PROFESSOR EDWARD FINCH

**SCHOOL OF THE BUILT ENVIRONMENT
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Joint Coordinator

CIB Working Commission W070 - Facilities Management and Asset Maintenance

It was with great anticipation that the CIB W070 (Facilities Management) Working Group chose the University of Cape Town to host their biennial symposium in 2012. This anticipation was further enhanced by the opportunity to join the Procurement Systems Working Group (W092) and the Public Private Partnerships Task Group (TG72). The converging interests of service and facility procurement make this conference a pivotal event. It is envisaged that ‘hybrid vigour’ brought about by the combining of expertise in these areas will allow us to address some pressing issues. The term ‘academic’ is often used as a disparaging term in common parlance. It is used as a synonym for irrelevant, inconsequential, theoretical or speculative without a practical purpose or intention. The term ‘moot point’ exemplifies this viewpoint stemming back as far as the Sixteenth Century. The word moot is an Old English word that means “an assembly of the people for making judicial or political decisions.” If, after an argument, it was concluded that the point made was irrelevant, it was called moot. The term moot has today developed the specific meaning amongst the legal profession of a “hypothetical discussion on a legal point as an intellectual exercise.” In the same way that arguments at an original moot or town meeting were considered of little consequence, the conclusions of an academic exercise among lawyers carries no weight in the real world and so it, too, is irrelevant or moot. Can we as academics be accused of pursuing irrelevant arguments? Based on the evidence of contributions to the Cape Town conference the answer must be emphatically ‘no’. Based on the currency of the procurement topic, again, the answer must be ‘no’. There has never been a more important time – given the prevailing economic crisis. Organisations are looking for answers to pressing questions. However, the knee jerk responses of cost savings and efficiencies that new models of facilities management procurement appear to offer need to be tempered with a broader understanding of how the built environment impacts on organisations, communities and individuals. The concept of ‘buy now – pay later’ is one that has brought the global markets to an unenviable situation – being saddled with insurmountable debts. The construction and property professions are also under close scrutiny. The private finance initiative continues to be the subject of fierce debate. At a time of scarce public investment, the ability to tap private sector finance is alluring. Yet, the question of delivering long-term value to communities needs to be addressed. Inevitably, the conference papers around the theme of ‘Delivering Value to the Community’ will do exactly that. As joint CIB W070 coordinator I hope that the discussions arising from the proceedings will stimulate lively debate. As such, I am confident that participating academics and practitioners will concern themselves with much more than ‘moot points’. The opportunity to make a difference is too great to miss.

Professor Edward Finch
December 2011

FOREWORD



PROFESSOR PETER MCDERMOTT

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CIB Working Commission W092 – Procurement Systems

CIB is the acronym of the abbreviated French (former) name: “Conseil International du Bâtiment” (in English this is: International Council for Building). In the course of 1998, the abbreviation has been kept but the full name changed in to:

INTERNATIONAL COUNCIL FOR RESEARCH AND INNOVATION IN BUILDING AND CONSTRUCTION

CIB was established in 1953 with the support of the United Nations, as an association whose objectives were to stimulate and facilitate international collaboration and information exchange between governmental research institutes in the building and construction sector. At that time an implicit objective also was to help rebuild the European infrastructure for building and construction research following the ravages of the Second World War. CIB has since developed into a world wide network of over 5000 experts from about 500 member organisations active in the research community, in industry or in education, who cooperate and exchange information in over 50 CIB Commissions covering all fields in building and construction related research and innovation. CIB Commissions initiate projects for R&D and information exchange, organise meetings and produce publications. These meetings can be Commission meetings for members only or international symposia and congresses open to all. Publications can be proceedings, scientific or technical analyses and international state of the art reports.

CIB Working Commission W092 was established in 1989, and the initial aims and objectives established were:

- To research into the social, economic and legal aspects of contractual arrangements, appointment systems and tendering procedures used in relation to construction projects
- To establish and comment upon the practical aims and objectives of contractual arrangements and to define the participants and their responsibilities
- To review areas of commonality and differences
- To formulate recommendations and the selection and effective implementation of project procurement systems
- To compare and contrast standard conventions for the various systems of project procurement generally and specifically
- To report and liaise with relevant CIB Working Commissions and Task Groups.

CIB W092 has matured alongside that of the construction procurement discipline. The main objective for CIB W092 is now defined to include both the investigation of the use of procurement to deliver wider sustainability (social, environmental, and economic) goals and the use of procurement to help maximize the value jointly created by the stakeholders to construction and the equitable distribution of the resulting rewards.

The subject of the conferences has developed also and has included a broad range of topics, including

- Infrastructure Procurement
- Understanding Construction Markets and Competition
- Public Construction Procurement
 - o Transparency and accountability
- Policy Through Procurement
 - o Social Economic and Environmental Benefits, Policy, Conflicts - Competition versus Sustainability Skills, Employment, Small to Medium Sized Enterprises
- Public Private Partnerships/Private Finance Initiatives
- Asset Backed Procurement Vehicles
- Procurement and Contractual Strategies
 - o Supply Chain Management, Partnering Framework Agreements/Contracts
- Procurement Strategies in Different Sectors

Since inception W092 has organised and managed many Symposia and worked with local and regional industry including in Montreal, Canada; Gavle, Sweden; Chiang Mai, Thailand, Durban, South Africa; Santiago, Chile; Port of Spain, Trinidad and Tobago; and Chennai, India, and UK (Liverpool, Salford). The conference held in South Africa in 1996 (Durban) significantly affected the strategic direction of CIB W92. We are delighted to be returning to the region once again and are looking forward to an equally inspiring conference.

Professor Peter McDermott and Professor Steve Rowlinson
December 2011

FOREWORD



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Public Private Partnerships are now commonly used to accelerate economic growth, development and infrastructure delivery and to achieve quality service delivery and good governance. The spectrum of nature and types of public private partnerships (PPPs) are overwhelming. There have been tremendous developments in the use of PPP in many countries that has made it increasingly important to understand these practices. Given the changing economic, social and political environment, coupled with globalisation and budgetary constraints, PPP has become unavoidable and indeed desirable in many countries worldwide. The need for PPP in the many countries has been accelerated by the evidently vital role of modern infrastructure in economic growth.

The principal aim of TG72 is to address public private partnership on an international level by providing a forum to facilitate exchange and synthesis of research on the issues (social, economic, financial, procurement and contractual, political, cultural, environmental, etc.) that underpin PPP. It will identify emerging international practices within PPP in the planning, development and maintenance of constructed facilities. The objectives of TG72 are to develop a thriving international research community within the field of PPP through involving practitioners and experts in the field to collaborate on distinct scholarly tasks; identify champions from each continent or region to co-ordinate the above initiatives within that region to support the overall aim of the task group and to produce a template to help in capturing and comparing emerging priorities, concepts and best practices in PPP developments across countries and regions

TG72 has participated at many conferences since its establishment in late 2008 including: Global Innovation in Construction Conference at Loughborough; CIB Congress, in Salford, UK; Innovation in AEC Conference in Pennsylvania, USA and PPP workshop at QUT in Brisbane Australia. In addition, TG72 organised an international Symposium (Conference and Workshop) on 'Revamping PPPs' at Hong Kong and it is directly involved in participation in many international PPP research projects, including the EU Cost Action programme on PPP Trends in Transport; and the, Private Sector Participation in Water Sector Governance led by the National University of Singapore.

The mandate for TG72 has been extended for another four years from 2011 to 2015 to address rapidly changing PPP landscape after the recent financial crisis and also the significant changes in stakeholders' expectations. These need to be captured in an extended research programme in relation to governance (including legal and structural issues); financing modalities; developed/developing countries priorities & differences; institutional framework; procurement (including contractual) framework; and sectoral priorities & differences (e.g. in water sector, transport, etc.)

This conference has provided an opportunity to address some of these issues, based on papers from many countries (UK, South

Africa, Australia, Bangladesh, Netherlands, Slovenia, etc.) and the ensuing discussions during the much anticipated networking among those of us interested in this theme. The titles of papers on PPP that will be presented at this conference include:

- What are the benefits of standardizing PPP procurement processes?
- Enabling the development of PPP, from niche to maturity
- Innovative solutions in DBFMO projects
- A comparative review and evaluation of the Negotiated and Competitive Dialogue procedures as effective procurement routes to deliver private finance
- A conceptual framework for assessment of whole life value for money in PPP projects in the SADC region
- PPP road projects in Bangladesh: Identification and prioritisation of risks
- An investigation of the benefits to, and effects on, society and individuals from PPP infrastructure delivery.
- A comparative study on legislations relating to public private partnerships in the UK and Slovenia
- Analysis of critical success factors for PPP road projects
- Performance indicators for public-private partnership (PPP) in infrastructure
- Involvement of External Agencies for Supplementing Competencies in Urban Local Bodies for Implementing Urban PPP Projects
- Do public private partnerships (PPP projects) provide value for money for infrastructure development in Australia?

We will make use of our extended task group mandate, to actively pursue and develop the growing PPP 'body of knowledge' and disseminate our findings and that of our members. We hope to achieve this through special sessions in conferences and external foci to stimulate interest and bring together additional support through a variety of conduits, including communities of practice, funding agencies, regulatory bodies, government agencies etc. that have interest and are engaging in PPP developments. Those interested are cordially invited to join us in this interesting journey.

It is anticipated that a major output of TG72 over the next four years of the extension will be a publication of an edited book to be titled "Public Private Partnership: An International Handbook" The book will provide an international perspective on PPP by drawing upon the existing and fast developing body of principles and practices from many countries. You are encouraged to participate and contribute to this important project of the task group, as well as to join other activities of TG72. Please do let us know your areas of interest and how you could participate.

We wish you all fruitful deliberations at what is sure to be an enjoyable conference, thanks to the hard work of the local organizers. Indeed we are proud to be part of this timely conference, along with two CIB Working Commissions whose 'work' areas connect so well with our own, hence the expected 'bonus' synergies.

Professor Mohan Kumaraswamy and Professor Akintola Akintoye
December 2011

PREFACE



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Dear Conference Delegates

It is with great pleasure that we welcome you to this CIB W070, W092 and TG72 Joint International Conference hosted at the University of Cape Town. We hope that you will derive much from this gathering of colleagues and fellow researchers. This particular conference, with its focus on Facilities Management, Procurement Systems and Public Private Partnership, had an interesting beginning as it was initially conceptualized as two distinctly separate events, both scheduled to be hosted here at the University of Cape Town, with TG72 being incorporated into the W092 stream. Upon reflection we decided that an ideal opportunity existed for us to combine the various themes into one, over-arching conference. What you have before you is the result.

The main theme of the conference is how the development, procurement, delivery and management of built assets and facilities can deliver value to all stakeholders, including the wider community. The focus is on the maximization of the value jointly created by the stakeholders and the equitable distribution of the resulting rewards. This focus is informed by transformations in public and private organisations concerning the procurement of building and infrastructure, support services and workplace strategies. Our intention is that the bringing together of these working commissions will foster research synergies.

We are indebted to the members of the Scientific Committee for reviewing the abstracts and papers and whose feedback and comments assisted authors with the development of their papers. Acceptance of papers for inclusion in the Conference Proceedings were based on double-blind reviewing to ensure a high standard and international comparability.

We are grateful to all those who helped bring this conference to fruition. Foremost among these are the CIB Commission and Task Group Coordinators, namely, Professor Eddy Finch (University of Salford) and Associate Professor Danny Then (The Hong Kong Polytechnic University) - CIB W070 Coordinators; Professors Steve Rowlinson (University of Hong Kong) and Peter McDermott (University of Salford) - CIB W092 Coordinators; and Professors Akin Akintoye (University of Central Lancashire) and Mohan Kumaraswamy (University of Hong Kong) - CIB TG72 Coordinators.

Finally, thanks are also due to Ms Belinda Chapman of the Conference Management Centre at UCT; Dave Woolley for the website creation and maintenance; and ARCOM for permission to use their Guidelines to Authors and Paper Template.

Enjoy the Conference!!!

Associate Professor Kathy Michell

Professor Paul Bowen

Professor Keith Cattell

Hosts and Local Conference Organisers

University of Cape Town, January 2012

KEYNOTE SESSIONS

CHANGING THE CONSTRUCTION PROCUREMENT CULTURE TO IMPROVE PROJECT OUTCOMES

DR RON WATERMEYERⁱ

SODERLUND AND SCHUTTE (PTY) LTD, PO BOX 119 PARKLANDS, JOHANNESBURG, 2121, SOUTH AFRICA

Projects involving construction works need to be delivered on time, within budget, and to the required quality. They also need to meet client expectations and contribute to aspects of sustainable development. Such projects all too often fail to meet expectations. Changes in approach and practice are needed to improve project outcomes. This requires an understanding of contracting arrangements which enable projects to be delivered on a basis other than the traditional preplanned approach, including different allocations of responsibilities, cost based pricing strategies, early contractor involvement and framework agreements. It may also require the modernisation of the procurement and delivery management system and the adoption of a systematic, purposeful and strategic approach to the delivery of a construction works based on the ISO 10845 standards for construction procurement and the FIDIC and NEC3 families of contracts. The systems, tools and techniques are available for an industry willing to embrace change in order to improve industry performance and project outcomes. A culture change is, however, necessary to embrace these changes

Keywords: contracting, procurement, tendering

INTRODUCTION

Procurement, according to ISO 10845-1 (2010), is the process which creates, manages and fulfils contracts relating to the provision of goods, services and construction works or disposals, or any combination thereof. Procurement is a key process in the delivery and maintenance of construction works as organisations invariably require goods and services from other organisations to satisfy their needs. There is seldom the direct acquisition of construction works as client needs vary considerably. Professional services are required, as necessary, to plan, budget, conduct condition assessments of existing works, scope requirements in response to the owner or operator's brief, propose solutions, evaluate alternative solutions, develop the design for the selected solution, produce production information enabling construction and confirm that design intent is met during construction. Constructors, on the other hand, are required to construct or refurbish works in accordance with requirements or to perform maintenance services, frequently on works that is in use, and hand such works over to or back to the user upon completion of the works or services. Construction works are accordingly delivered through a supply chain or what BS 8903 (2010) refers to as "a network of suppliers, including subcontractor".

Construction works projects need to be delivered on time, within a budget, to the required quality and to meet client expectations. There is much evidence, particularly in developing countries that that this is not always the case. Foster, for example, found that Sub-Saharan African countries typically only manage to spend about two thirds of the budget allocated to investment in infrastructure and where infrastructure is provided, it is not focussed where it is most needed. The Construction Sector Transparency Initiative's recent pilot project in Ethiopia, Guatemala, Malawi, the Philippines, Tanzania, United Kingdom, Vietnam and Zambia found that on the projects reported on only 28% were delivered within the contracted time with 23% being delivered in more than double the time, while 40% were completed within or below budget with 9% being more than 100% over budget. The Construction Industry Development Board (CIDB) in South Africa found that clients were neutral or dissatisfied with the quality of completed work on around 20% of the projects while around 12% of the projects surveyed had levels of defects which were regarded as inappropriate.

Construction works can also contribute to sustainable habitats in which present and future generations can live healthy within the limits imposed on the environment's ability to meet present and future needs. They are significant creators of employment over the life cycle of such works. For example, the construction sector is in South Africa the third highest generator of direct employment per US\$ 1 million spent and is only surpassed by the agriculture and mining sectors.

This paper reviews recent developments in procurement and the delivery of infrastructure which have the potential to improve delivery outcomes and outlines the culture change that is necessary to deliver better value.

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CONTRACTING ARRANGEMENTS

THE TRADITIONAL PRE-PLANNED APPROACH TO DELIVERY

Virtually no civil engineering works were carried out in the UK after the Romans left until the seventeenth century. This all changed during the latter half of the 1700s. John Smeaton, who is often regarded as the founder of civil engineering and whose largest project was the Forth and Clyde Canal linking the East side of Scotland to the West, developed his approach to managing works. In 1768 he set down his management scheme for the construction phase with detailed tables of responsibility. His team comprised the engineer in chief, the resident engineer and the 'surveyors' for the various geographical sections working under him, and contractors (as opposed to direct labour) (Barnes 1999).

Sir Joseph Bazalgette, who was responsible for constructing the major sewer projects and the embankments on the Thames in London, developed a standard form of contract in the 1860s which was adopted by the Metropolitan Board of Works. This form of contract served as the model for many standard forms of contract, including the first edition of the Institution of Civil Engineer's standard form of contract published in 1945 (Barnes 1999).

This "master-servant" model, which was established by Smeaton and entrenched by Bazalgette has remained in use for the majority of civil engineering projects for more than two hundred years and is still used on projects managed in the traditional way, particularly in developing Anglophone countries. This approach to delivery which was passed on from the UK to its colonies is no longer promoted by the UK Government which now requires that procurement strategies and contract types support the development of collaborative relationships between the government client and its suppliers and facilitate the early appointment of integrated supply teams. Traditional non-integrated procurement approaches are no longer used unless it can be clearly shown that they offer best value for money (OGC 2006).

ALTERNATIVE ALLOCATION OF RESPONSIBILITIES

An alternative to the design by employer contracting strategy is the so-called design and construct contracting strategy. In this strategy, the contractor undertakes most of the design and all construction in accordance with the employer's brief and his detailed tender submission. This option provides single point accountability and allows the construction to commence before the detailed design has been completed.

A variation to the design and construct contracting strategy is the develop and construct contracting strategy. This strategy is similar to that of design and construct, except that the employer issues a concept design as a baseline document for the development of the design.

In the management contractor contracting strategy a management contractor provides consultation during the design stage and is responsible for planning and managing all post-contract activities, including any design of the works or portion thereof, and for the performance of the entire contract. The management contractor subcontracts construction works to others. This contracting strategy can be implemented on a design by employer in terms of which the contractor is not responsible for the design of the permanent works, a develop and construct or a design and construct basis.

ALTERNATIVE PRICING STRATEGIES

Contractors have traditionally been required to price a scope of work in terms a price based pricing strategy i.e. a lump sum, bill of quantities or price lists. More recently, contractors have been required to do so on the basis of an activity schedule (lump sums for items linked to a programme and method statements). Contractors can also be required to perform a contract in terms a cost based pricing strategy.

In a cost reimbursable contract wages, salaries, materials, plant and equipment and subcontract amounts can be reimbursed at open market or competitively tendered prices. Some of the items of equipment can be reimbursed at prices that are agreed in terms of the contract. Site overhead charges can be included in a percentage overhead applied to wages and salaries of those working on site. Fees to cover items such as profit, company overheads, finance charges, insurances, and performance bonds, as relevant, can then be added. Such contracts can be competitively tendered as tenderers can compete on the basis of margins and rates.

A cost reimbursable pricing strategy can be used with any of the aforementioned allocation of responsibilities or where the contractor is not responsible for the design of the permanent works. Such a strategy is most often only used in emergency situations, unless the productivity/costs can be controlled. The management contractor contracting strategy enables costs to be controlled should such a contractor be required to subcontract on a competitive basis most of the works and services for which he is responsible.

A target cost contract enables productivity to be controlled by means of a target price which may be tendered or negotiated. In terms of this pricing strategy, the contractor is paid his costs as defined in terms of the contract and on completion of the works, is paid (gain share) or is liable (pain share) for an agreed proportion of the difference between the target cost and the actual cost.

LEAN CONSTRUCTION

Research has indicated that in order to provide higher value and less waste the fragmentation in design needs to be addressed, preferably before 25% of the design is complete (Lichtig 2006). Target cost contracts can be used to facilitate early contractor involvement in terms of the design by employer, develop and construct and design and construct contracting strategies should contractors be contracted on the basis of their cost parameters and a target price is negotiated when there is sufficient production information available to agree a target price. Escape clauses can be inserted in such contracts to enable the employer to use the designs and approach the open market in the event that agreement cannot be reached regarding the target price.

FRAMEWORK AGREEMENTS

Framework agreements enable infrastructure clients to procure goods, services and construction works on an instructed basis (call off) over a term without any commitment to the quantum of work instructed and in the absence of a detailed scope of work. Such agreements contain the term of the agreement during which an order may be issued, the broad scope of work which may be included in an order and the basis by which contractors will be remunerated for instructed work.

A key consideration in entering into a framework agreements is to decide on how contractors are to be remunerated for broadly defined work which is not sufficiently scoped to enable it to be priced at the time when the agreement is entered into. Cost based pricing strategies are well suited to framework agreements for works as:

- a cost reimbursable pricing strategy linked to the management contractor contracting strategy allows the cost of the project to unfold as the bulk of the works and services that are provided by the contractor are subcontracted on a competitive basis; and
- the target price in the target cost contract can be agreed before the issuing of a call off (order) to proceed with the works or services associated therewith.

Cost based pricing strategies enable a framework agreement to be entered into with one or more contractors. Such pricing strategies enable a series of packages within a programme to be constructed by one or more contractor who can be provided with a continuous stream of work over the term. This enables lessons learned in one package to be taken to the next and enables a team to work together on an integrated approach over a period of time.

Framework agreements reduce the need to approach the market for goods, services or works falling within the scope of the agreement over the term of the agreement, reduce the number of relationships to be managed and provide clients with programming flexibility to manage expenditure relating to the delivery and maintenance of infrastructure over time. It is also possible for one public institution to make use of another public institution's framework agreement to meet their needs. This can be used to overcome capacity constraints at the different spheres of government or within a region.

A SYSTEMS APPROACH TO PROCUREMENT

FUNDAMENTALS OF A PROCUREMENT SYSTEM

A system is an established way of doing things and provides order and a platform for the methodical planning of a way of proceeding. Systems are underpinned by processes, procedures and methods. Systems need to be documented, managed and controlled. Processes and procedures within a system also need to be audited to ensure that outputs and outcomes are achieved to the requisite quality and within an acceptable risk exposure. Procurement is the process which creates, manages and fulfils contracts. Procurement commences once a need for goods, services, works or disposals has been identified and it ends when the goods are received, the services or works are completed or the asset is disposed of. There are six basic activities associated with procurement processes which establish actions and deliverables / milestones associated with the procurement process as indicated in Figure 1 (Watermeyer 2011b). Procedures and methods used in conjunction with policies guiding the selection of options and the application thereof are required to implement these procurement processes. Procurement documents are needed to communicate to tenderers a procuring entity's procedures and requirements up to the award of a contract and to establish the basis for the contract that is entered into with the successful tenderer. Governance and quality oversight structures need to be linked to milestones in the procurement process.

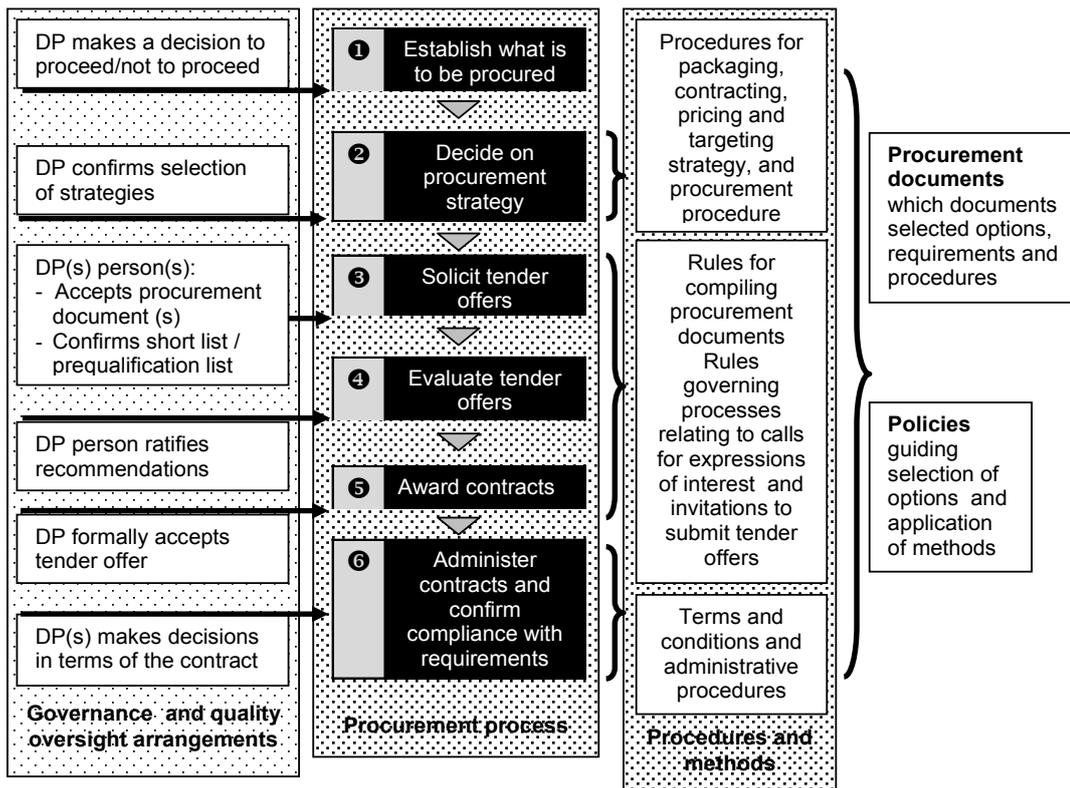


Figure 1: Components of a procurement system

A procurement system accordingly comprises (Watermeyer 2011a):

- rules and guidelines governing procedures and methods
- procurement documents which include terms and conditions, procedures and requirements
- governance and quality oversight arrangements to manage and control procurement
- organisational policies which deal with issues such as the usage and application of particular procurement procedures, requirements for recording, reporting and management of risk, procedures for dealing with specific procurement issues, the usage of procurement to promote social and developmental objectives and the assignment of responsibilities for the performance of activities associated with the various processes.

STANDARDISING THE CONSTRUCTION PROCUREMENT SYSTEM

Procurement is a process and can therefore be standardised. The starting point in the development of any procurement system is to determine the objectives for the system. Objectives associated with procurement systems typically relate to good governance (primary objectives) and, particularly in developing countries, to the use of procurement to promote social and national agendas (secondary or non-commercial objectives).

A set of procurement objectives which are acceptable to both the public and private sectors form the basis of the recently published ISO 10845 standards for construction procurement, namely:

- primary objectives: the procurement system shall be fair, equitable, transparent, competitive and cost-effective; and
- secondary objectives: the procurement system may, subject to applicable legislation, promote objectives additional to those associated with the immediate objective of the procurement itself.

These objectives or end outcomes establish the overarching performance requirements for a standardised procurement system. Standards for methods and procedures associated with the soliciting of tender offers and the award of contracts can be developed around these system objectives at a national and international level. It is also possible to develop a generic set of procedures and methods covering the universe of options that are commonly encountered in the soliciting and evaluation of tender offers and the formatting and compilation of procurement documents. ISO 10845 parts 1 to 4 provides a set of generic methods and procedures to address these issues (Watermeyer 2011b).

There are many international, national and regional standard forms of contract (i.e. a contract between two parties with standard terms that do not allow for negotiation). These forms cover a wide range of contracting types, many of which satisfy the aforementioned primary objectives. These forms are, however, drafted around other objectives relating to the allocation of risk and the management and administration of the contract which vary depending upon the nature of the work. It is accordingly not possible to provide a single generic form of contract which enables contractual risk to be managed across the different categories and types of procurement that may be encountered. It is, however, possible to make use of standard forms of contract within families of standard contracts that have been developed by international organisations such as those published by the International Federation of Consulting Engineers and the Institution of Civil Engineers i.e. the FIDIC and NEC3 families of contracts. (The FIDIC and NEC3 forms of contract cover construction works and professional services while NEC3 forms of contract also cover supply, term service and framework contracts) (Watermeyer 2011b).

It not possible to standardise governance and quality oversight arrangements and policies at a national or international level as different arrangements need to be adopted to deal within different procurement contexts, e.g. between public and private sectors, between the different tiers of government and between government departments and state owned enterprises. Accordingly, some procedures and methods can be standardised at a regional, national or international level and others only at an organisational level.

ISO 10845-1 (2010) establishes the framework for the development of an organisation's procurement policy, including any secondary procurement policy. BS 8534 (2011) provides recommendations and guidance on the development within a public or private sector organization of policies, strategies and procedures for the procurement of construction in the built environment:

THE DELIVERY MANAGEMENT SYSTEM

The delivery of construction works needs to be managed and controlled in a logical, methodical and auditable manner. The starting point in the development of any delivery management system is to identify the information which needs to be developed and accepted by the client at a particular point in the delivery process to enable a project to be advanced. The stages in the delivery of construction works can then be defined as the activities that need to take place between such points. These stages enable the work flow (sequence of connected activities) toward the attainment of an end of stage deliverable to be developed and culminate in gates (control points) which can be used to provide assurance that the proposed works:

- remains within agreed mandates,
- aligns with the purpose for which it was conceived, and
- can progress successfully from one stage to the next.

There are a number of different systems that have evolved (see Table 1). The Royal Institute of British Architect's Plan of Work (2000) commences with the appointment of the architect and is structured around the design by employer contracting strategy as it contains a procurement stage just after the production information stage. ISO 29481-1 (2010) starts with the establishment of portfolio requirements at a project level (client planning) and is structured around a develop and construct contracting strategy as it contains a procurement stage just after the full conceptual design stage.

On the other hand, the CIDB Infrastructure Gateway System (2011) commences with planning at a portfolio level and does not embed any contracting strategies in the stages as the end of stage deliverable form the scope of work for a particular contracting strategy e.g. a management contractor can be appointed after stage 3, a design and construct contractor after stage 4, a develop and construct contractor after stage 5 and a design by employer contractor during stage 6. A key feature of the CIDB stages is the introduction of stage 2 (procurement planning) which allows a construction procurement strategy to be developed at a portfolio level during the planning stages and the advantages of framework contracts to be realised. Another key feature is the linking of the hand over and commissioning of the construction works to an asset register to improve the sustainability of the completed works.

THE USE OF PROCUREMENT TO PROMOTE SUSTAINABLE DEVELOPMENT OBJECTIVES

THE SUSTAINABILITY AGENDA FOR PROCUREMENT

Sustainable development may be defined as “an enduring, balanced approach to economic activity, environmental responsibility and social progress” (BS 8900:2006). The general principles for sustainability in construction works from inception to end of life are:

- sustainability needs to be consider in terms of economic, environmental, and social aspects;
- performance and functionality needs to be achieved with minimum adverse environmental impact whilst improving economic and social aspects at local, regional and global levels;
- the whole of the works as well as its parts (products and components), services and processes needs to be considered over life cycle; and
- different target audiences will have different perspectives on the challenges and the preferred solutions.

Table 1: Stages in the delivery of construction works

CIDB (2011)	ISO 29481-1 (2010)	RIBA Enterprises (2000)
1 Infrastructure planning	-	-
2 Procurement planning	-	-
	0 Portfolio requirements	
3 Package preparation	1 Conception of need	A Appraisal; B Strategic briefing
4 Package definition	2 Outline feasibility; 3 Substantive feasibility	C Outline proposals; D Detailed proposals
5 Design development	4 Outline conceptual design; 5 Full conceptual design; 6 Co-ordinated design and procurement	E Final proposals
6 Design documentation (6a (Production information) and 6b (Manufacture, fabrication and construction information))	7 Production information	F Production information; G Tender documentation; H Tender action; I Mobilisation
7 Works	8 Construction	J Construction to practical completion
8 Hand over; 9 Close out (9a Asset data and 9b Package completion)	-	K After practical completion

The sustainability agenda for procurement flows out of the 1992 Earth and 2002 World Summits i.e. to utilise procurement, without prejudicing international trade principles, to (Watermeyer 2004):

- alleviate and reduce poverty,
- minimise the harmful effects of development on the local environment,
- establish and strengthen indigenous building materials and methods,
- promote construction technologies that increase employment, and
- promote increased use of environmentally sound goods, building materials and construction technologies.

This agenda has more recently been expressed as only purchasing goods that are really needed, and buying items or services whose production, use and disposal both minimize negative impacts and encourage positive outcomes for the environment, economy and society (BS 8903: 2010).

SUSTAINABLE PROCUREMENT

The fundamental questions that needs to be asked before proceeding with a procurement are:

- Can unnecessary consumption be avoided through demand management?
- Can alternatives such as reuse, refurbishment or reconditioning or the acquiring of second-hand or used items be considered?

Once the decision has been taken to proceed with a procurement, choices need to be made regarding how best to proceed. Choices are informed by project objectives i.e. the reason for undertaking the project as well as broader societal objectives. Project objectives need to be translated into procurement objectives that may relate to either the delivery of the product itself (primary objectives) or what can be promoted through the delivery of the product (secondary objectives). Primary objectives typically relate to budget, schedule, quality/performance, rate of delivery, environmental/health and safety aspects, buildability, relationships (e.g. long term relationship, early contractor involvement, integration of design and construction etc), client involvement in the project, end user satisfaction and maintenance and operational responsibilities. Secondary objectives typically relate to the alleviation and reduction of poverty, job creation, the reduction of negative environmental impacts or the promotion of health and safety performance beyond statutory requirements.

Sustainability through procurement necessitates that attributes such as usage of e.g. energy and water, choice of construction materials, methods and resources, waste disposal, adaptability for changed usage, accessibility and maintainability are considered.

These attributes may relate to different stages in the life cycle of construction works and may be described by a set of indicators (quantitative, qualitative or descriptive measures), that relate to its design, construction, occupation or eventual demolition. Such indicators should be based on the impacts of aspects of the works in relation to the environment, economic value, the well being of users and issues of concern to the community and provide a platform for objective decision making (Watermeyer and Pham 2011).

Choices are also informed by considerations relating to the service life of the works, whole-life costs and benefits of the procurement, and the capabilities of supply chains to address sustainability issues throughout the chain.

Primary objectives (“must haves”) are usually met through:

- the scope of work included in the contract i.e. the document that specifies and describes the goods, services, or construction works which are to be provided, and any other requirements and constraints relating to the manner in which the contract work is to be performed; and
- the selected procurement strategy i.e. the selected packaging, contracting, pricing and targeting strategy, and procurement procedure for a particular procurement.

Secondary procurement objectives (“nice to haves”) can be achieved through the selected procurement strategy, particularly through targeting strategies which include incentives that are provided in the form of tender evaluation points, financial incentives for attaining key performance indicators, contractual obligations and mandatory subcontracting requirements. ISO 10845-1 (2010) provides a set of targeted procurement procedures which can be used to create the demand for services or goods or to secure the participation of targeted enterprises and targeted labour in contracts. Other parts of ISO 10845 provide key performance indicators to measure the participation of target groups in the performance of contracts throughout the entire supply chain.

CONSTRUCTION PROCUREMENT STRATEGY

There are a number of different approaches to procuring construction works, each of which can result in different outcomes. Procurement strategy is all about the choices made in determining what is to be delivered through a particular contract or call off from a framework agreement, the procurement and contracting arrangements and how secondary procurement objectives are to be promoted.

The framework set out in Figure 2, which draws upon the menu of options embedded in the ISO 10845 construction procurement standards and the FIDIC and NEC3 families of contracts, enables choices to be made and aligned with project objectives in the development of a construction procurement strategy (Watermeyer 2011c). The application of this framework:

- rationalises the delivery of projects within a programme or portfolio of projects and minimises the contractual relationships which are entered into; and
- enables resources and objectives to be matched to the choices made regarding the manner in which needs are to be met; and
- has the potential to delivery construction works more efficiently and in a manner which closely aligns with project objectives and is more likely to deliver value for money.

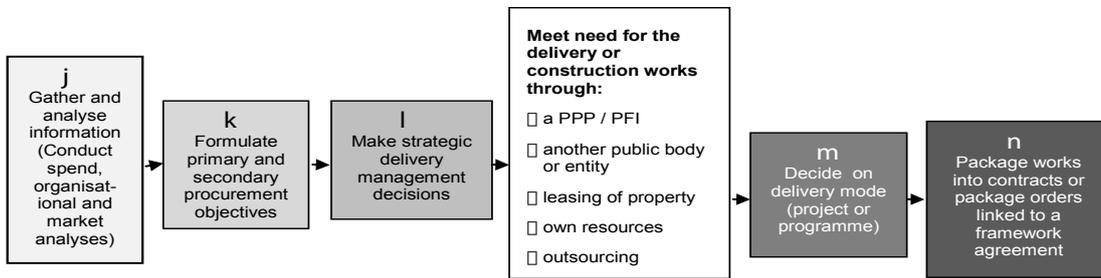
CHANGING THE CULTURE

Embracing new or different practices such as those embodied in the ISO 10845 construction procurement standards, the FIDIC and NEC3 families of contracts and the CIDB Infrastructure Gateway System takes time and requires strategic leadership. Clients are the drivers of change. They need to change the culture in which construction works are delivered if they wish to see improvements in project outcomes.

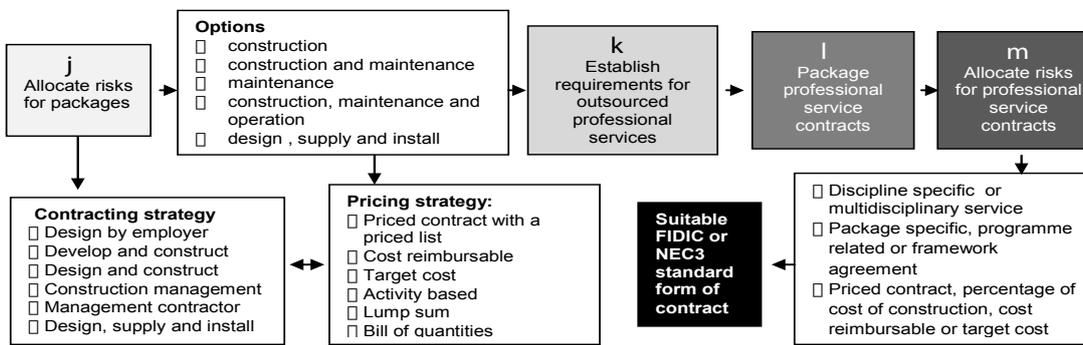
Culture changes along the lines of those expressed in Table 2 have the potential to bring about improvements in project outcomes.

CONCLUSIONS

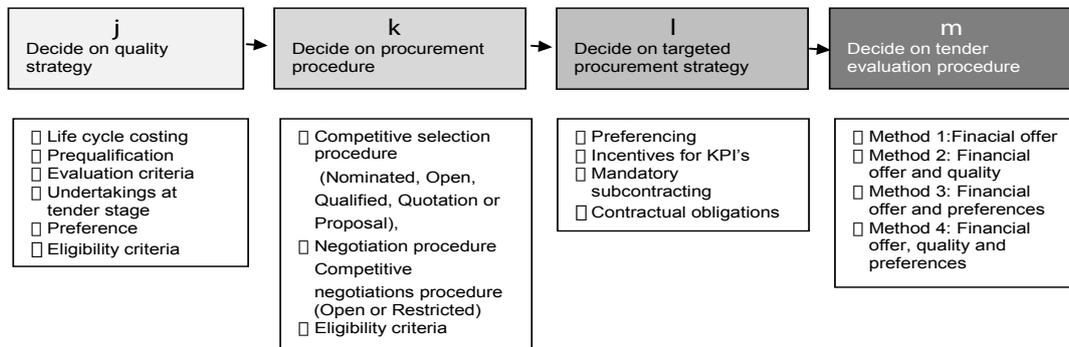
There have been major advances in all aspects of the construction procurement system over the last few years, all of which have the potential to improve project outcomes. The systems, tools and techniques are available for an industry willing to embrace change in order to improve performance and project outcomes. A culture change is, however, necessary to embrace these changes.



a: Develop a delivery management strategy



b: Decide on the contracting arrangements



c: Decide on the procurement arrangements (See ISO 10845-1)

Figure 2: Framework for developing a construction procurement strategy (Watermeyer 2011c)

Table 2: Culture change required to improve project outcomes

From	To
Master-servant relationship of adversity (“them” and “us”)	Collaboration towards shared goals (integrated project team approach)
Fragmentation of design and construction	Integration of design and construction
Constructability and cost model determined by design team and quantity surveyor / cost consultant only	Constructability and cost model developed with contractor’s insights
Short-term “hit-and-run” relationships focused on one-sided gain	Long-term relationships focused on maximising efficiency and shared value
Risks are allowed to take their course	Active risk management and mitigation
Develop the project in response to a stakeholder wish list	Deliver the optimal project within the budget available
“Pay as you go” approach to delivery	Discipline of continuous budget control
Rigid, bespoke, ill defined and disjointed procurement system	Flexible, predictable, integrated, documented and auditable procurement system
Poorly structured procurement documents based on bespoke or local standards and forms of contract with reliance placed on local knowledge	Structured procurement documents based on international / national standards and forms of contract with minimal customisation / amendments and clear and unambiguous requirements
Project management focussed on contract administration	Decisions converge on the achievement of the client’s objectives
Standard delivery stages prescribe the contracting arrangements and are unrelated to a portfolio of projects	Delivery is managed and controlled through stages which permit the full range of contracting arrangements and commence at a portfolio level
Ill defined end of stage deliverables and acceptance procedures	Well defined end of stage deliverables and acceptance procedures which enable informed decisions to be made
Design and construction developed in isolation from operation and asset management considerations	Design and construction aligned with operation and asset management requirements
Procurement strategy focussed on selection of form of contract as all other choices are predetermined	Selected packaging, contracting, pricing and targeting strategy and procurement procedure aligned with project objectives
One project one contract	Works packaged appropriately to achieve objectives and efficiencies
Project delivery take place within predetermined parameters without any conscious thought to objectives	Projects deliver on documented primary and secondary objectives in a measureable and quantifiable manner

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DOES FM DESTROY VALUE? A POLEMIC

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FM has a long history of declaring, without much evidence, that it adds value as well cutting cost. In practice the latter dominates. In the process FM often detracts from business or social value and transfers costs to others.

Keywords: facilities management, human resource management, environmental impact, organizational culture, value destruction

INTRODUCTION

Much academic effort has been expended in recent years seeking to define how FM adds value. The topic is arguably as old as FM with the rhetoric of adding value and reducing cost traceable to the early days of the subject (e.g. Tranfield and Akhlaghi, 1995). The debate can be elusive but practice focuses overtly on the cost end of the combination. I want to risk approbation, and be slightly provocative, by asking whether FM in practice subtracts rather than adds value. In what deserves to become a seminal paper Crowther and Donlan (2011) have coined the concept of a value creation space and argued, without detail, that logically the concept must also embrace negative creation or value destruction. Although their concept derives from the domain of events marketing the danger of value destruction space must surely be on the FM radar.

The practice of managing buildings is as old as civilization (Roper, 2012) but has only been designated as Facility/Facilities Management (FM) since 1978 (Price, 2003). Since then the term has been adopted globally and has spread to encompass in practice the provision of an ever growing range of building services applied to an ever growing range of building purposes. Many would contend that there are generic aspects of FM, systems and processes that can be applied regardless of building purpose. Perhaps at the level of construction and day to day services that is true. I am concerned here with the, potentially oxymoronic, 'intelligent client' (Roberts, 2001); that part of the FM function devoted to the interface with the 'core business'ⁱⁱ; facilities planning rather than facilities provision (Thompson, 1988).

Whether that function, and the resulting facilities, add value, are neutral, or indeed destroy value must depend on a building's purpose, the strategy of the occupying business and the wider context. Buildings intended to promote cultural and social regeneration in say Cape Town (Michell 2010, 2012), must surely embody a different concept of value to say a for profit healthcare facility in Cape Cod. There may though be generic lessons. Michell's research has identified 'white elephants'; facilities that a community "does not feel they need or want" that stand empty and are subject to a high level of vandalism. If the investment in those facilities has not delivered its intended social impact have they actually wasted money, destroyed economic value, and also failed to enhance the social capital of the community for which they were intended. Does this failure to engage users characterize other facilities failures? The USA's 'cube farms' much satirized but still the prevailing office formⁱⁱⁱ might provide a, surprising parallel. Many in practice not only stand empty much of the day^{iv} but also lead to office designs which consume more total space, hence both embodied and in use energy, an environmental cost. Equally they may be sub-optimal in contributing to a business's human capital and competitiveness (Vischer, 2012; Myerson, 2012; Haynes, 2012). How did the situation arise?

i. I.Price@shu.ac.uk

ii. A pervasive, and arguably inappropriate, term (Price, 2004)

iii. <http://stocks.investopedia.com/stock-analysis/2011/Are-Companies-Replanting-Their-Cube-Farms-SCS-MLHR-KNL-HNI-ODP-OMX-SPLS0624.aspx#ixzz1YNsVQucF> accessed on 18/09/2011

iv. Utilisation studies time after time reveal work stations occupied between 70% (clerical grades) and 30% (executive grades) of the working day. Covert vandalism or at least failure to maintain workspaces is rampant (Nathan and Doyle 2002)

DESTROYING KNOWLEDGE VALUE?

EVOLVING THE CUBE

FM, in the sense of workplace management and IFMA, traces its origins to a meeting in Herman Miller's offices in Ann Arbor Michigan in 1978. At the time Herman Miller were enjoying considerable success selling their Action Office. Robert Propst who headed Herman Miller's Research Corp is credited as the lead designer for the Action Office^v, launched in 1968, and widely regarded as the ancestor of the cubicle.

An interview with Propst reported two years before his death survives online^{vi}. "I don't even feel faintly guilty about Dilbert," Propst says from his suburban home near Redmond, Washington. "The things expressed in that comic are the very things we were trying to relieve and move beyond. It was a Dilbert world even back then. Everything we worked toward tries to express something more interesting." "Back then" was the early Sixties, an era when offices were huge, open spaces filled with orderly rows of desks and chairs, surrounded by neat, closed-in rooms. "Those offices were devoid of the imprint of work or process," says Propst. "I call it the clean-desk syndrome. At the end of the day, ideally, you had no bodies or paper showing. It was so sterile. The CBS Building in New York was an interesting example. In there, you could not choose anything yourself, except maybe a picture of your wife or your dog."

He goes on to criticise those who picked up the concept and converted it into what it became [emphasis added]:

The austere quality for which cubicle-filled offices are now criticized was entirely intentional. "We tried to create a low-key, unself-conscious product that was not at all fashionable," says Propst. "The Action Office was supposed to be invisible and embellished with identity and communication artifacts and whatever you needed to create individuation. We tried to escape the idea of being stylish, which is gone in five years. We wanted this to be the vehicle to carry other expressions of identity. That's why we provided tackboards and all kinds of display surfaces [...]"

There were early signs that not everybody understood. "A lot of people in the industry said, 'Where the devil is the design?'" Propst chuckles. Still, the Action Office caught on almost immediately, spreading throughout the American workplace, and spawning imitators (Propst's last count puts them at 42). But Propst's forward-thinking motives were misinterpreted by some companies, which simply crammed more workers into smaller spaces and took advantage of the system's huge potential for savings and tax breaks (laws permit businesses to write off the depreciation of cubicles much more quickly than that of traditional offices). "The dark side of this is that not all organizations are intelligent and progressive," Propst says. "*Lots are run by crass people who can take the same kind of equipment and create hellholes. They make little bitty cubicles and stuff people in them. Barren, rat-hole places.*"

So much, in Propst's opinion, for the first twenty years of FM. Others were making similar critiques. Becker (1990) commented on knowledge work as 'rugby not relay' whilst Peters (1992) in addition to arguing for space management as the most ignored – and most powerful – tool for inducing culture change, speeding up innovation projects, and enhancing the learning process in far-flung organization commented that while we fret ceaselessly about facilities issues such as office square footage allotted to various ranks, we all but ignore the key strategic issue – the parameters of intermingling. Duffy (2000), reflecting on a movement to which he contributed hugely.

Facilities managers share with architects and designers a great deal of responsibility for what is, by any standard, an astonishing case of conservatism. This is odd because facilities management emerged as a fully-fledged profession 20 years ago, largely because of a growing realisation that the physical environment of the office, on its own, was not enough to solve what were already, even by the slower standards of that time, rapidly developing business requirements. I remember arguing at the time, as many others did, that the way in which office space was managed through time is of equal significance to office design. The big idea was that as software is to hardware, so facilities management is to design. It is unfortunate to have to admit, 20 years later, that it would have been rather more accurate to say, "so facilities management should be to design". What has happened has been very different from what we expected. The skill of managing office space may have developed but the office environment itself remains very much as it was dedicated to [emphasis added] **rolling out formulaic solutions.**

v. <http://hermanmiller.com/Designers/Propst> accessed 20/09/2011

vi. http://www.metropolismag.com/html/content_1198/no98man.htm accessed 20/09/2011

The cube farm did not take off so much in the UK^{vii}, perhaps because it was seen as consuming too much space. Instead we got serried blocks of four, or latterly 6 to 8, ‘workstations’ arranged in neat straight lines. Such designs were easy to roll off CAD systems, and met a demand for notional efficiency. In practice were they value destroying? I want to argue that:

- In the last 10 years alternatives have been shown to be possible
- Those designs add value, in the genuine economic sense of more output per unit of input, and
- They also actually cost less overall as well as leaving a lower carbon foot print but
- They demand a rethink of how offices function and therefore the design and investment priorities.

PROVING THE PUDDING

In 1998 Turner and Myerson reviewed workplace changes over the previous 10 years and distinguished modernisers from mould breakers. The former had invested in new, often out of town, office buildings rich in design features but without accompanying relaxation of older cultural norms. Staff felt uneasy using the newer interactive spaces. FM tried to control and preserve designs to which they were attached (Donald, 1994), and imposed solutions without communication or consultative processes of change. Mould-breakers in contrast were typically young companies determined to rewrite the rules of office design by taking a radical new approach to use of time and space. They tended to be found in newer technologically literate industry segments. Ten years later (Myerson, 2012) more mould breaking examples could be found in big businesses, driven he believes by globalization and the increased emphasis on creativity in western economies. Indeed some of the mould breakers of the 1990s became big businesses themselves. Today’s mould breakers are increasingly virtual. Looking back on the changes Myerson sees more emphasis on team, exchange and public spaces also more expression, in space of organizations’ brands or narratives. What we do not know from that analysis is how many companies failed in the new globalized world while they clung to old ideas and old concepts of the workplace. Breslin (2012) provides one example.

Did FM drive the successful changes? In most of the examples I know well it only did where FM, or at least workplace management, was seen as part of the HR or people function, responsible for organizational culture. One of the finer examples was provided by the UK’s Government Communications Headquarters (GCHQ) whose use of a new workspace to enable strategic changes is described online^{viii}. It includes the evidence of impact on the organization’s delivery of its strategic role.

ECHQ, the London Headquarters of the global property firm E C Harris provides another example (Stuart, 2012). The project, completed in 2006, was part of a deliberate aim to differentiate the firm in a market sector which was becoming crowded and to some extent commoditized. Its derived benefits include an increase in available billable hours, an increase in staff satisfaction, retention and recruitment and an increase in commissions and margins as well as a 33% cost and carbon reduction per head compared to the firm’s previous HQ. It operates at around 25% less cost per supported member of staff than the average corporate HQ in London and challenges prevailing design priorities in a number of ways (Beard and Price, forthcoming) including a complete emphasis on facilitating intermingling. It currently supports over 900 staff from 545 workstations; an occupation efficiency around twice that of supposedly vaunted examples of new European HQs such as Microsoft’s HQ at Schipol Airport^{ix}. The occupiers, who regarded the building as a paradigm shift in 2006, are already seeing it as dated compared to what could be achieved (personal communications to the authors). It is an example of shifting the inner ‘nut’: rethinking the fundamental assumptions about a facility and achieving a dramatic increase in both business productivity and, by some indicators, facilities efficiency. It was a business driven project from start to finish.

The priorities afforded to different kinds of space are also different (see Table 1). Fully 20% of the Net Internal Area (NIA) of ECHQ is space accessible to clients or collaborators of various kinds. It includes a café-bar, various meeting facilities and a small conferencing suite. The accessible area (dubbed landside by comparison with airports) is finished and managed to a high standard. The ‘airside’ behind a security barrier is laid out to be open and flexible with a design that subconsciously recaptures some of the feel of the *burolandschaft* offices of the 1960s. Even so space for both formal and informal meeting is generous. When, as here, space planning starts from the perspective of better supporting business goals it is possible also to achieve far greater efficiency and saving of net cost and carbon. The growing international movement for Corporate Social Responsibility [CSR] is increasingly calling for what triple bottom line (Elkington, 1998) reporting: i.e that companies report not only on their financial performance but also their ecological and social impact. A workspace such as ECHQ, while it is business led in the classic sense of Becker et al. (1994), or a lean asset (Price, 2007) is also genuinely demonstrated to make a triple bottom line contribution, hence the designation in this paper’s title. The overall result incorporates a shift of emphasis away from a concentration on individual settings towards a higher proportion of shared space

vii. Though I recall working in one briefly in 1983. A ‘relay not rugby’ approach to decision making, abetted by the cubes, arguably contributed to an £80m over appraisal of an investment decision. There is insufficient space to explain.

viii. http://www.ogc.gov.uk/documents/Lovell_Elliot_-_Day2_Session5.pdf (available from author)

ix. Reports on the New WoW network at the time claimed it only utilized 13 m² per FTE whereas the North American norm is still c.a. 20 m² (Becker pers comm 2010). ECHQ is under 7m² per FTE.

some of it semi-public in the sense of accessibility to the firm's clients and strategic contacts. Both examples might be considered genuinely value adding, delivering or enabling the strategic purposes for which they were designed, and, *inter alia* being perceived as such by their users, the equivalents of Michell's (op. cit.) sustainable facilities rather than white elephants. Elsewhere office based FM delivers, in the interests of notional efficiency, too much space that is, at best neutral with respect to business and at worst destructive of knowledge creation, learning, and economic value adding. Are there examples from other sectors?

VALUE DESTRUCTION: GENERALIZING THE EXAMPLES

BUSINESS SCHOOLS

Academia is in general cautious about embracing newer, open offices such as the example just illustrated (Price and Fortune, 2008; Price et al., 2010). Equally it is, in the USA and increasingly the UK, a sector that is becoming increasingly commercialized. Business Schools are in the forefront of that challenge and increasingly themselves globalised^x. Many have invested in new buildings as part of their competitive strategy. In the UK the Association of Business Schools (ABS n.d.) have gone to the lengths of preparing a media bulletin illustrating 15 examples. A minister from the previous administration praises this example of his government's investment in higher education and boasting of the "huge reductions in carbon emissions" embodied in the buildings.

That is indeed one feature. The buildings are environmentally efficient –**in use**. They are also enormously wasteful of space in academic offices, hence larger than they need to be, while ineffective in terms of provision of meeting spaces. Contrast two buildings of similar size (Table 1). One is ECHQ. The other is an unrenovated business school in a university generally recognized in the sector as spatially efficient. Lecture theatres and other teaching spaces have been removed from the business school case.

The newer, supposedly carbon efficient buildings use approximately twice as much space per FTE and deliver even less interactive space. If Peters (1992) was correct when he described the "parameters of intermingling" as the critical dimension in knowledge creation, and Myerson's review (op cit.) suggests history has confirmed it (c.f. Price, 2002; Haynes and Price, 2004), these new Business School buildings are ill suited to their core purpose. They are also expensive with construction costs per m² typically above £3,000. Is paying too much for too much ineffective space an effective value proposition? or, to echo Michell (op. cit.), are the buildings 'green' elephants with a looming maintenance problem that cost per m².

Table 1 Comparison of an exemplary corporate HQ and Business School that is notionally efficient on HEFCE performance measures and apparently 'full'

	ECHQ	BS1 W/O TEACHING
Total Net Internal Area m2	5839.53	5130.54
Workstations provided	545	383
FTE Staff supported	800	302
m2 per staff member	7.30	16.99
m2 per work station	10.71	13.40
PUBLIC SPACE		
% Client access	20.00	7.34
STAFF SPACE		
% Informal Interaction	4.00	1.85
% Staff Meeting	6.53	1.59
% Total Meeting	10.53	3.44
% Work stations and / circulation	69.00	89.23

THE COST PARADOX

Cost, usually per m² or per service episode still rules large. Since ca 1997 the UK has seen a rise in elaborate schemes designed to accurately compare costs in offices (IPD Occupiers), health facilities (ERIC^{xi}) and Higher Education (EMS^{xii}). There are two ways to reduce cost per m². One is to reduce costs. The other is to retain excess space, especially if nothing is spent on it. The result is an

x. <http://www.ft.com/business-education>; Drew 2011

xi. Estates Return Information Collection run by the Department of Health

xii. The Estates Management System established by the Higher Education Funding Council

often an excess of poor quality space (May and Price, 2009; Price and Clark, 2009; Kennie and Price, forthcoming). The situation is a classic example of Goodhart's (1975) Law applied to the Public Sector (c.f. Pidd, 2005). Unfortunately recent government directives to reduce Public Sector assets do not often differentiate between the efficient and those who held a buffer against such circumstances. Should those surplus assets now be sold they will of course have less value than would have been the case say five years ago: a reduction in value born by the Taxpayer.

Hargreaves (2012) will report on another instance of taxpayer value destruction this time in Social Housing, again in the UK where it seems the cost of short-term contracts for remedial maintenance resulted in a net burden of £ billions. In a similar vein Martindale et al. (2008) identify failure of chilled storage units as the biggest single source of loss and waste in the UK supply chain. Short term maintenance contracting is a likely cause.

DISCUSSION

IS THIS FM?

The examples above do no more than scratch the surface. Some might say they are a fact of life. Some might say they represent an opportunity to make money, a 'tragedy of the commons' (Hardin, 1968). Some might blame procurement departments, or general management of core businesses, or political decision makers. All indeed contribute. That said the examples point to various instances of failure, by FM, to identify and contribute to various forms of net waste. Why? Various paradoxes suggest themselves.

MEASUREMENT

There is the old adage that you cannot manage what you cannot measure but do we measure what we can, then manage accordingly?

THE WRONG SORT OF ENGAGEMENT

Michell's white elephants represent failure to engage the community of users in co-creating (Alexander, 2012) future facilities and hence value. My green elephants and some over optimistic public projects arguably arise from failing to sufficiently challenge users' perceptions of what they need. The first appears as under consultation; the second as taking the user opinion, at least as expressed by management, at face value.

MISUNDERSTANDING EFFICIENCY

I am coming to wonder whether CAD systems have a lot to answer for. They make it easy to reproduce standard design elements, typically workstations across a template. The result is the cubicle farm or its UK equivalent, neat rows of four, or six workstations that fill a template with the precision of troops on parade

RETHINKING THE RECIPE

The examples point to a need to consider what goes into the modern workplace pudding, and how it is created. Some of the lessons I draw are as follows.

BUSINESS INTENT

These are workspaces created in pursuit of a strategic business objective, not with saving cost as their primary rationale. In the process they actually save more. The currently quoted average density of corporate HQ offices in London is 11.2 m² per FTE^{xiii}. ECHQ achieves less than 7m². Its occupants have embraced working without dedicated desks because they have a variety of attractive locations to work from when they are in the building. GCHQ does something similar though the precise figures have not been released.

UNMANAGED SPACE

For many the various 'desks' in these environments are better thought of as shelves for communications equipment than traditional desks or work-stations. There are places for team anchors (Greene and Myerson, 2011) but most people are mobile. Interestingly where they sit is not booked, managed or monitored in the manner of classic FM with bookable hotdesks, hotelling, space standards and all the other paraphernalia that have grown up in FM. People go where they need to to get done what they need to. There is ample, unmanaged, space for everyone. They are neither stationed or stationary.

xiii. Investment Property Databank 2011

LEARNING AND THE PERIPATOS

Over the last 20 years, to name but a few, we have had the Learning Organization, Knowledge Management, the Experiential Economy and Value Co-creation. Implicit in all of them is the emphasis on people learning and communicating; exchanging knowledge and ideas. The peripatetic school of philosophy founded by Aristotle apparently derived its name from his habit of teaching while moving. Using evidence from modern theories of cognition (Beard and Price, 2010, forthcoming; Beard 2012) have argued that such exchanges can be enriched by special settings. Much has been published on the benefits of informal interaction and its opposite the debilitating affect of unwanted disturbance. Once the link with a specific 'station' is broken, as for many it can be, the dilemma disappears. Within less space overall it is possible to provide better environments for both interaction and concentrated individual thinking.

PROCESS NOT SOLUTION

Employee satisfaction, measured by surveys and staff retention, rose in the cases I have described. In contrast Bull and Brown (forthcoming) describe a situation where the FM of 'finaceco' were tasked with cutting costs and implemented a predesigned and regimented solution with all the usual trappings. Communication was left to line managers' interpretation of a brief. Many employees reported their loyalty to the company had decreased.

By contrast, in the examples above and other success stories employees were given the opportunity in various ways to comment on the proposed changes. Their reported fears are often consistent. "I need an office to concentrate, to have confidential conversations, to store xyz. Sometimes these are genuine. Very few honestly admit their concerns at loss of status.

CONCLUSION

Unfortunately after over 40 years of FM it is remarkably easy to find the same examples of spaces built and or managed according to guidelines and best practice that are too large, wrongly located, badly maintained or otherwise disappointing to those who create or deliver services from them. There is undoubted waste of investment money and daily budgets. There are constraints on building purpose, whether commercial or community. Is getting smarter at doing the wrong thing the limit of the FM research communities' ambition?

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THE INCUMBENT INTERESTS AND ACCOUNTABILITY IN THE CONSTRUCTION SECTOR: THE COST APPROACH TO MULTISTAKEHOLDER STANDARD-SETTING

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This presentation will focus on governance issues in the construction sector. Particular emphasis will be placed on the CoST approach, accountability and transparency.

Keywords: accountability, transparency, CoST approach, stakeholders

It is our intention to distribute a copy of Associate Professor Calland's paper after the conference.

A copy of the Powerpoint presentation may be obtained from:

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SESSION 1

STRATEGIC FACILITIES MANAGEMENT

VIRTUALITY – WHAT DOES IT MEAN FOR FM?

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It has been speculated that virtuality will have a dramatic impact on the use and design of physical space. Especially for those involved in facilities management (FM), this trend is already easily observable. This study aims to clarify what virtuality really means for facilities management. The clarification is backed by taking a view of what virtuality is and what it could be to companies from different industry sectors. The study was conducted by reviewing literature on virtuality as well as collecting and analyzing data on the case companies. In the literature review, two different concepts of virtuality were identified. Problems arise when the concept of virtuality used is not clearly specified. The term, as well as many other terms related to the subject, is often misused. This paper provides examples of the division and then further explains the roles of the two different virtualities in facilities management. Findings conclude that companies in the industry seem to leave a lot of virtuality's potential untapped and that more consistent and precise use of terms is needed.

Keywords: information technology, value creation, virtuality

INTRODUCTION

During the past few decades, as information technology (IT) has intensified most office work tasks and also enabled a number of new ones, it has gradually gained its current position as an irreplaceable part of an office worker's work setting. IT has naturally gained attention in the scientific world as well. Not only in the field of computer science, as the most obvious one, but also in other fields that are more concerned about the implications that adopting IT has rather than the technology itself. Organizational science is a good example of these other fields of science. In organizational science, IT-supported work has become widely referred to as virtual work. The same meaning for word 'virtual' has been adapted to a number of terms further forming the whole concept of virtuality. This concept of virtuality seems not to be unambiguous (Fang & Dutta 2005). In facilities management (FM) research the concept of virtuality referred to is the one adapted from organizational science (Roulac 1996; Becker 1998; Hinks 2002; Joroff 2002; Joroff et al. 2003). Most cases where virtuality is mentioned relate to workplace management as a part of facilities management. Workplace management has a strong connection to organizational science and this means that a similar approach to virtuality is taken.

Nonetheless, the organizational science approach is not all there could be to the entity of virtuality from the perspective of FM. Through examples from the industry, this paper presents a parallel perspective to virtuality that cannot simply by its definition be the same virtuality that is dominant in organizational science. The study approaches virtuality from a clearly wider perspective than previous FM research and intends to present a more comprehensive depiction of the entity of virtuality. Also, this paper addresses some obvious problems in the present discussion of virtuality. This paper does not follow the common structure of a scientific article in that some of the results and conclusions are being presented already in theory. This is because a significant part of the findings of the study is based on the literature review. In the first part of this paper, the definition for 'virtuality' is elaborated from the definition of 'virtual' and the identified duality of virtuality is explained. In the second part the two virtualities are described separately and then the implications of this duality are discussed. The third part considers the two virtualities in the context of today's facilities management and the potential utilization of virtuality is further discussed.

DEFINING 'VIRTUALITY' THROUGH DEFINING 'VIRTUAL'

The variety of different aspects to virtuality and the relatively early stage of its adoption to different fields have led to the existing manifold terminology regarding virtuality. Some of the terms used are rather hazy and many have a number of synonyms. Also, the term virtuality has become vaguely used. It is often referred to without even the slightest intention to really consider what it means. A clarification of its meaning needs to be addressed. As virtuality does not yet have an established uniform definition, it needs to be defined by examining its root word virtual. Therefore, the literature review focused on different usages of the words 'virtuality' and

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'virtual' in the context with some relation to FM. Instead of going through the evolution of the word 'virtual' from the Latin word 'virtus' (proficiency, virtue, manliness), let's focus on what it means in today's language. The dictionary definition is in general terms "almost or nearly as described, but not completely or according to strict definition" and in computing "not physically existing as such but made by software to appear to do so" (Oxford Dictionaries 2011). Lipnack and Stamps (2000) have three contemporary meanings for virtual:

- 'Appears to Exist' meaning; virtual is something that is not real, but appears to exist and appears real to the senses;
- 'Almost Like' meaning; virtual is not the same, but almost like or in essence the same as its non-virtual equivalent; and
- 'Virtual Reality' meaning; virtual as it is in 'virtual reality', "a recent meaning invented for an emerging capability"

According to Lipnack and Stamps' (2000) philosophy of virtual, which falls in the organizational science category, the authors use the 'Almost Like' definition, as a virtual team is in many ways similar, but also critically different from a conventional team working together in the same place. 'Virtual' is used similarly in terms 'virtual organization', 'virtual corporation', and 'virtual office.'

The 'Appears to Exist' meaning Lipnack and Stamps (2000) disprove by saying that when they talk about virtual teams, they mean teams that certainly are real and not electronic representations of the real thing. The newest 'Virtual Reality' meaning they do not accept as it would attest "...to forces that have moved teams into an altogether different realm of existence – virtual reality – or, more precisely, digital reality. Electronic media together with computers enable the creation of new kinds of spaces. They are real to the groups that inhabit them, yet are not the same as physical locations" (Lipnack & Stamps 2000).

Taking a closer look at the 'Appears to Exist' and 'Virtual Reality' meanings presented by Lipnack and Stamps (2000) – how recent in fact is the meaning of 'virtual' as it is in virtual reality? Also, how different really is this meaning from the 'only appears real to the senses but is not in fact'? Going back to the computing-related definition of 'virtual', where virtual does not physically exist as such but is made by software to appear to do so. This would be exactly the same as in virtual reality when virtual reality is a synonym for a digital representation of either the real world or of an imaginary world that aims to mimic something that could really exist and to deliver the perception of this to the observer. But isn't the computing-related definition for 'virtual' also exactly the same as the 'Appears to Exist' definition, only with the specification of using software to achieve this status?

Instead of attesting to any forces, the writers of this paper suggest that virtual reality is just an application of emerging technologies exploiting the idea of virtual in the meaning "appears real to the senses" and does not demand its own definition for 'virtual'. This leaves us with two relevant definitions for 'virtual', which both have their place in FM. The following section introduces the two different virtualities to which the two described definitions of virtual respectively relate.

THE TWO VIRTUALITIES

In the literature, two different virtualities relevant from the FM perspective can be identified: organizational virtuality and digital representation virtuality (DR-virtuality)ⁱⁱ. In the following those are described first individually and then discussed together in broader context.

ORGANISATIONAL VIRTUALITY

The term 'organizational virtuality' has not been in such widespread use as for instance terms 'virtual organization' and 'virtual team'. The term should be in more widespread use as it specifies the type of virtuality at issue. In FM research, when referred to virtuality, it's often the organizational virtuality which is dealt with – whether the particularization is made and expressed or not (Roulac 1996; Becker 1998; Hinks 2002; Joroff 2002; Joroff et al. 2003). For organizational virtuality the 'Almost Like' i.e. "people acting virtually like an organization, a team, etc." definition by Lipnack and Stamps (2000) for 'virtual' fits well. It supports the exhaustive definition for organizational virtuality presented by Fang and Dutta (2005). Based on the virtual organization literature and the knowledge-based view, they have elaborated a definition for organizational virtuality as "the capability of an organization to connect geographically dispersed entities to continuously work together by taking recourse to information system (IS) resources".

Fang and Dutta's (2005) major characteristics of a virtual organization (geographical dispersion, functional diversity and extensive use

ii. The writers of this paper wish to emphasize that the term DR-virtuality was generated as a part of the study for notation of the other identified virtuality. The term is not suggested to be used otherwise than for the distinction of the virtuality at issue.

of information technology) are rather vague, but this is in fact a good summary of the great number of characteristics named for virtual organizations in the literature. Other characteristics that occur in the literature include for example shared purpose/common interest, diversity of people or cultures, and temporal dispersion (asynchronous collaboration). In addition to being intra-organizationally virtual firms can be interorganizationally virtual. Outsourcing is an example of interorganizational virtuality (Fang & Dutta 2005).

Virtuality in an organization can also be approached through virtual space. It is a part of the concept of dividing space into physical, virtual and mental/social spaces, which has risen especially in the past decade to become a part of organizational study. This division has been used for instance by Vartiainen (2006; 2008), who bases it on Nonaka et al.'s (2000) work. Nonaka et al. (2000) introduced the Japanese concept of 'ba' as a shared context where knowledge is created, shared, and utilized in. As they plant the concept of 'ba' into today's work setting, they bring up the notion that it does not necessarily mean only physical space, but rather "unifies physical space such as an office space, virtual space such as e-mail, and mental space such as shared ideals."

Vartiainen (2008) – while strongly focusing on mobile work – claims that it's the physical, mental/social, and virtual working spaces where individuals and groups collaborate today. Virtual space – the most important one from the perspective of this study – he describes as an electronic working environment, a virtual work space or a collaborative working environment consisting of various tools and media for individual employees, groups, and whole organizations. As these tools and media Vartiainen (2008) lists among others Internet, intranet, e-mail, videoconferencing, document management, smartphones, groupware systems, and social software. Overall, Vartiainen's (2006; 2008) view to virtual organization is that a fully virtual organization communicates and collaborates through ICT in the mental and virtual workspaces. This is in conjunction with Lipnack and Stamps' (2000) definition for virtual team as a group of people working interdependently, but with a shared purpose across space, time, and organization boundaries using technology. Both of these views, as well as Fang and Dutta's (2005), obviously emphasize the importance of technology for a virtual organization. Even if some researchers do not find use of ICT a defining characteristic for a virtual organization, it seems that most have the same approach as Vartiainen (2006; 2008) for example. This approach concludes that an organization is not virtual without ICT enabling communication and collaboration.

DR-VIRTUALITY

In the introduction of this paper it was claimed that the virtuality often referred to in FM research, above defined as organizational virtuality, is not all there could be to the entity of virtuality from the perspective of facilities management. The rationale behind this is easiest approached through an example. An example would be a three-dimensional virtual model of a building created using computer-aided design (CAD) software, often recognized as the 'embodiment' of building information modeling (BIM). What makes this digital 3D-representation of an existing or planned construction virtual? It hardly is virtual for the same reasons the virtual organization is; geographical dispersion, functional diversity, and use of information technology as Fang and Dutta (2005) described.

This is where the 'Appears to Exist' definition for 'virtual' steps in. This definition is in conjunction with the other virtuality referred to earlier – DR-virtuality. The logic behind the name digital representation -virtuality is rather simple: what seems to characterize this virtuality is the use of the concept of the virtual environment (VE) – and more precisely – 3D virtual environment as a digital representation of something also observable or imaginable in the real world. One commonly known example of the usage of the word virtuality as a synonym for a three-dimensional virtual environment is the concept of reality-virtuality continuum (RV continuum). Milgram and Kishino (1994) presented their idea of a continuous scale between reality and virtuality, where there is completely real environment at one end and completely virtual environment at the other end. The widely used graphic presentation of the RV continuum is shown in Figure 1 below.

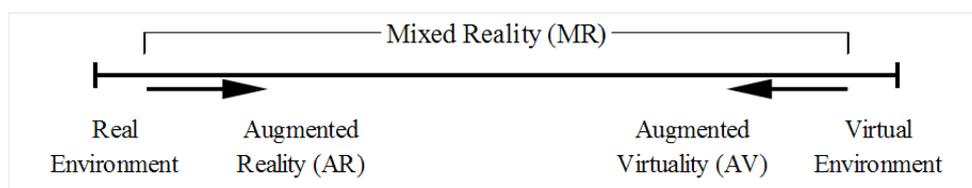


Figure 1: Simplified representation of a RV continuum (Milgram et al. 1994)

While real environment is quite self-explanatory, the other end of the continuum might need some clarification: "The conventionally held view of a Virtual Reality (VR) environment is one in which the participant-observer is totally immersed in, and able to interact with, a completely synthetic world. Such a world may mimic the properties of some real-world environments, either existing or fictional..." (Milgram & Kishino 1994).

The problem with the above concept, according to Milgram and Kishino (1994), is that virtual reality is also often used with reference to many other environments that are not completely synthetic and do not offer total immersion. These environments fall somewhere along the reality-virtuality continuum and represent mixed reality (MR). In MR environments, real objects are presented together with virtual objects within a single display. The methods for this are either augmenting real environments with virtual objects (augmented reality, AR) or augmenting virtual environments with real objects (augmented virtuality, AV) (Milgram & Kishino 1994). One example of AR technology is wearable or handheld devices, such as smartphones, that shoot the real environment with a camera and then show it augmented with virtual objects in a display (video see-through). Examples of applications for AR include visualization of a 3D-modeled building in its planned environment and visualization of planned furnishing in an existing building.

AV can be created for example by shooting a real object with a camera and placing it into the virtual environment. This is then observed through a visual display. AV applications for the use of FM in particular are few. Overall, the applications of DR-virtuality are various. The strong connection DR-virtuality has on FM comes from the fact that the 3D virtual environment is a digital presentation of physical space which is an essential part of FM. One of the main drivers for utilizing DR-virtuality has been avoiding the potentially high cost of trial-and-error. This cost may be for example in money (in the case of prototyping, production and manufacturing process simulation, BIM, etc.) or in human health (in the case of simulators for air and spacecraft pilots, emergency procedures training, etc.). Even if developing different DR-applications is expensive, they come at a low cost compared to the real-life trial-and-error.

As different DR-virtuality applications are becoming easier to use and to produce, their utilization is becoming more affordable. This means that the driver for utilizing DR-virtuality no longer needs to be for example the avoidance of very high cost of trial-and-error as it has been in older simulation applications. We can already observe DR-virtuality coming to many everyday applications – for example in smartphones and tablets, where it is not only about avoiding high cost, but also creating new business in a number of ways.

IMPLICATIONS OF THE DUALITY OF VIRTUALITY

Despite some divergent interpretations, it seems that for organizational virtuality the key words are collaboration, dispersion and ICT. If taken the technological approach, it seems no particular technologies need to be named, as the only purpose for technology is to support collaboration of a team or organization, whose members are dispersed in terms of geographic location for instance. So even if technology is a defining characteristic for organizational virtuality, technology seldom is in the main focus when examining organizational virtuality. DR-virtuality perspective is much more technology driven. It seems to be more about studying what virtual environments could offer to a specific industry, field of science, or group of people and what are the consequences of applying DR-virtuality in the object. For DR-virtuality, the idea is creating something that only exists in a digital form, but gives the observer the feeling that it could also exist in a more tangible form.

From the technology perspective, there are some areas where the two virtualities overlap as depicted below in Figure 2. A good example of this overlap would be the collaborative virtual environment. The environment could be three-dimensional and highly immersive to the user, thus being at the core of DR-virtuality, but at the same time serve as a shared environment, where a team could collaborate as if they were all present in the same physical space despite being spread around the world.

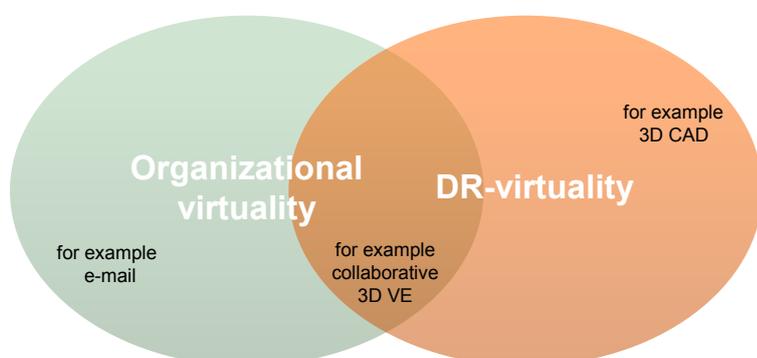


Figure 2: The two virtualities

On the other hand, in both virtualities there are areas that fall clearly very far from the other virtuality. An example is e-mail. It is a tool that most virtual organizations use. It represents ICT, so when used by a dispersed team for collaboration it would be enough to fill the technology-requirement for the team to be virtual. But how about when viewed from the other virtuality-perspective – there is in fact nothing virtual about e-mail; the connection between e-mail and 3D virtual environments is extremely remote. Similarly there are a number of 3D VE-applications that need not to aim at any kind of collaboration. They can be used by a single user only, and solely for the user's own purposes (for instance a CAD-application). Clearly, then it is not even possible to speak about an organization or a team whatsoever; thus, the application has nothing to do with organizational virtuality.

Basically the existence of the different virtualities is not a problem as long it is made clear which one is at issue, in fact, virtuality should never be referred to without being more specific. What seems to potentially cause problems in the current discussion regarding virtuality is terminology. Usage of prefix 'e-' and words 'digital', 'virtual', and 'cyber' to produce new terms has become very confusing. In some cases there are multiple terms for the same object or the same term for multiple objects. The term 'virtual space' is a good example of how one term has multiple uses. Above virtual space was described as a working environment, with various tools including e-mail, document management, smartphones etc. Virtual space may also refer to a virtual representation of the space (where one can observe stars, planets, etc.). In addition, virtual space is often used as a synonym for three-dimensional virtual environment.

CASE STUDIES – EXAMPLES OF THE TWO VIRTUALITIES

The aim of the study was to clarify what virtuality means for facilities management. To support this, a study of how virtuality is and how it could be utilized in the industry was conducted. The relevance of different applications of virtuality was evaluated on the capability of creating value to the end-customer, who would in most cases be the user of the space. The empirical part of the study was conducted by applying the identified concepts of virtuality into three case studies and simulating a hypothetical situation how value creation could be improved by utilizing different applications of virtuality.

The investigation was limited to technological applications as technology turned out to be what links the two identified virtualities. The intention was not to find new technologies for FM, but to investigate which technologies (software and hardware) are currently in use and which should be in order to achieve improved value creation. Some practical aspects such as limited availability of technologies, high cost, or other such obstacles were not considered. This means that some of the suggested technologies are not easily utilized yet today.

BACKGROUND AND DATA COLLECTION OF THE CASE STUDIES

The two concepts of virtuality were applied in three case studies. In the first case study, the focus was on how the value creation processes allowed the property manager and the owner to take care of their end-customers' daily life issues in an office environment. In the second case, the scope was narrowed to strategic workplace management services. The mechanisms and structures, which were not supporting the value creation, were identified from the business processes. In the third case study, the aim was to understand how a construction company could create value for nursing homes by their nursing home product.

The three cases have been structured around four steps. First, the end-customer value was identified by interviews and questionnaires. Second, the current value creation process was recognized by interviewing employees of the companies who were actually creating the value. Third, the identified value creation process was reflected against value creation theory in workshops, brainstorming sessions and case study analysis. Fourth, ways to improve value creation utilizing the two virtualities were formed and analyzed based on the capability of creating value to the end-customer.

DISCUSSION ON THE POTENTIAL UTILIZATION OF THE TWO VIRTUALITIES

Based on the case studies, the identified technological applications of virtuality that could potentially improve value creation in FM are BIM, virtual model of a building, integration of information systems, and telepresence.

Integration of information systems

In each of the studied cases, the setting is very strongly interorganizational. All the studied organizations rely on their surrounding networks of organizations, which comprise of actors such as end-customers, service providers, contractors, sub-contractors, and property owners. In order to be able to rely on the network, the information received from other actors must be reliable.

In the case of optimum efficiency, information is not only reliable, but also timely. In order to achieve this, human errors and delays in service could be prevented by making the information systems of different organizations communicate among themselves and by allowing shared access into an information system across the network where necessary. The cases showed that this is not where we are today. In fact, it is not only the interfaces between organizations, but also inside the organizations where the same data is re-entered or processed manually, which causes inefficiencies. The downside with making 'computers communicate among themselves' is the lack of personal service, which is appreciated among some end-customers. This means that one is forced to make a decision; the trade-off is timely/accurate service and individual/personal service.

Telepresence

Information flows played a crucial role in all cases studied. Arranging sufficient and effective means for communication absorbs lots of resources. Through development of telepresence technology, some of the interaction tasks that used to demand physical presence can today be carried out remotely; this development is still on-going. The technology for telepresence ranges from simpler videoconferencing equipment to more sophisticated mixed and virtual reality collaborative environments. Telepresence applications can be considered something enabling 'just-in-time-presence' and offering 'just-in-time-conference space', which means improved time, cost and environmental efficiency as traveling can be avoided. In the case where meeting physically would otherwise be impossible, telepresence applications can create improved value instead of just making value creation more efficient.

Building information modeling (BIM)

Among those who are not that familiar with BIM, it is often considered a 3D virtual model of a facility. The 3D model is only the visual presentation of the model and serves as an important part of BIM software's user interface. The 3D virtual model means that BIM represents DR virtuality, but BIM is a strong tool for collaboration, thus representing organizational virtuality. As BIM is much more a collaboration tool than just a visualization tool, the virtual model part is discussed separately. Aside from the 3D model and its utilities, BIM is used for document and information management, project management, estimating, scheduling, simulation, and analyzing a number of factors related to feasibility, costs, energy, and environmental performance. Server BIM enables even better collaboration and higher efficiency in the early stages of a building's lifecycle as all the designers will have the latest model and information in their use (Eastman et al. 2011). BIM's advantages are not restricted to only the designing and construction phases, but can be seen through the lifecycle of the building. BIM can help in managing the real estate portfolio of an owner or a user in many ways: planning and budgeting of a renovation project, analyzing space use, and managing environmental and cost performance of operation. The cases show potential for BIM through a building's lifecycle. Research showed that it is underutilized in the operation of a building.

Virtual model of a building

As BIM systems used in the construction are relatively heavy and complex, less sophisticated applications are needed for visualization and measuring purposes. When a new building is built using BIM, for example the geometry and material data is there in the model ready for also other than construction-related uses. It would often make sense to prepare a virtual model of an existing building which has not been built using BIM. The virtual model of a building, an application of DR-virtuality, can enhance value creation to the end-customer in a number of ways. Its applications – whether as part of the BIM or as a simple virtual model of the existing or planned facility – are various. For example the following uses were identified as potentially improving value creation: simulating use of premises prior to construction, visualization consummating communication between end-customer and designer (also by AR applications), reorganizing space use, planning space change needs, and marketing of space. The advantage of a virtual model comes mainly from the ability to depict plans in 3D instead of 2D. This is one means of avoiding the cost of trial-and-error.

IMPLICATIONS FROM THE CASE STUDIES

Studying the case companies from the perspective of the concepts of virtuality described earlier in this paper made the underutilization of virtuality evident. BIM, virtual models, integration of information systems, and telepresence are applications of virtuality that could potentially improve value creation in FM. Virtuality and technology are not the only things connecting the applications listed. Another common factor is that all the applications help in managing information flows inside or between organizations. Information flows and managing them seems to be of crucial importance in each of the cases studied and for this purpose, virtuality is one of the most suitable tools. Virtuality should not only be considered as a means of making things more efficient. Virtuality potentially enables creating added value to the end-customer from the owner (as the landlord), from the builder of new and renovated premises and from the facilities management unit.

CONCLUSIONS

The aim of the study was to find out what virtuality means for facilities management. Based on the literature on virtuality, the different concepts related to virtuality were identified and elaborated where needed. Case companies from the industry were studied from value creation perspective by conducting interviews, questionnaires, and workshop meetings. The different concepts of virtuality were then reflected against the data from the cases. The literature on virtuality can be described as being rather colorful. Also, references made to virtuality are often unscientifically vague. Approached from the perspective of FM, two relevant concepts for virtuality were identified in the literature: organizational virtuality and digital representation virtuality. What separates these two virtualities on a conceptual level is the different definition for the word 'virtual'. The strongest link between the two virtuality concepts is technology.

The case studies showed that some of virtuality's potential is currently left untapped. Four technological applications of virtuality were suggested for not only making value creation more efficient, but also for potentially creating added value to the end-customer. Most of virtuality's current potential lies in improving information flows. Virtuality being such an interdisciplinary subject means it has been and will be viewed from various perspectives. At the edge of digital revolution, it became a universal buzzword. This is easily explained by the interdisciplinarity and the intangible nature that virtual has. The use of words 'virtuality', 'virtual', and many related terms should become more coherent. If it is about dispersed, mobile, digital, or collaborative, why not to use the respective term instead of the term 'virtual'?

The main limitation of the study is that the value delivered to the end-customer and its improvements by means of virtuality was not quantified. This is due to the obvious difficulties that come with such broad approach as the entity of 'virtuality'. More precise outcomes in terms of the quantity of achievable improvements could have been reached with a more narrow approach than just 'virtuality'. Also, the study did not consider the reasons for underutilization of virtuality applications. The attempts to really grasp virtuality's essence are few. With organizational virtuality Fang and Dutta (2005) have given their effort. This paper intends to take a wider view to the essence of virtuality. For future research on virtuality, an even broader, more interdisciplinary perspective is suggested. A more thorough study on the concepts and terms of virtuality is needed. In future research related to virtuality, a more precise use of terms is suggested. In general, when dealt with virtuality, the distinction made in this paper needs to be noted.

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FACILITIES MANAGEMENT ALIGNMENT TO BUSINESS NEEDS – AN INTERNATIONAL SURVEY

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Growing international recognition of the important role of building facilities as a business resource has led to a greater awareness of real estate as an enabling supportive resource and facilities management (FM) as a business practice, and as a profession that can contribute to business success. Globalisation, technological advances and shifting management priorities have altered both the provision and management of corporate facilities and associated support services. To this end organizations have pursued various strategies aimed at better matching between demand and supply, all efforts to better control and manage facilities occupancy costs. The need for alignment between business needs and the organisation's facilities infrastructure is at the heart of any strategy in supporting business success. This paper reports on the results of experts' evaluation of the alignment of FM to business needs based on an integrated alignment model comprising variables that are critical in aligning FM strategies to corporate business plans. The model is a product of a combination of comprehensive literature review, experts' focus group meetings and case studies reviews.

A central theme of any optimization process is the concept of alignment of business resources to business needs. Alignment in an active sense implies moving in the same direction, supporting a common purpose, being synchronized in timing and direction, being appropriate for the purpose and in a passive sense the absence of conflict. The proposed model advocates that the alignment of FM resources and actions to support the corporate business plan requires a critical evaluation of a number of variables – *Supply and Demand Alignment; FM Service Alignment; FM Resources Alignment; and Organisational Alignment*. A limitation of the survey is that it relies on a restricted sample of experienced senior executives in facilities managers and/or corporate real estate, consultants and research academics.

Keywords: real estate and facilities management, alignment, business, alignment model

INTRODUCTION

A growing corporate awareness of the importance of workplace and its associated occupancy costs in recent years, has promoted the growth of facilities management in both the private and public sectors around the world. (Becker et al., 2004; Then et al., 2001; Carter, 1999) Over the same period, there have been rapid technological advances that have altered traditional views of real estate facilities and workplace provisions. Improved communication has increased inter-country mobility and resulted in changes to traditional supply chains. These changes, nationally and globally, have altered both the assessment and procurement of business support infrastructure including the provision and management of real estate facilities. In facilities management, there has been a greater awareness and realization of the need for integrated resources planning (i.e. people, property and technology) in order to derive optimal facilities solutions to meet emerging business challenges. (Robertson, 2000; Then, 1999, 2003; Nutt, 2000; CoreNet Global, 2004). A central theme of any optimization process is the concept of alignment of business resources to business needs (Kaplan & Norton, 2006; Green et al., 2004).

ALIGNMENT CONCEPT IN BUSINESS AND ITS APPLICATION IN FACILITIES MANAGEMENT

The alignment concept is aptly summarised by the following quotations from the book title: "Alignment" by Kaplan & Norton (2006):

"When the enterprise aligns the activities of its disparate business units and its support units, it creates additional sources of value...". (p.5)

"Corporations must continually search for ways to make the whole more valuable than the sum of its parts. Alignment is critical if enterprises are to achieve synergies throughout their business and support units. ...". (p.26-27)

"Alignment is NOT a one-time event". (p.245)

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“By its very nature, alignment requires cooperation across organization boundaries, and therefore the process must be managed proactively” (p.257)

In summary, alignment, in an active sense, implies moving in the same direction, supporting a common purpose, being synchronized in timing and direction, being appropriate for the purpose and in a passive sense, the absence of conflict.

All businesses need real estate facilities and facilities services to function – whether that business is a manufacturing company, a financial institution, a retail outlet, a hospital or a school. Matching real estate facilities and facilities services to business needs is an obvious requirement in terms of resource utilization, whether for profit-driven or not-for-profit organizations. In the context of this research, facilities management (FM) is a management function and includes a suite of services necessary to manage real estate facilities as a business resource. In facilities management, the need for alignment exists at different levels and is driven by the process of continuous matching of supply to demand, both in physical facility; support services and intangibles such as management processes, leadership and competencies (Nutt, 2004, Osgood, 2004; Then and Tan, 2006).

NEED FOR ALIGNMENT IN FM

Growing international recognition of the important role of real estate facilities as a business resource has led to a more prominent profile of facility management (FM) as a business practice and as a profession that can contribute to business success. Globalisation of markets and supply chains, rapid technological advances and shifting management priorities have altered traditional parameters that have governed both the provision and management of real estate facilities and support services. Competition has intensified creating pressures to use limited resources more effectively.

The need for alignment between business needs and the organisation’s real estate facilities infrastructure is at the heart of any strategy in supporting business success. To this end organizations have pursued various strategies aimed at better matching of demand and supply. The range of real estate facilities and FM services in any corporate setting is wide, impacting on a number of stakeholders whose expectations of facility and services performance are unlikely to be consistent. FM performance is a key variable to improving business performance since the focus of FM is to enhance the capability of an organization’s real estate and facility services to support the achievement of corporate goals (McGregor and Then, 2001). In recent years, strategies to improve FM services performance and ultimately business facilities’ performance have been influenced and impacted by:

- Widespread outsourcing of FM services to varying degrees and using a number of procurement models; (Barnhoorn, 1995; Frost, 1997; El-Harm et al. 2002; McBlaine, 2004).
- An increased demand in exploiting technology and knowledge management applications in the design and management of modern facilities and workplaces. (McGregor and Then, 2001; Joroff, 2002; Ratcliffe & Sarin, 2008; IBM Institute of Business Value, 2010)
- An increased focus on real estate facilities as a business resource and methods for measuring facility performance that reflect business goals. (Varcoe, 2002; McDougall et al. 2002; Then, 2003; Valence, 2004)

FM by nature is a dynamic business activity and must be responsive to changing client needs in order to fulfill its increasingly critical role as custodian of the corporate workplace and workspace environment. The extent to which these responses are reactive or planned (as an FM service anticipating the needs of the client and responding in a timely and cost effective manner) varies from organisation to organisation. This variation is influenced by the nature of the business, corporate perception of the role of real estate facilities, the competence of the in-house management and/or external service provider(s), and other factors.

More recently, research and practice directed at understanding the role of facilities/real estate in enabling core business strategy is receiving attention (Nutt, 2004; Osgood, 2004, McDonough and Nicola, 2009). In a recent longitudinal survey study of Fortune 1000 companies, Osgood (2009) noted obvious relationships between core business and facilities/real estate elements. However, the exact nature of these relationships is not well understood nor thoroughly researched. It is against the above background that the concept of alignment (Kaplan & Norton, 2006) is being applied to the role of FM within an organisational context.

Then and Tan (2006) first explored the alignment of facilities management performance to business needs. They provided an exploratory model linking FM performance to business performance. The initial model had gone through various iteration following a comprehensive literature review and various case studies. This paper represents the culmination of the model development with the commencement of a model validation via an international survey of experts in the field of real estate and facilities management. In the context of the proposed alignment model the proposition is that the synergies achieved through the alignment of the relevant parameters create a FM function that is optimally synchronized with the needs of the enterprise – it is neither more nor less than what is precisely required to support the business enterprise. Conversely, symptoms of misalignment would include situations within businesses in which there is mismatch between demand for and supply of appropriate space, services delivered within business

facilities are inadequate to meet operational requirements, or where resources allocated to facilities management are inappropriate for efficient and effective business delivery and operate in conflict with organisational policies and culture.

RESEARCH OBJECTIVES

The central theme of this research is to better understand the variables underpinning alignment of FM as an integral part of fulfilling business needs. The research started with a focus on an analysis of the dynamics between the role of FM and the role of supporting real estate facilities in meeting business needs.

The basic premise is the acknowledgement that business performance is dependent on having the appropriate operational facilities and services to support its business delivery (Then, 2003). Hence, the focus of FM is to minimize any potential mismatch between business performance and real estate facilities performance. Similarly, the quality of FM practice is directly linked to the extent of FM knowledge and application of best known practices in that any mismatch between the two will lead to suboptimal solutions.

In terms of research outcomes, it is anticipated that the research will contribute to a better knowledge and understanding of the following:

- The concept of alignment and how it can assist in improving the appropriate provision of real estate facilities and FM practice as a strategic and supporting management function.
- The key parameters of real estate facilities and FM that need to be aligned and their relationships;
- The alignment variables between the above parameters and the criteria that further define each of the alignment variables;
- A structured evaluation process or method that can be applied to evaluate the extent of alignment in any given business scenario.

Understanding of the extent of alignment (or misalignment) of real estate facilities and FM with business needs will assist in:

- Improving the positioning of real estate facilities and FM to be more effective in supporting the achievement of corporate objectives;
- Managing the dynamic nature of FM and its reactive and proactive responses in order to align with the nature of the business and other factors;
- Focusing FM to have a better understanding of business needs and drive more effective utilisation of real estate facilities; and
- Aligning FM performance with real estate facilities performance criteria aimed at measuring the cost and value contribution of real estate facilities to business objectives.

CONCEPTUAL DEVELOPMENT

Conceptual development of the model was guided by and based on a number of contextual propositions. They provide the link between the concept of alignment as a key to business success and its application to the realm of real estate facilities and FM.

The following propositions were used to develop the concept:

Proposition 1: FM is a support function to the enterprise similar to HR, Finance and IT.

Proposition 2: Support functions do not have a direct role in delivery of core business services but have a role in contributing to competitive advantage of the enterprise.

Proposition 3: Support functions contribute to competitive advantage by providing efficient and effective support services that align with enterprise strategies.

Proposition 4: An effective support function “understands its customers’ strategy and uses its functional expertise to create and deliver solutions that contribute to its customers’ success” (Kaplan and Norton, 2006:139)

Proposition 5: Alignment of FM with enterprise strategies is critical to the efficient and effective provision of FM services and facilities solutions that add value to the enterprise and enhance its competitive advantage.

Proposition 6: When alignment exists, the FM function understands the business strategies of the enterprise including the component business units (internal customers of the FM function) and develops its facilities strategies, service portfolio, resources and business processes to create and deliver facilities solutions that support its customers and stakeholders. Refer Figure 1 below.

Proposition 7: Based on Proposition 6, our concept of FM alignment can be expressed in terms of four dimensions or variables of alignment:

- Variable 1: Supply and Demand Alignment
- Variable 2: FM Service Alignment
- Variable 3: FM Resource Alignment
- Variable 4: Organizational Alignment



Figure 1: Alignment of FM to Business

Each variable can be defined by a number of criteria that can be used to achieve or assess alignment. Proposition 7 is shown conceptually in Figure 2.

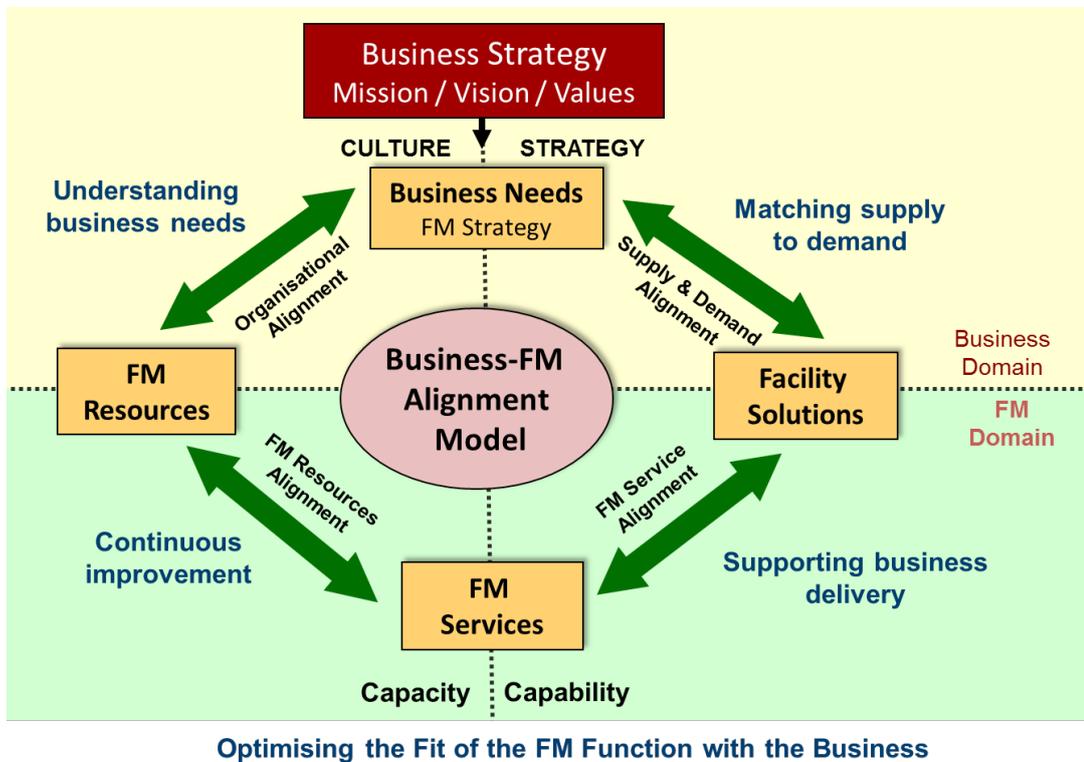


Figure 2: Business-FM Alignment Model

CONTEXT OF BUSINESS DOMAIN AND FM DOMAIN

Figure 2 conveniently delineates the context of the Business domain and that of the FM domain. Taking a horizontal delineation, the

top segment of the figure comprises of the business domain in which *Business Needs* drive *Facility Solutions* and the selection of *FM Resources* through *FM Strategy* shaped by the organisation's core business strategies and competencies.

The bottom segment defines the FM domain within which the appropriate *Facility Solutions*, *FM Resources* and *FM Services* are delivered to support the achievement of the organisation's Facilities Strategies and business objectives.

The quality of alignment between *Business Needs* and *FM Services* is determined by the appropriateness of *Facility Solutions* since they define facility requirements and the required services performance. Similarly, how *FM Resources* are harnessed and managed (in alignment with *Business Needs*) will influence *FM Services* organisational culture, innovation and quality of responses to current and future *Facility Solutions*.

Taking a vertical delineation, Figure 2 also highlights how business organisational culture, as reflected by how *FM Resources* are organised and managed will impact on its capacity to innovate and continuously improve (LHS). Similarly, the quality of *Facility Solutions* implemented is a product of appropriate strategy which, in turn, is a function of internal (and external) capability to define, assess and articulate how real estate resources and services can best meet planned business objectives.

ALIGNMENT VARIABLES AND CRITERIA

For the purpose of defining the alignment of FM with business four (4) relationships have tentatively been identified. Each of these relationships represents an "alignment variable" as shown in the Table 1 below.

A brief description of each of the alignment variables is given here. For each of the alignment variables a number of "alignment criteria" have been identified as being useful in assessing the degree of "fit" or "alignment" with a view to promoting continuous improvement (See Figure 3).

Table 1: Alignment Variables

RELATIONSHIP	ALIGNMENT VARIABLE	DESCRIPTION OF ALIGNMENT VARIABLE
Alignment between Business Needs and Facilities Solutions (A)	Supply and Demand Alignment	The alignment of Facilities Solutions (new and existing facilities) with Business Needs (space, operational functions, revenue etc.)
Alignment between Facilities Solutions and FM Services (B)	FM Service Alignment	Alignment of FM Services (service levels, processes and practices) with facility type and operational requirements of the Facilities Solutions
Alignment between FM Services and FM Resources (C)	FM Resource Alignment	Alignment of FM Resources (people, systems, budget) with that required to deliver the FM Services
Alignment between FM Resources and Business Needs (D)	FM Organizational Alignment	Alignment or fit of FM Resources within the business organization with Business Needs (policy, organization structure, culture etc.)

The Alignment of Business Needs with Facility Solutions

The principle that business needs must drive the procurement, ownership and/or leasing of facilities solutions (real estate) has been generally accepted. In this context the key variable is that of supply and demand management to ensure that facilities solutions meet business requirements effectively. The alignment of facilities solutions with business requirements is defined as the effective "fit" between demand and supply.

Alignment Criteria – Description

Capacity – The capacity of the facilities in meeting business requirements in terms of space and other facility attributes that support the delivery of business services or products.

Condition – The physical condition of the facilities which is appropriate to the functional purpose of the facilities.

Service potential – This is the potential of the facilities to meet future business requirements and the sustainability of the facilities into the future.

Risks – These are the risks associated with the facilities which may impact on business productivity and continuity.

Financial – These are the financial attributes that determine how judgments and decisions will be made in regard to the financial viability of the facilities and include capital value, operating costs and depreciation.

Social – These are attributes that relate to social responsibility aspects of the facilities such as heritage and ecological sustainability to which the enterprise is committed as part of responsible business.

(B) The Alignment of FM Services with Facility Solutions

Real estate facilities need to be provided with Facility Management (FM) services to support and enable occupancy and use. The suitability of FM services for the type of facilities solutions (e.g. office space, hospitals, factories and schools) is critical in ensuring that the facilities operate effectively and efficiently.

Alignment Criteria – Description

FM service strategies – These refer to the service strategies developed for the facilities in order to ensure that the facilities are able to perform their intended role in supporting business. They include the service portfolio necessary to achieve the FM service strategy.

FM service levels – The level of work volume and intensity of each of the FM services that is necessary to meet the requirements of the facility.

FM service standards – The quality standards of the FM services provided that lead to customer satisfaction.

FM service costs – The costs of FM services including procurement, management and transaction costs.

(C) The Alignment of FM Resources with FM Services

Real estate facilities need to be provided with Facility Management (FM) services to support and enable occupancy and use. These FM services in turn need to be adequately resourced (people, systems and budgets) in order for them to be effective and meet the needs of the facilities they serve.

Alignment Criteria – Description

Resource capacity – The capacity of the resources to perform the desired functions to the required standard.

Resource suitability – The suitability of the resources to enable the desired functions to be performed with optimum efficiency and effectiveness.

Resource organization – The organization or configuration of the resources to enable the desired functions to be performed with optimum efficiency and effectiveness.

Resource costs – The costs of the resources including procurement and management.

(D) The Alignment of FM Resources with Business Needs

The FM resources that enable the delivery of FM services need to operate within business parameters of policy, culture, corporate image and the requirements/expectations of its customers. This will apply whether the FM services are in-house or outsourced.

Alignment Criteria – Description

Business governance – The FM organization structure and the effectiveness of its positioning within the enterprise management and reporting levels.

Procurement strategy – How FM is sourced as a support function and the extent of compliance with business policy and procurement strategy.

Business policy – The extent to which the FM functions' operations and services comply with and support business policies.

Organizational culture – The compatibility of the FM resources (people) with the business environment and culture.

Figure 3 illustrates the alignment criteria corresponding to each of the alignment variables.

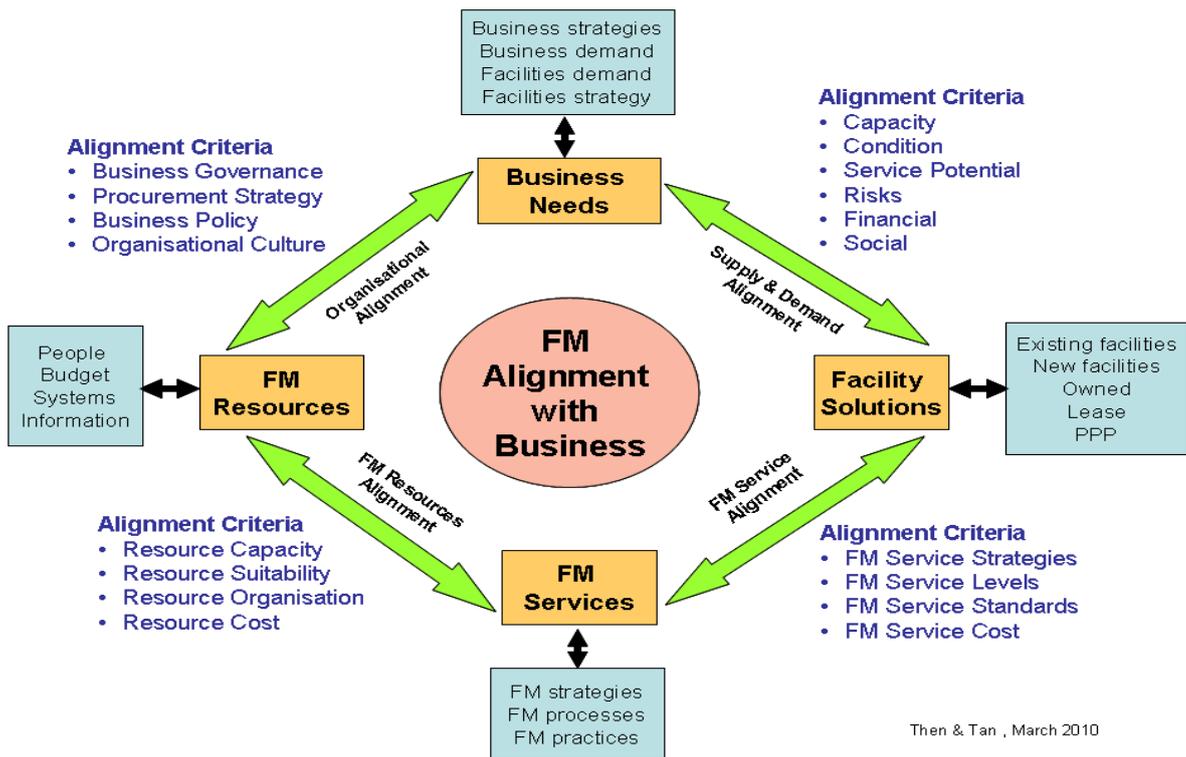


Figure 3: Alignment Variables and Criteria

VALIDATION OF ALIGNMENT MODEL

The paper advocates that the alignment of real estate facilities and FM resources and actions to support the corporate business plan requires a critical evaluation of a number of alignment variables – Supply and Demand Alignment; FM Service Alignment; FM Resources Alignment; and Organisational Alignment. For each of the alignment variables a number of “alignment criteria” have been identified.

RESEARCH APPROACH

The proposed conceptual model is a product of a combination of comprehensive literature review, expert focus group meetings and case studies reviews. A questionnaire survey was designed to validate the proposed FM Alignment Model and Alignment Criteria for each arm of the Alignment Variables, as shown in Figure 3 above. The questionnaire comprises of two parts:

Part 1 concerns the validation of alignment criteria for each arm of the alignment variables. Respondents are requested to indicate the degree of relevance and usefulness of each of the alignment criteria on a 5-point Likert scale from Low (1) to High (5).

Part 2 concerns the validation of the overall FM Alignment Model (Figure 3) i.e. the four alignment components, their relationships and identified criteria. Respondents are requested to indicate the degree of validity in terms of relevance to the practice of FM, completeness, robustness and soundness of concept, on a 5-point Likert scale from Low (1) to High (5).

The complexity of the proposed model dictates that respondents must have relevant management experience and knowledge to be considered as ‘experts’ in Real Estate and Facilities Management. In this respect only senior management personnel are selected as potential respondents. In addition, the scope of geographical coverage of the respondents would be international with respondents from Asia, Australia, North America, Europe and Middle East. Potential respondents are identified through professional contacts of the researchers and professional institutions.

SURVEY RESULTS

This paper reports on the findings from a current sample of 52 respondents from the countries mentioned above, representing a response rate of 49%. (Figure 4)

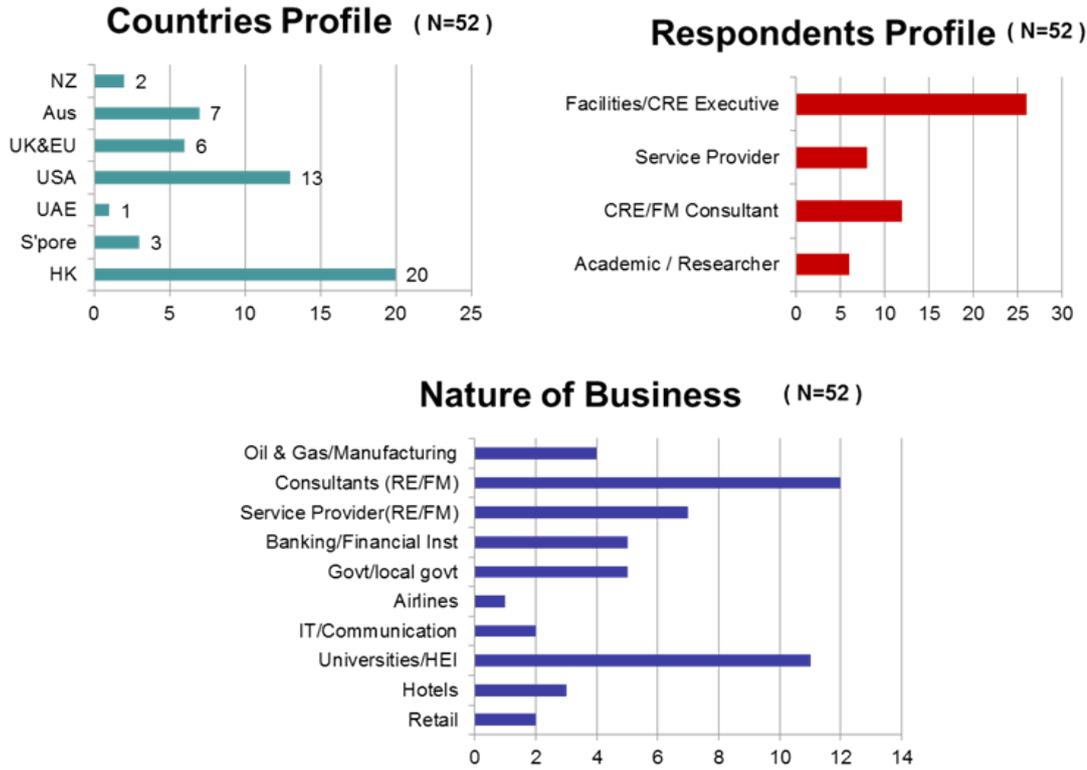
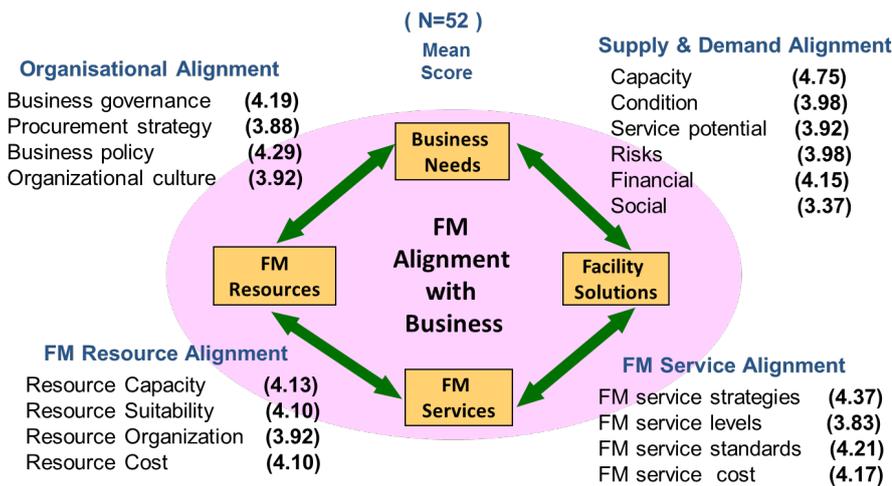


Figure 4: Survey Sample Attributes

Simple statistical analyses of the collected responses were performed to check the validity of the proposed models. Specifically, the mean values were computed for each alignment criterion and variable. The results of the validation of alignment criteria for each arm of the alignment variables was very encouraging with all four arms of the alignment model having an overall average score of above 4.0 out of a possible maximum of 5.0. The individual scores of each of the criteria within each arm range from a low of 3.37 to 4.73. See Figure 5.

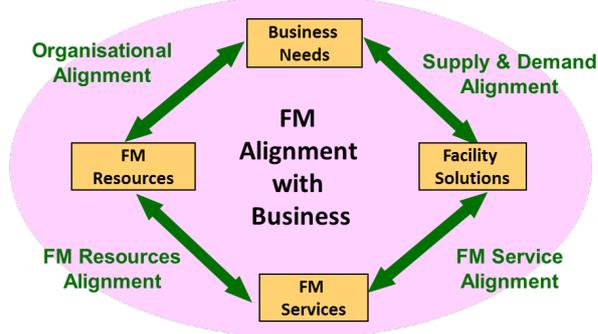


Respondents – Senior RE/FM/Property professionals in North America, UK & Europe, HK and SEA through email questionnaire survey or direct contact.

Figure 5: Mean Scores of Alignment Variables and Criteria

The results of Part 2 of the survey concerning the validation of the overall FM Alignment Model i.e. the four alignment components, their relationships and identified criteria (i.e. Figure 3) were equally encouraging with both 'validity' and 'value' of the proposed

model having an overall average score of 4.11 and 4.12 respectively, out of a possible maximum of 5.0. The individual scores of each of the criteria within the two variables range from a low of 3.81 to 4.44. See Figure 6.



Validity	Score (1 - 5)		Value	Score (1 - 5)
❖Relevance	4.44	(N=52) Mean Score	❖Importance	4.21
❖Completeness	4.06		❖Usefulness	4.06
❖Robustness	3.81		❖Application	4.08
❖Conceptually Sound	4.13			
	Overall Average=4.11			Overall Average=4.12

Figure 6: Mean Scores of 'Validity' and 'Value' of the Alignment Model

CONCLUSIONS

Developments in recent years have promoted the growth of facilities management in both the private and public sectors around the world. Globalisation of markets and supply chains, rapid technological advances and shifting management priorities have altered both the provision and management of building facilities and support services. In this respect, the need for alignment between business needs and the organisation's facilities infrastructure is at the heart of any strategy in supporting business success. The topic of alignment between available resources and business needs is a theme that has emerged in recent years. In the field of facility management, alignment between business needs and facility provision and management as an objective or strategy has been increasingly mentioned. This research is an attempt to unpack the concept and processes of alignment in the context of the practice of facilities management within an organizational setting.

]This paper advocates that the alignment of Facilities Management resources and actions to support the corporate business plan requires a critical evaluation of a number of alignment variables – Supply and Demand Alignment; FM Service Alignment; FM Resources Alignment; and Organisational Alignment. Results from the international survey of experts in the field of real estate and facilities management largely support the propositions of the research. Efforts are currently taken to extend the survey by extending the sample size and geographical coverage and will be the subject of further papers covering regional or inter-country comparisons.

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TOTAL QUALITY FACILITIES MANAGEMENT AND INNOVATION: A SYNERGISTIC APPROACH

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The ideas of quality and performance management and innovation in facilities management service provision are not new. Total Quality Management (TQM) is widely recognised throughout the world as a concept capable of providing competitive advantage. Innovation has also received considerable attention as having a crucial role in securing sustainable competitive advantage. However, there has been little consideration of the potential for integration of TQM practices with innovation principles in determining facilities management performance. TQM and innovation appear to corroborate each other and are becoming increasingly important in facilities management. This study takes a theoretical approach to critically review the relationship between TQM and innovation and to determine the relationship between TQM and Innovation in regard to facilities service provision. The theoretical implication is that FM service providers may adopt a synergistic approach to TQM and innovation, leading to sustained competitive advantage in terms of better positioning themselves within the saturated FM marketplace.

Keywords: TQM, innovation, performance management, service provision

INTRODUCTION

The recognition of Total Quality Management (TQM) as a management concept capable of providing competitive advantage is widespread around the world. Innovation has also received considerable attention as having a crucial role in securing sustainable competitive advantage. Facilities management is considered to be a strategic management function and as such, is now focusing considerable attention on the areas of quality management and innovation.

Innovation and TQM appear to corroborate each other and some companies have adopted both TQM and innovation processes with a view to competing favourably in increasingly competitive markets. However, little previous research has considered synergistically integrating TQM and innovation and whether this would be advantageous, or even imperative, for facilities management providers wishing to survive the current market.

This paper takes the form of a critical review of previous research in the area to take a view as to whether a synergistic approach would be possible in facilities management. Challenges around this are centred on the fact that previous studies have indicated different views around any relationship. The review concludes that it may be advantageous for FM providers to adopt this approach but further empirical evidence is required to validate this theory.

QUALITY AND PERFORMANCE IN FACILITIES MANAGEMENT

Quality management techniques have been used with great success in the manufacturing industries for many years. For example, in Japan the cornerstone of the success of Japanese industries since the 1950s was their absolute belief in Total Quality Management (TQM), an obsession with giving the customers what they want and continually striving for improved performance (Grigg, 1996). However, the manufacturing industry differs from facilities management in that it produces tangible products in large batches via repeat processes, whilst FM projects are mainly undertaken in single batches and the product is not necessarily a tangible item, it may be a service or a process (Pheng, 1996). For example, a manufacturing process may produce cars, shoes or components, while a FM service may produce a productive workplace.

The value to be gained through a total quality approach is increasingly being recognised in business (Alexander, 1996), including the

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construction industry, which is similar to FM in that quality is difficult to measure (Yasamis et al., 2002). Attempts have also been made to apply TQM to service industries such as hotel and catering (Pheng, 1996). Over the last decade attempts have been made to relate TQM to facilities management. There is now pressure for change and improved quality in FM which has come from external sources by well-informed clients (Pheng, 1996) and consumers are now better able to give clear objectives to service providers (Aatsalo-Sallinen, 2006). Quality management is, therefore, essential to the FM industry in order to be competitive and to maintain the identity of FM as a key strategic business tool.

For TQM to be successful there must be support for the concept from top-level management, which must act as a facilitator in what is an enabling process (Grigg, 1996). It must, however, include all people at all levels and in all functions (Pheng, 1996). With increasing competition among FM service providers, it is essential for providers to implement quality management processes to continue to meet and exceed expectations in order to differentiate their product in an increasingly service saturated market. Many service providers are moving towards a diverse range of services and organisations that have traditionally offered specialist services are now becoming general facilities management organisations. The question of the subjective nature of value and the consequential need for a bespoke service offering within FM is therefore of paramount importance.

FM can contribute to the performance of organisations in a number of ways, which include strategy, culture, control of resources, service delivery, supply chain management and change management (Amaratunga and Baldry, 2002). The constructs of performance measurement in facilities management are neither well-established nor standard (Amaratunga, 2000). The approach to performance measurement in FM has historically tended to concentrate on financial measures, then broadening into an emphasis on customer satisfaction and quality as it was acknowledged that financial measures are inadequate for demonstrating workplace effectiveness (McDougall and Hinks, 2000). Modern business requires dynamic measures that motivate continuous improvement in critical areas such as customer satisfaction, flexibility and productivity (Varcoe, 1993). However, to use performance assessment effectively, FM needs to make the transition from measurement to management (Amaratunga and Baldry, 2002). Facilities management service providers and in-house FM teams should implement quality and performance management initiatives in order to measure their current position and bring about future improvements. However, it is also possible that they could look to a synergistic approach between quality management techniques and innovation processes.

SYNERGIES BETWEEN TQM AND INNOVATION IN FACILITIES MANAGEMENT

The first point to note is with regard to positioning facilities management as a strategic discipline. FM is known to be responsible for buildings and services supporting businesses. However, Noor and Pitt (2009) argue that this view does not consider the holistic perspectives of the corporate world in that effective FM encompasses multiple activities under various disciplines, combines resources and is vital to the success of any organisation. FM can bring value in terms of organisational effectiveness through managing and improving services, as well as innovation in service management.

In recognising the strategic aspects of FM, comparisons can be drawn with innovation and quality management. Alexander (1996) argues that FM focuses resources on meeting user needs to support the key role of people in organisations and strives to continuously improve quality. This supports Oakland's (2003) view of quality, which is simply meeting customer requirements and Atkin and Brooks (2009) consider that, even within in-house arrangements, internal departments must be considered as customers of the FM service and their needs served accordingly.

Likewise, it could be argued that innovation is about exceeding customer expectations. Tidd and Bessant (2009) point out that the pattern of competitive advantage is increasingly favouring those organisations that can mobilise knowledge, technological skills and experience to create novelty in their product or service offerings and in the ways they create and deliver these offerings.

Alexander (2003) suggests that FM emerged as a response to the business environment as companies embraced new technologies, sought competitive advantage and recovered from challenging business times at the same time as requiring to trim overheads, operate more efficiently and "delight" their customers. Perhaps, therefore, FM service providers should look to their quality management system to meet customer requirements, in conjunction with innovation to go beyond expectations.

Many definitions of FM such as Tay and Ooi (2001) consider that FM plays a supportive role in enhancing the performance of a

firm and in contributing to business objectives (Kaya et al., 2004). Becker (1990) considers that FM can enhance the organisation's ability to compete successfully in a rapidly changing world whilst Alexander (1996) points out that the facilities manager acts on strategic demands, developing plans in line with the corporate strategy. Clearly this is in agreement with Tidd and Bessant's (2009) assertion of innovation contributing to competitive advantage. Customer focus, continuous improvement and empowerment are three management concepts which are at the heart of TQM and innovation and will help organisations to compete.

Noor and Pitt (2009) argue that innovations do not occur through one person's individual act, but as a result of a complex set of processes requiring the efforts of many individuals. Therefore, if service delivery is to be innovative, it needs to be clearly managed as a set of processes by creative people. Cardellino and Finch (2006) found that innovation management is active although there was a lack of an identifiable systematic process. In relation to quality management, it is recognised that for organisations to perform well, they need good process management because underperformance is primarily caused by poor processes (Oakland, 2003). Process management, as a central theme of TQM, is therefore highly relevant to the management of innovation in FM.

However, although there are clear linkages between facilities management as a profession and the concepts of TQM and innovation, it is not clear whether innovation and TQM can be synergistically applied within facilities management. There is little research in this area with a specific focus on facilities management although the following section considers it from a general perspective.

THE RELATIONSHIP BETWEEN TQM AND INNOVATION

Conflicting arguments exist regarding the relationship between the principles of Total Quality Management (TQM) and innovation (Prajogo and Sohal, 2001). Companies accepting TQM into their structures and systems may be able to provide an appropriate environment to nurture innovation due to the congruence of principles across the two disciplines (Dean and Evans, 1994; Kanji, 1996; Mahesh, 1993; Roffe, 1999; Tang, 1998).

Nowak (1997) emphasised the importance of innovation and quality management strategies and stated that both are processes that lead the company towards competitive advantage. He also established a link between innovation and TQM as a common organisational platform that facilitates sharing of knowledge and skills.

Customer focus is one of the integral components of TQM and it encourages organisations to search for new customer needs and expectations, therefore, leading organisations to be innovative with regard to introducing new products to meet the changing needs of markets (Juran, 1988). Ojelabi and Smith (2012) also make the point that continuous improvement encourages change and creative thinking in the organisation of work and that empowerment, teamwork and involvement are also substantial in determining the success of organisational innovation. Oakland (2003) argues that the way people are managed and developed at work is becoming recognised as one of the primary keys to improved organisational performance and that world class organisations value and invest in their people through principles such as these.

According to authors such as Flynn et al. (1994) and Baldwin and Johnson (1996), the implementation of a TQM system could foster the innovation process in companies due to TQM elements such as continual improvement or customer focus. Their assertion is that companies combining TQM and innovation processes stand to have competitive advantage and a higher chance of survival.

Continuous improvement is another key element of TQM and this will often cause companies to change, which may be reflected in the development of new products, services and processes (Singh and Smith, 2004).

Pfeifer et al. (1998) identified three subject areas of importance in innovation as follows:

- Customer orientation and service: one must see through the eyes of customers;
- Flexible organisational structures;
- Creative staff: a favourable environment and freedom.

These points appear to be aligned with the principles of TQM. For example, the framework put forward by Flynn et al. (1994) includes customer orientation as a key point of TQM. Ojelabi and Smith (2012) also consider that TQM promotes empowerment and implicates employees in continuous improvement, which could support a creative staff, and flexibility is also important as a requisite to quickly adapt to customers. Prajogo and Hung (2008), based on a study of Korean manufacturing firms, also showed

the effectiveness of TQM in a research and development environment and that it can be applied and adapted as a set of generic principles in environments other than manufacturing or production areas. Martinez-Costa and Martinez-Lorente (2008) also found clear evidence of TQM promoting innovation. They discovered that companies which applied TQM and developed organisational innovation gained greater benefit than companies that do not. They concluded that the managerial implications are that companies that operate where continuous innovation is a necessity should see TQM as a means of quality improvement but also as a technique to facilitate the innovation process.

However, several researchers, such as Slater and Narver (1998) and Wind and Mahajan (1997), have rejected the idea of a positive relationship between TQM and innovation on the basis that it retains principles and practices which could be detrimental to the implementation of innovation. These authors are in agreement that the philosophy of customer focus could lead organisations to focus purely on incremental improvements in products and services rather than striving for innovative solutions. The danger is that products or services may be developed which are very similar to those of the organisation's competitors due to a focus on benchmarking customer preferences (Ojelabi and Smith, 2012). It is possible that customer focus could potentially lead to a "tyranny of the served market" whereby managers see the world only through the eyes of their current customers, failing to explore latent needs and thereby leading to failure to drive generative learning through the search for the unserved and untapped potential in markets (Ojelabi and Smith, 2012).

Standardisation is necessary for conformance and the reduction of errors but it has been argued that it could result in rigidity from the innovation point of view as it may trap people into staying with what is workable (Glynn, 1996; Kanter, 1983). It has also been suggested by Lawler (1994) and Samaha (1996) that continuous improvement is aimed at simplifying or streamlining a process, which may be detrimental to innovation as organisations may continually improve processes which are fundamentally flawed. Perhaps it is also difficult to achieve rapid innovation concurrently with product quality and Samaha (1996) argues that organisations focussing their strategy on frequent and fast innovations will have inadequate time to learn about the processes in order to achieve a high level of quality conformance.

There are few studies that analyse the relationship between TQM and innovation empirically. Prajogo and Sohal (2003) sampled 194 Australian companies and found that TQM had a positive influence on quality and innovation performance. However, Singh and Smith (2004) did not find a firm link in a wider sample of Australian manufacturing firms. A Spanish study (Martinez-Costa and Martinez-Lorente, 2008) did find a positive link although their sample is only comprised of 102 companies in the machinery and measurement instrument sectors. Prajogo and Sohal (2001) carried out a detailed analysis of the possible effect on innovation of implementing a TQM system and a summary of this is shown in Table 1.

Table 1: Relationship between TQM and innovation

ARGUMENT IN SUPPORT OF A POSITIVE RELATIONSHIP	ARGUMENT IN SUPPORT OF A NEGATIVE RELATIONSHIP
Customer focus: encourages organisations to search consistently for new customer needs and expectations.	TQM can 'trap' organisations into improvement or incremental innovations.
Continuous improvement: encourages change and creative thinking in how work is organised and conducted.	TQM can lead organisations to be 'narrow-minded'. They define the "tyranny of the served market" as only seeing the world through current customer eyes.
Empowerment: involvement and teamwork.	Based on the issue of risk avoidance and adaptive approach, TQM could strategically lead organisations to be imitators or followers rather than innovators or leaders.
	TQM could hinder creativity due to the enforcement of standardisation or formalisation.
	TQM promotes single-loop learning rather than double-loop learning.
	From a strategic point of view, TQM focuses on cost efficiency that could limit the capacity and opportunity for innovation.

Adapted from Martinez-Costa and Martinez-Lorente (2008)

In a competitive environment, product and service innovation are necessary to surpass competitors in terms of customer satisfaction and it seems logical that companies implementing TQM will also make considerable effort in innovation. However, it has been argued (Ojelabi and Smith, 2012) that the innovative company must manage key elements in the innovation process effectively to succeed and ensure adequate organisational support. This idea could be the TQM system. Although it is difficult to take a decisive view based on these findings, given the importance of innovation and quality management to company survival in a competitive market, further study of this relationship is highly relevant in facilities management.

CONCLUSIONS

This paper has reviewed the role of quality and performance management in FM and argues that quality management is essential to the industry to be competitive and to maintain the identity of facilities management as a key strategic business tool. With increasing competition among providers, quality management processes can enable product differentiation in an increasingly saturated market. Likewise, when FM is recognised as a strategic support service, there appear to be several similarities and linkages between FM quality management and innovation. Facilities management and quality management can be regarded as meeting customer requirements, whilst innovation takes this further to go beyond customer expectations. Facilities management plays a pivotal role in enhancing firms' performance, which has been shown to be aligned with the principles of TQM and innovation.

Varying views were uncovered as to any relationship that exists between TQM and innovation. Arguments in support of a positive relationship are centred on the assumption that companies embracing TQM into their systems and culture will provide an environment for innovation success due to congruent principles between TQM and innovation. However, other researchers reject the idea of a positive relationship with the view that TQM could be detrimental to innovation. These opposing arguments can be extended to consider the relationship between quality performance and innovation performance as well as TQM practices, quality and innovation to determine any positive relationship.

It seems logical to consider that due to the linkages between innovation and quality managed facilities, companies implementing TQM will also employ innovation techniques. Given the importance of innovation and quality management in the current market, the study of this relationship within facilities management is highly important. However, currently taking a decisive position based on these findings is difficult and further empirical research is required in this regard. It does seem possible that FM service providers could potentially adopt a synergistic approach to TQM and innovation, leading to sustained competitive advantage.

What is proposed in terms of further research is a structured survey of staff members within various market leading facilities management service provider companies to establish the approaches to TQM and innovation within these organisations. As TQM is an all-encompassing approach flowing from leadership level to junior levels, the survey should aim to target all organisational levels.

Different researchers have used structural equation modelling to examine the relationship between TQM and innovation and it is suggested in this case that an integrated model of quality and innovation management such as that developed by Prajogo and Sohal (2006) could be employed to measure quality and innovation management practices within the facilities management context.

If the results suggest a positive relationship between quality management and innovation in the FM context, the intention would be to create a framework enabling FM organisations to implement an integrated innovation and quality management system following similar principles to those of the International Organisation for Standardisation (ISO). Therefore, it is suggested that an extensive research study in this area is required.

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STRATEGIC ANALYSIS OF BUILDING PORTFOLIOS: THE MULTIMAP METHOD

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In the late 1990s organizations in public sector recognized the big maintenance backlog within their building portfolios. The situation will affect the effectiveness of the core business and also the environment in the buildings. Total portfolio overview as a base for plans for upgrading were demanded. The objective is to contribute to the development of an innovative and efficient method and tool to support strategic FM (Facility Management), primarily on a portfolio level to bridge the gap between performance and demand for technical condition. After the start and up to now additional topics of condition have been added for a total mapping of buildings potential. This should over time lead to a more strategic and value adding FM practice. Quantitative as well as qualitative methodology (workshops, expert groups, interviews, case studies) have been carried out. In totality the MultiMap method and tool now consists of several modules to map portfolios' potential as a part of strategic planning. The methods represent a systematic and effective approach that is well suited for portfolios, or first scan of single objects. So far it is used on approx 25 million square meters (m²) (hospitals, public buildings), which is about 55% of the building mass in Norwegian public sector. Recently the method has been adapted to other types of infrastructure, i.e. roads and nautical installations.

Keywords: building portfolios, facilities management, multimap, property development, strategic analysis

INTRODUCTION

Maintenance of buildings, specially in the public sector, has been more or less neglected for a long period of time. In 1997 Oslo City Council (the authority in our largest municipality) demanded information about value and upgrading costs for their total building portfolio of approximately 4 million m². The largest categories were schools and healthcare buildings.

Due to the size of the portfolio and relatively short time for execution the MultiMap method was developed. The starting point was to avoid details and determine the most important building elements that have largest influence on building costs. The mapping should be cost efficient through use of existing data, standardized classification systems and knowledge in each organization.

A four year long research project, managed by Multiconsult, with the title "Buildings and Property as Strategic Means for Effective Health Services" supported by the Norwegian Research Council was finished in 2010. An aggregate summary of the Specialist Health Care Service status (building stock, current practice of asset management) in Norway was for the first time established in this project. For this purpose the MultiMap method was used. A strong demand for technical and structural upgrading is documented, plus a significant need to transform facilities in order to customize the locations for future health service packages (Larsen, 2011). From the start and up to today other modules or mapping topics has been developed according to the clients needs. Our experience so far is that the method is suitable for the purpose of gathering basic information for evaluation of the potential in the portfolio and each building and floors. We have not found equivalent methods in use today. In total approximately 55% (approximately 25 million m²) of the public buildings in Norway are mapped as per November 2011. In the last years the main area has been hospitals (approximately 5 million m² 1 million m² in Sweden and some buildings in private sector).

Buildings represent a large part of real capital within many sectors and maintenance at the optimal level is therefore essential. Technical condition, adaptability, usability etc, are important factors in obtaining quality and effectiveness in core business. In addition to technical and functional challenges with the existing building stock social trends and forecasts are showing multiple and complex challenges that are crucial for development of the building stock, example related to:

- High population growth: By 2050 it is expected an increase in population from the current approximately 5 million to between approximately 5.4 million and approximately 7.7 million, with 6.5 million as the average value. This will require considerable development of buildings and infrastructure, both new construction and refurbishment of existing.

- Requirements regarding efficiency: With strained economy and use of resources, there will be increasing demands for efficiency and utilization of resources, particularly area – and energy efficiency.
- Building codes and requirements: New requirements regarding environment, energy and accessibility will come.

The growth and change will lead to needs for reconstruction, extensions and development of building stock together with new constructions. Some parts of the existing buildings are not suitable for refurbishment due to lack of adaptability and some have limited potential for other purposes. The overall objective with development of the MultiMap method and tools has been to contribute with good decision making support.

RESEARCH METHOD

Methods used in the development of methods, tools and parameters:

The different modules have been developed over a long time, with a high number of people involved. In general the following research methods have been used:

- Literature studies, evaluation of available existing methods, document studies, interviews, workshops, several large scale case studies.
- Both R&D projects and real life projects with clients

OBJECTIVES

The main purpose was to get a better model for gathering information needed to support the strategic planning within large portfolios to strengthen the interaction between core business and support services. In Norway the public sector uses approximately 49 million m² which is approximately 10 m² per person. The hospital sector uses about 5 million m² typically concentrated in big campuses. A big backlog regarding maintenance is documented; the average age is about 40 years and approximately 700.000 m² (14%) are listed (Larssen and Kvinge, 2008).

In order to make the right decisions a lot of data is required. And in a huge portfolio it is necessary to sort out which parameters are essential for the decisions. Furthermore the method should be effective regarding use of resources and clarify potential for future use on each floor in every building. Parameters regarding usability today and adaptability to meet new demands are the most important. These will be physical (structural) parameters that are most impossible to change. All other parameters (technical upgrade, energy improvements etc are a question of costs.

RESULTS

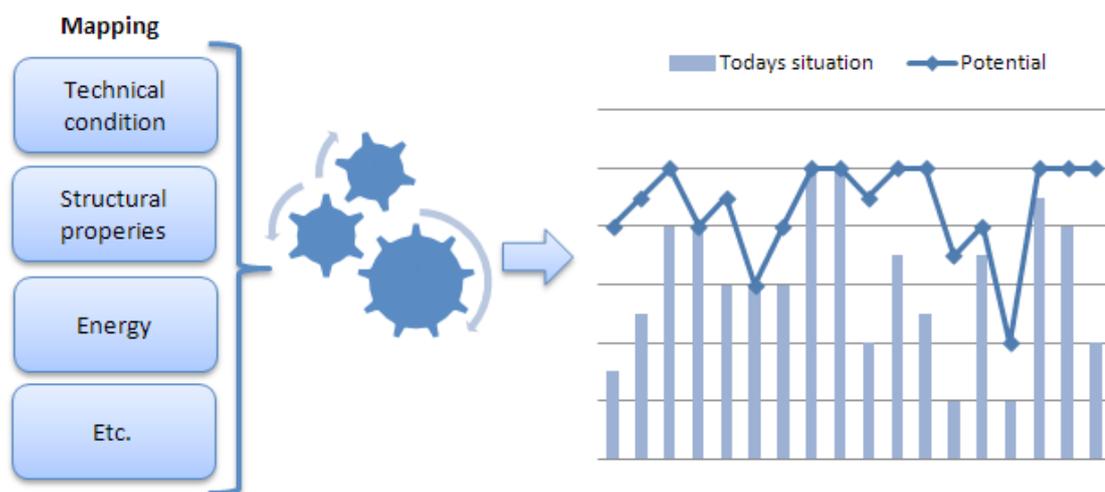


Figure 1 The principle behind the MultiMap method

The method developed includes an analysis and assessment of the current situation with respect to core business needs and the building stock performance to support these needs. The next step is to analyse the potential for further development of the building stock.

To address the strategic facilities management perspective two key principles have been in focus:

- Focus on only the most important structural properties/characteristics
- Optimize the relationship between resource use and level of detail to obtain sufficient information quality at low cost within a short period of time.

Furthermore, it is considered essential that the tools and methods are generic and that the surveys can be repeated over time and produce comparable results. For large portfolios it is also of importance how to aggregate and communicate data.

BASIC PRINCIPLES

An important objective has been to optimize the relationship between detailing and the use of resources. This has led to the following basic principles for the mapping of the building stock:

- The use of existing knowledge
Mapping of building information should, as far as possible be based on existing knowledge in the organization, i.e. from administrators and users and others who are familiar with the buildings history and modifications, the current problem areas, maintenance situation, user opinion, etc.
- Forms and explanatory matrices
To organize information and establish an objective point of view standardized forms for the assessment, including guidance, are developed. Essential in the guidelines is the definition of the reference level through descriptive explanatory matrices as a basis for the registration.

THE TOOLS DEVELOPED

The tools developed generally rely on the principles of the Norwegian Standard NS 3424, “Condition Assessment of Buildings”. The standard represents a generic methodology for specifying condition grades to mark the parameters characteristics in relation to a defined reference level. Condition grades are an expression of:

“The condition of a component or parameter, according to a defined reference level”.

NS 3424 uses condition grades between 0 and 3. Condition grade 0 is the best grade, and condition grade 3 the lowest (Norwegian Standard, 1995). Table 1 gives a general description of the condition grades in the standard.

Table 1 Aggregation of information (Multiconsult)

CONDITION GRADE	DESCRIPTION
0	No symptoms
1	Slight symptoms
2	Medium-strong sympt.
3	Strong symptoms

The results of the survey will provide a general overview of the needs, possibilities and limitations and thus serve as a warning light and form the basis of any further analysis. In other words, the purpose of the method and the tools developed is not to be detailed and exhaustive.

EXAMPLES OF TOOLS DEVELOPED

Some examples of modules/tools that are developed are:

- Technical condition: 18 parameters (building components)
The objective is to reveal maintenance backlog / technical defects as a basis for estimation of costs for technical improvements. The survey helps to highlight expected investment needs, as well as a basis for further prioritizing.
- Structural properties/adaptability: 12 parameters (properties)
Identifying the buildings adaptability aims to uncover the most important and fundamental characteristics of the buildings. This means information about the floor heights, spans, load bearing capacities, installation space, etc. The parameters will primarily determine how easily the building / floor can be modified and adapted to the business that is there, or for what other purposes it can be used.
- Usability: 8 parameters (questions)
Identifying usability aims to reveal the buildings suitability for the current core business. The survey provides a basis for

evaluating which buildings / parts of buildings that are in need of adaptation, refurbishment or new buildings, or alternatively should be phased out of its current activities. This information must be considered in the context of adaptability.

- Structural requirements for different use (evaluation of potential): 8 requirements.
This is a survey of the buildings structural properties and a set of predefined requirements for different use for the same parameters. The purpose is to compare the information from the survey with predefined requirements to uncover potential for future use.
- Common infrastructure, land and site conditions 17 parameters
- The purpose of the tool is to reveal the technical condition of the infrastructure on the building site. This means common technical systems (supply etc.), as well as issues related to land such as roads / places, the potential of development, etc.
- Energy: 13 parameters
The survey intends to identify the potential for improving energy efficiency in buildings. This means, among other things, mapping of the energy source, technical systems, insulation, etc.

ANALYSIS

Mapping is done per floor in each building, and. with the following two main principles for the analysis of data:

- Aggregation of information
- Match against predefined requirements

Aggregation of information

Aggregation of data is done by weighting all registrations per floor. Condition grades are weighted by space and costs of upgrading in order to aggregate information up to portfolio level. Figure 2 shows the principle around the aggregation of information.

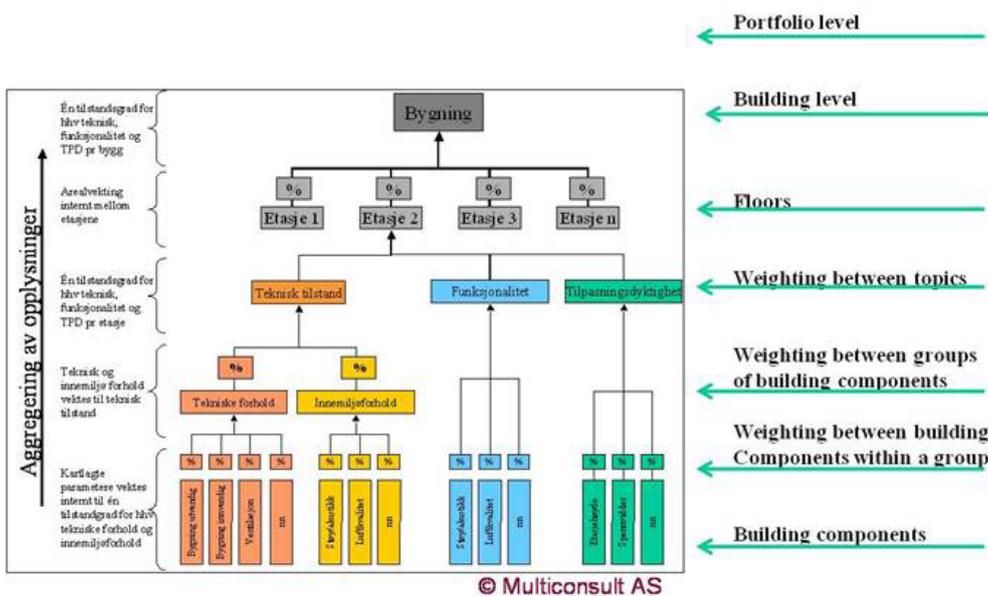


Figure 2 Aggregation of information (Multiconsult)

Match against predefined requirements

The method used is to identify the potential of the buildings by comparing the mapped characteristics with predefined requirements for the same parameters. For example, predefined requirements for structural characteristics are used for evaluation of potential for alternative use. Different functions have different predefined requirements. The comparison includes 8 parameters. To what extent the properties meet the requirements indicates how the building / floor has the potential to accommodate their respective functions today and over time (Larssen, 2011) (Larssen et al., 2010).

PRESENTATION OF THE ANALYSIS

One challenge is to communicate the analysis of such large amounts of data in a simple and clear manner. The dataset of a ten-story building will consist of 300 parameters when only the two first modules are used (technical condition and structural properties). One way of presenting the results of the analysis is to aggregate both information and potential for future use at building level as shown in Figure 3. The presentation shows a map of the whole site, with links to detailed information on each building. This way of presenting the analysis provides a good overview of the building stock.

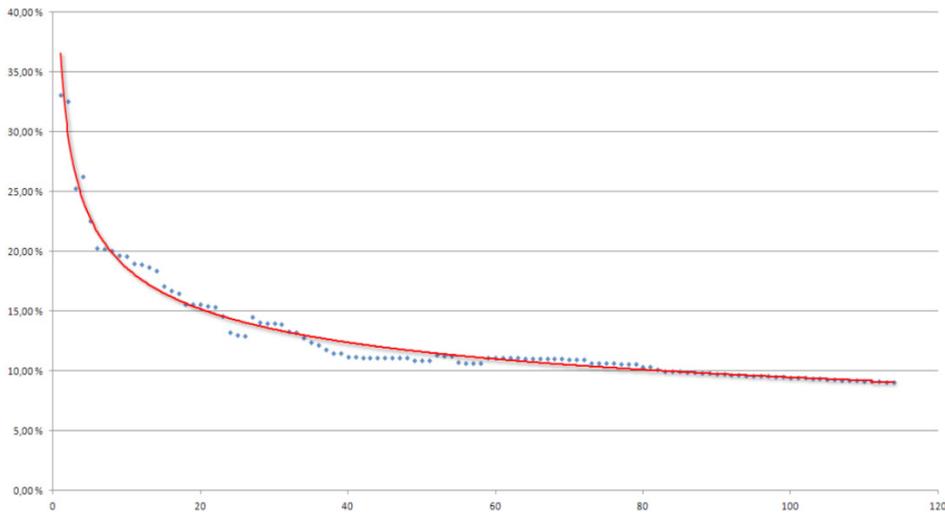


Figure 5 The uncertainty of a mapping of a large portfolio (Multiconsult)

CONCLUSIONS

The main purpose was to get a better model for gathering information needed to support the strategic planning within huge portfolios. This should strengthen the possibility to do the right strategic decisions. Throughout all the cases done it is obvious that the main purpose is fulfilled. Furthermore the model and tools has turned out to be effective regarding use of resources. Aggregating the data together with use of new technology has shown as a very important way of communicate huge amount of data. The model has been developed for building portfolio within public sector but has proved to be generic by using it for other purposes such as roads and nautical installations.

FURTHER DEVELOPMENT

As mentioned, the model and tool has proved to be generic. In that respect it should be a base for further development within other sectors such as railways, water and energy supply.

Based on the global focus on climate and energy a new development project has just been started on the topic “Sustainable Potential in Buildings”. In this work all the demands from BREEAM and the results from the Nordic project “Sustainable Refurbishment” be taken into consideration and examined for an aggregated level.

All the experiences gained using the model will also be a platform for more investigation and research on the relation between the building itself and core business within the building.

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THE ECONOMIC CASE FOR EARLY ADOPTION OF FACILITIES MANAGEMENT

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The construction industry in Ireland has been the sector hit the hardest during the recession with a potential return to output volumes of the mid-1990s. In order to compete within this struggling construction sector the traditional way of doing business must be re-engineered. One of the ways to achieve this is by introducing the Facilities Management (FM) process much earlier into the construction process, in order to maximize long term sustainability, and above all whole life construction costs. This paper will focus on a recently constructed sports clinic in Dublin, in which an aggressive programme was introduced around energy management savings. The data collation methodology included in depth structured interviews with members of the Architectural/ Engineering/ Construction and Facilities Management (AEC /FM) teams involved in the original construction and current operation of this building. There was also additional data collected and analyzed through the use of a questionnaire survey distributed to a number of senior academics and professionals within the AEC / FM sector, in order to triangulate all the research findings. The research findings strongly advocate that the FM process should be applied as a business strategy throughout the design and construction stage, so as to reduce possible sustainability impacts and life cycle costs. This approach could potentially maximise the usability of the structure and ensure that criteria that are usually overlooked at construction are properly addressed at the outset of a project.

Keywords: facilities management, sustainability, whole life cycle costs

INTRODUCTION

The poor state of the Irish construction industry is highlighted by the DKM Economic Consultants report on an industry that has experienced a severe contraction in construction output since it peaked in 2007 at €38.4 billion, to a return to output volumes of around €10.5 billion by the end of 2011. Garvey (2010) highlighted that as the construction recession deepens, it will result in major implications not just for the public finances but also for future levels of employment and economic growth. These figures have prompted the need for better savings through a sustainable future in buildings, as outlined by Sustainable Energy Ireland (SEI, 2009). SEI outlined that in Ireland small businesses could save €300 million a year through simple actions to reduce energy costs, such as, lighting, refrigeration, heating and air conditioning. The importance of sustainability and the return to economic growth was enforced by Lewis (2009) who stressed the link between economic activity and energy usage. Lewis (2009) believed that it was critical that the return to economic growth was not matched by a corresponding growth in energy demand, where Ireland's future economic successes are not undermined by deteriorating environmental patterns and unsustainable energy usage. The DKM report (2009) also identified niche opportunities in regard to the climate change/sustainability agenda, such as, improving the energy performance of the stock of buildings in the public and private sectors. The Irish Government is also trying to promote sustainable practices by stating that environmentally-friendly policies are to get priority in competing for State contracts worth up to €16 billion a year. The harsh reality of the country's current situation along with the realisation of the need for a more sustainable future have shown that the traditional method of construction needs to be re-engineered and a more innovative approach has to be adopted. One of the best ways to achieve these savings in today's environment is through the emerging discipline of FM, which can help to provide a new focus for the study of buildings. This approach was voiced by Shah (2007), who believed that FM, if integrated early into the construction process, can help maximise sustainable construction potential, as well as providing a new cost focus for buildings. The importance of FM playing a role within the construction management stage is further advocated by Wu et al. (2006) who claimed that the maintenance and operating costs can be five times the capital costs, with the business operating costs reaching up to two hundred times the capital costs over the life of the building. This fact is further expanded on by Hallberg and Tarnardi (2011) who cite the National Institute of Building Sciences (2007) report, to convey, that a total of 3.8 % of improvements in productivity of the facilities

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of a building would be equal to the total cost of design, construction and operation of the facility. The Facilities Manager is in a position to address some of these improvements and help increase productivity. The reason for this was further explained by Hodges (2005) who outlined that the Facilities Manager is in a unique position to view the entire process and with the proper financial and strategic planning tools can create long-lasting value to the organisation by developing, implementing and maintaining sustainable facility practices. Despite these potential benefits, this profession still remains largely undeveloped and holds little recognition within the Irish AEC /FM sector, despite the establishment of professional FM institutions around the world e.g. International Facilities Management Association (IFMA), British Institute of Facilities Management (BIFM), etc. The aim of this paper is to set out the economic case for introducing the process of FM at an early stage in the construction management process, in order to increase usability and sustainability, so as to reduce overall lifecycle costs. The authors will provide recommendations as to what particular stage in construction management the Facilities Manager could have the most beneficial economic impact.

RESEARCH METHODOLOGY

The research methodology adopted is a combination of a case study with interviews and a subsequent questionnaire. These different forms of research methodologies are then triangulated, as this will further increase confidence in research data, creating innovative ways of understanding a phenomenon, challenging or integrating theories, and providing a clearer understanding of the problem (Jick, 1979). This research methodology is further advocated by Thurmond (2004), who notes that the intent of using triangulation is to decrease, negate, or counterbalance the deficiency of a single strategy, thereby increasing the ability to interpret the findings. This method will be applied, so as to combine both sets of results, in order to produce a richer and more detailed conclusion.

CASE STUDY

The case study selected was a newly constructed sports surgery clinic in Dublin. The building was opened in 2007 and was constructed for an initial €60 million. The four storey building consists of an underground car park, four multi-operating theatres blocks, inpatient and outpatient facilities, multi-media solutions, an onsite diagnostic department and twenty consultant rooms. The FM team in 2010 were formally appointed after the clinic had been in operation for three years to implement a financial plan. The financial plan was created through a number of saving initiatives and small works projects based around environmental improvements and more conscious energy management. This financial plan proposed to the owner saving initiatives in the region of €1.2 million over three years. The FM team targeted the following areas to concentrate on generating energy and environmental savings:

- Reducing consumption through efficient working practices i.e. re-education of staff in terms of energy usage / waste disposal.
- Installation of a waste compactor on site.
- Liaison with vendors in relation to renegotiating current service level agreements.
- Building Management System (BMS) monitoring and management.
- Re-configuration of the boiler arrangement to decrease operation hours / consumption.
- More frequent use of the generator at peak demands.
- Increased HVAC efficiency through BMS.

The Facilities team also undertook a programme of investment totalling €182,000 that generated savings of approximately € 360,350 over the three year period. The proposed savings over three years are outlined in Table 1 below.

Table 1 Better Energy Management Plan

ITEM	DESCRIPTION	INITIAL COST	SAVINGS
1	The changing of all current lights in the downstairs car park to PIRS. This will result in a microwave signal being emitted and in turn will optimize the efficiency of the lighting, as it will only be used on a needs basis.	€9,141	€27,215
2	Replace all 50watt A.R. 11type lamps with 35Watt energy efficient type.	€6,873	€10,039
3	Replacement of 120 x 35 Watt capsule halogen downlighter fittings in Consultant suites and throughout the building to 2 Watt LED downlight with equal Lux level performance.	€8,591	€10,479
4	Modification of all corridor and back house light fittings to incorporate 2 tube electronic start T5 tubes in place of 4 tube T8 type. This will reduce the power consumption by approximately 50% and increase the lifespan of the fittings and components by approximately. 50%.	€13,233	€41,454

ITEM	DESCRIPTION	INITIAL COST	SAVINGS
5	Installing key switches throughout the building that will prevent the staff and patients from leaving unnecessary lights on. This will enable reduction of electrical waste.	€7,900	€31,971
6	Reconfiguration of the boiler plant to incorporate a combined Heat and Power system. The proposed installation of a CHP system will eliminate the three boilers which have no connection between the domestic hot water calorifiers and the main headers, resulting in significant savings in gas.	€32,905	€47,916
7	Installation of two port valves on the existing LTHW and their associating controllers. This will prevent boilers becoming heat sinks.	€10,590	€29,040
8	Updating the microprocessors in the BMS to encompass a complete re-programming of the existing BMS and include every item of plant in the facility. Also the installation of additional BMS control instruments and the associated I/O cards and programming. This will allow closer control and interaction between the user and the system on the Plant and Equipment set points.	€29,755	€57,692
9	Design and installation of a new control system for the compressors that will create an "on demand" scenario ensuring the compressors only operate when needed.	€16,790	€15,700
10	Advanced training on critical equipment i.e. BMS, Medical Equipment, wheel chairs.	€14,500	€24,100
11	Medical Air Compressor re-design and re-build.	€16,790	€15,700

2.1.1 Data Collection

The case study was selected in order to establish if some of these saving savings could have been realised during the initial construction stage of the project by earlier introduction of the Facilities Manager. To achieve this, semi-structured open interviews where used as the main tool of analysis, as they give the interviewer the power to explore, probe and ask questions deemed interesting to the researcher (Berry, 1999). Five interviews were conducted in order to validate this claim (Table 2).

Table 2 Interview Process

INTERVIEW	INTERVIEWEE
1	The current Facilities Manager.
2	The Project Manager who worked on the Clinic during construction.
3	The Architect who worked on the Clinic during construction.
4	The current Facilities Mechanical Technician.
5	The current Facilities Electrical Technician.

The interview questions were based around a number of areas that were highlighted throughout the literature review. The questions were designed to test claims set out by Shah (2007), that the Facilities Manager can play a significant role in maximising sustainable construction potential, if FM is integrated at the beginning of the project lifecycle. This approach is also supported by Booty (2006), who explained that introducing the Facilities Manager at an early stage can benefit the whole life cycle costing by reducing such elements, as maintenance and energy costs components. The case study interviews also addressed claims made by Kelly et al. (2005) that by involving the Facilities Manager at the design stage will help avoid the long term needs of the client and other stakeholders being overlooked during the briefing process. There were also questions designed around the facilities department, in order to test the argument put forward by Price (2004) that the internal FM departments have fallen into the mind set of seeing themselves as commodities and unintentionally conspiring in a system of discourse that perpetuates and reinforces that view.

Case Study Results

There were a number of areas of concern within the energy management plan that were based around poor design choices and inadequate planning. The Facilities Manager could have done little to influence some of the poor design choices, but could have helped identify a number of areas at the beginning of the construction process that would have benefited the clinic over the life cycle of the structure. All of the interviewees believed that if the client had appointed a Facilities Manager from the beginning, some of the savings outlined in the Energy Management Scheme could have been realised during construction instead of resulting in an expensive retrofitting.

There was also a strong belief, that if early collaboration occurred between the Facilities Manager and the design team, costs over the

clinic's life cycle would have been reduced, as the Facilities Manager would have a strong idea of what was required for a building service to function efficiently. There was also evidence, through the analysis of the interviews, to support the view that the client had no prior knowledge of plant or operational requirements and was not made fully aware of the benefits of sustainable design. This resulted in additional monies being spent to rectify this through the current savings initiatives scheme, with all interviewees strongly agreeing that the Facilities Manager could have facilitated the avoidance of some aspects of this if introduced in an early capacity. The current Facilities Manager and former construction team both agreed that additional savings could have been realised through sustainability practices in cavity wall design, low LEDs installation and Combined Heat and Power (CHP). These answers supported the arguments put forward by Shah (2007), Booty (2006) and Kelly et al. (2005), as outlined above.

There were also a number of legacy issues within the clinic, with the respondents of the interview claiming that there was little that could be done to improve the materials selection from the Facility Manager's perspective. This question was asked, in order to test the claim put forward by Swaffield and McDonald (2008) that other professionals do not necessarily appreciate a buildings life cycle costs during construction leading to financial implications down the line. There was an opportunity, however, to reduce these implications through the internal fit-out of the clinic, had the Facilities Manager been involved during construction. The practical approach by the Facilities Manager, in some instances (according to the Construction Project Manager) could also have helped to avoid counterproductive design details, in favour of a more sustainable outcome.

The current FM team (according to the interviewees) provided a vital environmental experience for external visitors and were central to the clinics business goals. Despite this, the Facilities team, due to a lack of appreciation of its role by other professionals within the clinic, was only viewed as an operational service. The Facilities Manager was also viewed to be on a lower manager level and was not considered to be a key player in the clinic's business strategy. This resulted in the current Facilities Manager suffering from a managerial identify crisis having been confined to the lower levels of Management. This concurred with Price's (2004) claim and would add the concern, that Facilities Departments, despite their contribution to an organisation, see themselves as nothing more than commodities.

QUESTIONNAIRE

As the case study was adopted as one data collection strategy, it was decided in addition to distribute questionnaires, in order to gain a broader view and maximise research findings, in regards to FM and its possible contribution to improving the construction process. The target audience consisted of a number of senior academics and professionals within the Irish AEC / FM sector.

Data Collection

The questionnaire was created online, in the hope of encouraging more respondents to reply. There were a total of 90 emails sent out, which in turn generated 51 responses. The response from each profession is shown in Table 3.

Table 3 Questionnaire Response

PROFESSION	QUESTIONNAIRES RETURNED	PERCENTAGE OF QUESTIONNAIRES RETURNED
Facilities Managers	19	37 %
Project Managers	26	51%
Architects	6	12%

The questions were formatted around the same statements and claims as put forward in the case study section. The questionnaire also aimed to test and expand on further claims put forward by Brown et al. (2001) that the FM and the Project Management (PM) professions need to amalgamate to some degree. The questionnaire was designed to find out if respondents believed that this was a valid claim and at what stage the FM and PM could best collaborate. The questionnaire also aimed to expand on the general view of the FM process and to establish whether or not the Facilities Manager is considered as a key business manager. This claim is argued favourably by Barrett and Bawdry (2003), in that the FM process was not constrained by the physical elements of the building and could make a positive contribution to the primary business. This question will give an indication of how the current profession of FM is viewed in the Irish AEC sector.

Questionnaire Results

The questionnaire was broken into five different sections, in order, to properly address areas of the literature research that were deemed relevant. The first part of the questionnaire explored the claim that early integration of FM can reduce the life cycle cost of a building. This investigated the claim by Swaffield and McDonald (2008) that other professionals do not fully appreciate a building's life cycle during construction. This question generated a 94% response rate in agreement with this statement, leading on to the next

question, that the Facilities Manager is well placed to influence if not decide on all building-related expenditures through its life time (Wood, 2006). All of the respondents agreed in some form with this claim, which further advocated the approach of introducing the Facility Manager into the construction management stage at an early level.

The second part of the questionnaire tested the claim by Shah (2007) and Booty (2006) that the early integration of the Facilities Manager at the design and construction stage can help highlight best environmental practices. This would then help reduce the maintenance and operation costs over the building's lifecycle. There was a 98% positive response rate for both questions, with respondents agreeing either fully or partially with the combined theories, as outlined by Shah and Booty. The Architect and Project Management professions both had a significant percentage of responses that only weakly agreed with this statement. This may suggest that they felt threatened by the possibility of the Facilities Manager upsetting current construction practices. There was also evidence in other areas of the questionnaire to support this view where suggestions of early FM involvement are put forward.

The third part of the questionnaire investigated the current construction ethos towards FM and the need for a more innovative approach, as originally highlighted by Lindahl and Ryd (2006). This section also tested the current practice towards outsourcing of FM after construction. There was a 98% response rate that partially agreed with the claim that the outsourcing of the FM function results in a gap in the client's needs. An innovative approach was suggested within the questionnaire to involve a partnering of the Project and Facilities Manager along with the Design Team throughout the construction stage. This resulted in a 92% agreement rating. This suggested that the current construction ethos is not maximizing client's needs, and a more efficient approach would involve the early integration of the Facilities Manager into the construction process.

The fourth part of the questionnaire investigated the role that the Facilities Manager could play if they were integrated into the construction process. This section of the questionnaire effectively set out to examine the statement put forward by Brown et al. (2001), that the Facilities Manager, instead of the Consultant Project Manager, should be appointed to the lead role in the management of new building procurement. This statement generated a mixed response, in that over half of the respondents were in partial agreement with Brown et al. The strongest indication from the questionnaire is that the Facilities Manager would best serve if he/she were integrated into the design stage in a consultant role.

The final part of the questionnaire was designed to investigate FM in general and addressed claims made by Cotts (2009) that FM is a quintessential business function. There was a total of 88% of the respondents who believed that FM should be applied as a business strategy in helping to reduce financial, environmental and social impacts. However, despite this, 86% of the respondents believed that irrespective of its potential as a business strategy, it was still not considered an actual profession. This falls in line with the claim made by Jensen (2010), that FM needs to create added value, and if it is going to survive as a discipline, it now needs to offer more to the client than just lower operational costs.

TRIANGULATION OF RESULTS

The case study results showed a number of areas of poor design, which the Facilities Manager could have done little to rectify, but did highlight a number of other areas where their early presence would have greatly benefited the life – cycle costs of the clinic. The analysis of the case study of the sports surgery clinic resulted in the Facilities Manager and the former construction team stating that early collaboration between the Facilities Manager and the design team would have resulted in reduced costs over the clinics lifecycle, as the Facilities Manager would have a strong idea of what is required for a building to function sustainably. This approach could have further helped prevent the current savings initiatives scheme that was retrospectively implemented in the clinic and reduced costs over the clinics life cycle. The questionnaire results further verified, either fully or partially, that there is a belief that the Facilities Manager can play a key role in sustainability and increasing construction potential.

Apart from an initial exercise carried out at the beginning of the project by the joint Mechanical and Electrical consultant, there was no further assessment made on best environmental practice, leading the authors to conclude that the client was not made fully aware of the possible savings that a more sustainable approach could have realised. The clinic has also been plagued with legacy issues, with the majority of respondents believing that there was little that could have been done to avoid these construction problems, as they resulted from poor workmanship. There was an opportunity, however, to reduce future financial implications through the internal fit out of the clinic if the Facilities Manager had an early input into materials selection. The response from the architects would indicate that there would be territorial conflict in regards to allowing the Facilities Manager participation in the materials selection process. The Construction Project Manager believes that architectural enhancement is counter to operating cost, and that the Facilities Manager could be able to adopt a more practical approach in avoiding these counterproductive designs in favour of a more passive building. The Facilities Manager without undermining the role of the Architect, who would still be responsible for

meeting most of the Client's needs, could help the Client understand, as in this case, that design enhancement may result in increased operational costs, throughout the building's life cycle.

The survey results supported the innovative approach of partnering the Project and Facilities Manager along with the Design team throughout the construction stage. This resulted in a 92% agreement that the Facilities Manager could work alongside these professionals in helping to create a whole life – cycle costing model, in which their practical knowledge and approach could be used to reduce future expenses. This approach depends on a level of foresight from the client, as there may initially be an additional spend, in order, to produce a more sustainable and beneficial structure. However, there are elements that the Facilities Manager can contribute through his practical knowledge, without significant additional monies needing to be spent, which include, as outlined in the previous section, energy management, space planning, plant room design and the internal fit out.

The triangulation of the results also showed that the FM team within the clinic provided a vital experience to external visitors and was central to the clinics business goals. The questionnaires backed up this belief with 88% of the respondents claiming that FM should not be confined to an operational level but should be applied as a business strategy. However, it would seem that Facilities departments are still only viewed at an operational level, which is further reinforced by 86% of the respondents' believing that despite its potential as a business strategy, FM is still not considered an actual separate profession.

CONCLUSION

This paper effectively set out to investigate whether or not the Facilities Manager could play an active role in the construction process, in order, to help reduce life-cycle costs. Throughout the course of the research it was concluded that the Facilities Manager, if introduced at the beginning of a structure's life-cycle, has the potential to increase sustainability and, in the process, promote best construction practice. This approach would make sure that all the operational needs of the client are addressed at the onset of construction, as the Facilities Manager would adopt a longer term perspective on the facilities created, in the construction and design of the structure. The introduction of the Facilities Manager at an earlier stage should not diminish the role of the Architect, who would still be responsible for most of the Client's needs and generating design solutions for life cycle costs, but will instead offer an alternative methodology towards achieving a more innovative approach in realising the Clients needs. This collaboration process could result in substantial monies been saved by the Client throughout the structure's life cycle. An organisation that fully realises the potential of its FM department and includes it as a key player in their business strategy can benefit across the board in regards to not just reduce financial inputs but also environmental and social impacts for that organisation.

However, throughout the course of the research, it was also concluded that particularly in the Irish AEC / FM sector, FM will continue to play the silent partner, unless it begins to promote itself as the key business strategy. This can be overcome, in some aspects, where the Facilities Departments can promote themselves within an organisation through monthly financial reports highlighting the monies saved from better energy management. In order to further this research, it is recommended that the FM process begins to move towards creating interactive capabilities, in order to portray its financial worth to an organisation.

The application of Building Information Modeling (BIM) and other IT tools will be further explored by the authors, in order to promote the profession and process of FM in the near future, so as to, establish more firmly the FM process, and its early adoption in the construction process within the Irish AEC sector.

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THE FM MARKET IN THE NORDIC COUNTRIES – VOLUME, STRUCTURE AND TRENDS

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The main purpose of this research is to give an overview of the FM market in Denmark, Norway, Sweden and Finland. A detailed study of the Danish FM market was done in 2008-9. This was followed up by a series of workshops facilitated by the author with groups of specialists in each of the countries in 2010 and 2011 to collect up-to-date information about all the 4 countries in relation to market volume, degree of outsourcing, structure and trends. The method for data collection was inspired by Delphi method. During the workshop the participants filled in a questionnaire with individual answers after the facilitator's introduction of each question and followed by group discussion and possibilities to revise the initial individual assessments after discussions. The questions were based on the new European standard about FM Taxonomy, which just have been accepted. This research was part of a EuroFM project about FM Market Data in Europe. In connection with the mentioned workshops another set of workshops were organized – except for Finland on the same day and with the same group of specialist – as part of a research project on FM Futures. The main purpose of this research is to provide input to a common Nordic FM research agenda. A number of future trends, challenges and needs for new competence and knowledge from this research are have been identified. Among the conclusions are that the size of the FM market varies considerable between the four countries and even though some trends like increased globalization and focus on sustainability are common, there are not many similar trends across the countries.

Keywords: foresight, market, nordic countries, trends, outsourcing

INTRODUCTION

The purpose of this paper is to present the results of a study of the market for Facilities Management (FM) in four Nordic countries in Europe – Denmark, Norway, Finland and Sweden. The study was carried out with workshops in each of the four countries with focus on the national FM market and participation of FM professionals from the country in question. The study was part of EuroFM's 'FM Market Data' project, which started in 2010 (EuroFM, 2011). The author was coordinator for the Nordic countries in the EuroFM project. The market study for the Nordic countries was carried out in parallel with a project on FM Futures. The workshops in Denmark, Norway and Sweden were arranged in connection with workshops on the FM Futures project with the same participants. The basis for the workshops on the FM market was the new definitions for standardized facility products in a proposed European standard for FM Taxonomy (CEN/TC348, 2009), which has been approved in 2011. These definitions have first been used in an earlier study concerning the Danish FM market in 2008 (Jensen 2009 and 2010). The aim of the new study was – besides producing data to the EuroFM project – to give an updated evaluation of size, structure and trends of the FM market in Denmark and to collect similar data concerning the other Nordic countries to get a better overview and to be able to make comparisons and obtain deeper insights in the development of FM in the Nordic countries, including similarities and differences between the countries. The results have been published in a research report (Jensen, 2011). In this paper the results of the FM market study are presented together with future trends, challenges and needs for new competences and knowledge in the FM sector in the Nordic countries based on the FM Futures project (Rasmussen and Dannemand Andersen, 2012).

FORMER STUDIES OF THE NORDIC FM MARKET

Capgemini in Norway made a survey of the Nordic FM market by means of 36 interviews in 2004 spread on 29 large companies and 7 FM suppliers. In the evaluation of the size of the market the area of all buildings except from housing in each country was taken into consideration. The total potential FM market was estimated to € 53 billion for all five Nordic countries, including Iceland representing € 0.7 billion. It was evaluated that 75 % of the potential FM market was internally handled, whereas the actual market only amounted

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25 % of the potential market. This evaluation was only made as average numbers for all the Nordic countries. The outsourced market was expected to continue to grow with 8 % annually. Furthermore, the evaluation included assessments of the maturity of the market in each country. The Swedish market was evaluated to be the most mature, followed by Finland, while the Danish market was situated in the middle followed by the Norwegian market, and the Icelandic market was the least mature (Cappgemini, 2005).

The economic size of FM in relation GDP is according to a German PhD study 4.92% for the potential and 2.48% for the actually outsourced market in the five largest European countries: UK, Germany, France, Italy and Spain. The study uses a model of market types as shown in Table 1. The pioneer markets are UK and Holland, the developed markets are mainly Central European countries but also Denmark, Italy and Spain, emerging markets includes the other Nordic countries, Poland, Czech Republic and Hungary, and pre-emerging countries are mostly South-East European countries and other East European countries (Teichmann, 2009).

Table 1: Degree of outsourcing and growth rates for FM market types in Europe (Teichmann, 2009)

MARKET TYPE	DEGREE OF OUTSOURCING	GROWTH RATE
Pioneer markets	56,3 %	6,0 %
Developed markets	43,6 %	8,0 %
Emerging markets	32,5 %	12,3 %
Pre-emerging markets	17,5 %	21,5%

Teichman estimated the size of the FM market in all European countries based on GDP and the market model as well as expert interviews for different regions in Europe. The results for the five Nordic countries are shown in Table 2 and compared with the estimations from Cappgemini calculated to level 2008 (assuming the same potential market as in 2004 and an annual increase of 8% in the actual market).

The estimations of the size of the aggregated market for all five countries are surprisingly similar around € 50 billion for the total and both with € 18 billion for the actual market. However, except for Iceland the estimations vary considerably for the individual countries. The Swedish market is largest in both estimations, but Cappgemini evaluates the total market 57% higher than Teichmann and the actual market 46% higher. Cappgemini also evaluates the Finnish market higher than Teichmann, but the opposite is the case for the Danish and Norwegian market. The degree of outsourcing is fairly similar except for Denmark, where Teichmann's estimations result in 47%. This is based on Teichmann's evaluation of the Danish FM market being the most mature among the Nordic countries, while Cappgemini evaluated the Swedish market as the most mature followed by the Finnish market.

Table 2: Comparison of estimations of the size of the FM market in 2008 (Billion Euro)

	Denmark	Norway	Finland	Sweden	Iceland	Sum
Total						
Cappgemini	8,3	8,9	11,7	23,4	0,7	52,9
Teichmann	10.8	12.3	8.0	14.9	0.7	46.6
Difference	-2.5	-3.4	3.7	8.5	0.0	6.4
Actual						
Cappgemini	2.8	3.0	4.0	7.9	0.2	18.0
Teichmann	5.1	4.5	2.9	5.4	0.2	18.1
Difference	-2.3	-1.4	1.0	2.5	0.0	-0.1
Degree of outsourcing						
Cappgemini	34%	34%	34%	34%	34%	34%
Teichmann	47%	36%	37%	36%	36%	39%
Difference	-13%	-2%	-3%	-2%	-2%	-5%

The study of the Danish FM market for 2008 was based on two surveys divided into providers and clients of FM. The provider survey included 103 companies. The data collection with telephone interviews was done in June 2008 before the financial crisis started. The client survey included 272 organisations and the data collection with telephone interviews was done during November 2008 after the financial crisis had started. According to the survey the total Danish FM market in 2008 was € 7.9 billion for the potential market and € 4.9 billion for the actual Danish market. This implies an outsourcing degree of 62 % (Jensen, 2009 and 2010). The result for the total

market is close to Capgemini's evaluation of € 8.3 billion but quite a bit lower Teichmann's evaluation of € 10.8 billion. The opposite is the case for the actual market, where the result of € 4.9 billion is close to Teichmann's evaluation of € 5.1 billion, but quite a bit higher than Capgemini's evaluation of € 2.8 billion. The result of 62% degree of outsourcing is considerably higher than Teichmann's evaluation of 47% and indicates in relation to Teichmann's market model that the Danish FM market is a pioneer market rather than a developed market.

METHODOLOGY

The methodology of the new FM market study was a workshop based Delphi method (Linstone and Murray, 1975) using the participant's qualified guestimates as a basis for discussions and with possibilities to revise the individual evaluations after group discussions. During the workshops the participants filled in a questionnaire, which provided the documentation of the meetings. In relation to participants the aim was to have a broad presentation of FM professionals from both public and private clients, in-house and external providers, trade organizations, researchers and teachers. The goal was to have approx. 10 participants in each workshop besides the facilitator. The participants were invited in collaboration with national members of NordicFM. Table 3 shows the dates of the four workshops and the number of participants, returned questionnaires and response rates. The number of participants varied from 7 to 13 with an average of 10, which was satisfactory.

Table 3: Workshops and participation

	Denmark	Norge	Finland	Sverige	Sum/average
Date	27-10-2010	05-11-2010	10-11-2010	15-03-2011	
Participants	11	9	7	13	40/10
Questionnaires	11	9	5	10	35/9
Response rate	100%	100%	71%	77%	88%

The hope was to have national market data available for the workshops, but besides the results from Capgemini and Teichmann presented above, that was only the case in Denmark and to a limited degree in Norway. This made the workshops in Sweden and Finland more difficult and is seen as a reason for the lower response rate in these countries (77 and 71%). Another reason apparently was that not all participating providers were willing to share their evaluations of the market. The workshops were facilitated by the author of this paper. They were structured with a first part, where the focus was on the potential or total FM Market, and a second part, where the focus was on the actual or outsourced market. It is the impressions that some participants had problems to keep this distinction in mind.

The workshops in Denmark, Norway and Sweden for the market study were arranged in connection with workshops on the FM Futures project with the same participants. In Finland the workshops were separate with different participants. As a preparation for all of the workshops a research report about the FM sector and its status in the Nordic countries had been produced (Jensen and Dannemand Andersen, 2010). This included an innovation system model for the FM sector as shown in Figure 1, which was used to structure the workshops on the FM Futures project. The first part focused on megatrends in the national and international surroundings influencing the development of the professional FM sector (dimension 1), the second parts focused on trends and challenges for the professional FM sector (dimension 2), and the third part focused on the need for new knowledge and competences (dimension 3). The workshops were facilitated by two colleagues of the author of this paper specialized in technological foresight.

In this paper the main future trends, challenges and needs for new competences and knowledge identified and prioritized during the workshops are presented. The last part of the FM Futures project included an adapted Delphi questionnaire survey leading to a proposal for a common Nordic FM research agenda, but this is not covered by this paper. All the results of the study will be published in a research report by Rasmussen and Dannemand Andersen (2012) and summarized in two book chapters in Jensen and Nielsen (2012).

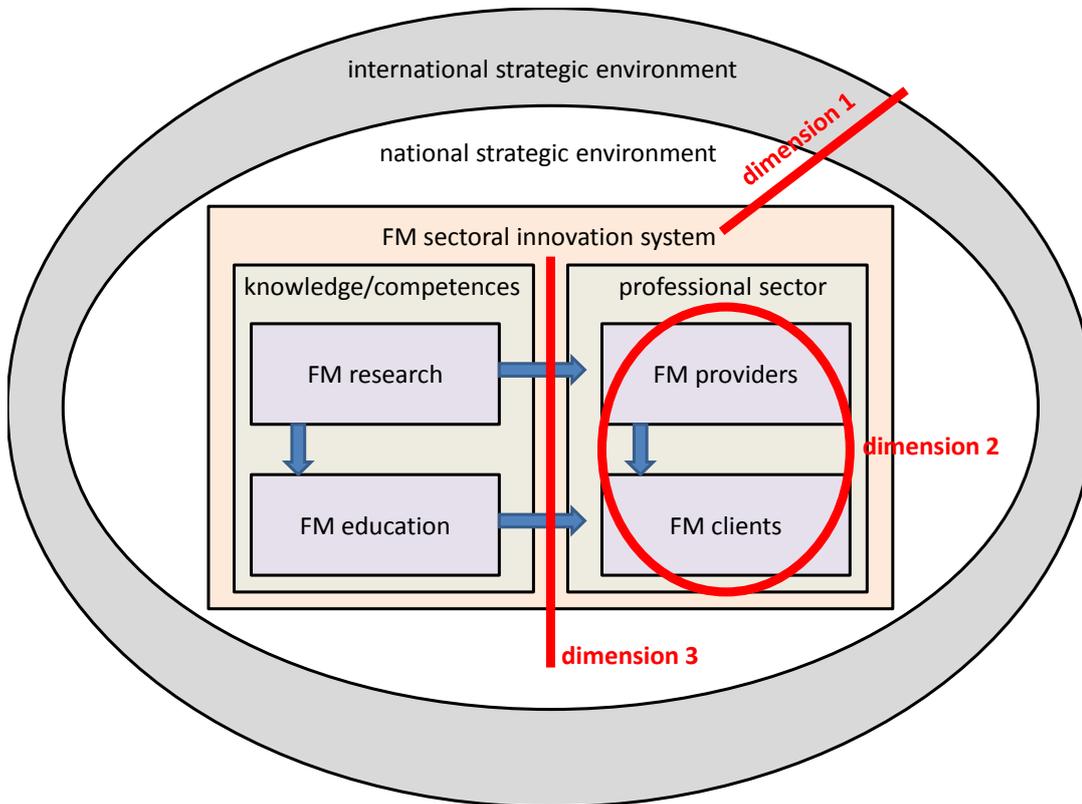


Figure 1: Innovation system model for the FM sector (Jensen and Dannemand Andersen, 2010)

RESULTS

MARKET DEVELOPMENT AND STRUCTURE

The workshop participants were asked to evaluate the factors that have influenced the amount of total FM activities (in-house and outsourced) for the two periods 2004-2008 and 2008-2010 (before and after the financial crisis started). During the period from 2004-8 the total FM market was influenced by economic growth and development of knowledge and service society with new providers and services, and the period from 2008-10 it was influenced by the financial crisis with increased competition and focus on cost reductions but also with maturing markets in all countries. In both periods the total FM market was influenced by increased globalization, professionalism and focus on sustainability. Political decisions and public procurement regulations were particularly mentioned in Sweden, while labour immigration and lack of local labour force was particularly mentioned in Norway.

The workshop participants were similarly asked to evaluate factors that have influenced the amount of actual FM activities (outsourced) in the long term and in the short term. For both the long and the short term the economical situation and politics are important factors influencing the degree of outsourcing. The most important long-term factors are increased globalisation, professionalism and market maturity. The most important short-term factors are competition and availability of labour force and competences. For Sweden added value is also mentioned as a short-term factor.

The participants evaluated very limited growth rates from 2008-9 and 2009-10 for the total FM market except for Sweden, where the average growth rate were 8 and 10%, but based on few responses. For the actual market the growth rate from 2008-9 was very limited in Norway and Finland and even slightly negative in Denmark, while the growth rate from 2009 to 2010 was around 5% in Denmark and Finland and 1.6% in Norway. For Sweden a growth rate of 7.5% was evaluated for both years, but again based on few responses.

The clients were in the study divided in four main markets: Public service, Private service, Industry, and Housing Associations. Public service was the largest market for total FM activities in Denmark, Norway and Finland with Private service as second largest. In Sweden Private service was largest and Public service second largest. All countries had Industry ranked as third and Housing associations as fourth for the total market. For the outsourced activities Private service was largest in all four countries. Public service was second largest except for Norway, where Industry was ranked as second and Public service as third.

The distribution on the main activities divided in Space & Infrastructure (S&I) and People & Organisation (P&O) according to the European standards (CEN/TC348, 2006 and 2009) was similar for the total market and the actual market in all countries as shown in Table 4. However, for Denmark and Norway S&I represented the largest part, while P&O represented the largest part in Finland and Sweden.

Table 4: Distribution and ranking of FM activities for the potential and actual market

	Denmark		Norway		Finland		Sweden		Average	
	Pot.	Act,	Pot.	Act,	Pot.	Act,	Pot.	Act,	Pot.	Act,
Space & Infrastructure	62%	53%	60%	64%	40%	40%	36%	36%	50%	48%
Space	1	1	1	1	1	1	4	3	1	1
Outdoors	4	4	4	3	4	3	5	5	4	4
Cleaning	2	2	2	2	2	2	3	2	2	2
Workplace	3	3	3	4	3	4	1	1	3	3
Primary activity specific	5	5	5	5	5	5	2	4	4	5
People & Organisation	38%	47%	40%	36%	60%	60%	64%	64%	50%	52%
Health, safety and security	2	3	5	4	2	4	3	3	3	3
– Hospitality					5	1	2	1	2	1
– Catering	1	1	2	1						
– Reception etc.	2	2	3	2						
ICT	2	4	1	3	1	2	1	1	1	2
Logistics	5	5	4	5	3	3	4	4	4	4
Business support	6	6	6	6	4	6	5	5	5	5
Organisation specific	7	7	7	7	5	5	6	6	6	6

Among S&I the highest ranking activity was Space followed by Cleaning in all countries for both the total and the actual market except for Sweden. Here Workplace was ranked highest followed by Primary activity specific, Cleaning, Space and Outdoors for the total market, and Workplace was also ranked highest for the actual market followed by Cleaning, Space, Primary activity specific and Outdoors.

Among P&O the highest ranking was ICT (Information and Communication Technology) in all countries for the total market except for Denmark, where Catering was highest. For the actual market Hospitality/Catering was highest ranking in all four countries. The term hospitality is not used in Scandinavian language and therefore the sub-products Catering and Reception etc. was used in the market studies in Denmark and Norway.

MARKET SIZE

The overall quantitative result of the study is an estimation of the size of the FM market in Denmark, Norway, Finland and Sweden as € 66.0 billion for the total market and € 26.2 billion for the actual market equivalent to a degree of outsourcing of 40% as shown in Table 5 with a comparison with former studies. It should be noted that the estimations concerns different years. This is based on the evaluations from the workshops in Denmark, Norway and Sweden, while the figures for Finland are estimated from the former studies.

Table 5: Comparison of estimations of the size of the FM market in the Nordic countries (Billion Euro)

	Denmark	Norway	Finland	Sweden	Iceland	Sum
Total						
Capgemini – 2004	8.3	8.9	11.7	23.4	0.7	52.9
Teichmann – 2008	10.8	12.3	8.0	14.9	0.7	46.6
This study – 2010	7.9	9.3	10.0	38.8		66.0
Actual						
Capgemini – 2008	2.8	3.0	4.0	7.9	0.2	18,0
Teichmann – 2008	5.1	4.5	2.9	5.4	0.2	18.1
This study – 2010	5.1	2.2	3.9	15.0		26.2
Degree of outsourcing						
Capgemini – 2004/2008	34%	34%	34%	34%	34%	34%
Teichmann – 2010	47%	36%	37%	36%	36%	39%
This study – 2010	64%	24%	39%	39%		40%

The most remarkable differences are the evaluations of the Swedish FM market. The total market is evaluated as low as € 14.9 billion by Teichmann and as high as € 38.8 billion at the workshop in Sweden and the actual market is evaluated as low as € 5.4 billion by Teichmann and as high as € 15.0 billion at the workshop in Sweden.

The evaluations of the degree of outsourcing are not very different for the Swedish market. In contrast there are big differences for Denmark and Norway. This study's result of 64% for the Danish FM Market is much higher than the other evaluations, while the result of 24% for the Norwegian FM market is much lower than the other evaluations.

If the results of former studies for Iceland are included with the result of this new study, the size of the FM market in all the five Nordic countries is estimated as € 66.7 billion for the total market and € 26.5 billion for the actual market equivalent to a degree of outsourcing of 40%. These total figures are summarised in Table 6.

Table 6: The size of the FM market in the Nordic countries in 2010

Billion Euro	FM market volume in 2010					
	Denmark	Norway	Finland	Sweden	Iceland	Sum
Total	7.9	9.3	10.0	38.8	0.7	66,7
Actual	5.1	2.2	3.9	15.0	0.3	26,5
Degree of outsourcing	64%	24%	39%	39%	39%	40%

TRENDS, CHALLENGES AND NEEDS FOR NEW COMPETENCES AND KNOWLEDGE

The only common megatrend in the strategic environments of FM for the next 10-15 years that was ranked high and seen as quite certain in the workshops on FM Futures in Denmark, Norway, Finland and Sweden was an increased focus on sustainability, but this was ranked lower and seen as more uncertain in Sweden than in the other three countries. The influence of globalization was ranked high and seen as quite certain in Denmark and Sweden but not in Norway and Finland. Demographic changes with labour shortage was ranked high and seen as quite certain in Denmark and Norway, but less so in Finland and not at all in Sweden. The influence of ICT was ranked high and seen as quite certain in Norway and Sweden, but less so in Denmark and not in Finland.

Despite these differences two important megatrends might be determined. The first concerns the increased focus on sustainability as mentioned above. The other megatrend concerns demographic changes, but the effect of this megatrend is interpreted or experienced differently in each country. In Denmark and Norway focus is on a mix of cultures and shortage of labour on the labour market. In Finland focus is on area and urban development as both industry and dwellings are located differently. For Sweden four megatrends ranked as no. 1, 3, 5 and 6 basically concerned the same overall megatrend of new ways of working and living, and that could also be interpreted as an effect of demographic changes. Issues mentioned were changes in the required infrastructure of work places and work spaces, and a new mix of working life and private life. Also increased job rotation, project based work and other new ways of working can be viewed as a part of this megatrend.

The most significant short and long term trends and challenges in the professional FM sector were completely different between the four countries except for an overlap on energy issues in the short term in Denmark and Finland. In Denmark sustainability in terms of energy, environment and branding was the highest ranked trend and challenge in both the short and the long term in Denmark. In Norway the most important short term challenge was that FM is not clearly defined and the need to spread out a common terminology, while the most important long term challenge was identified as the political development. The most significant short term trend and challenge in Sweden was to meet needs in relation to technology and new ways of working, while the most important long term challenge was how to balance the demand on standardised services and at the same time deliver a tailor-made FM operation in international solutions. Finally for Finland the highest-ranking short-term challenge was energy saving in FM including active energy management and incentives for service providers, while the most significant long-term trend and challenge was identified as housing FM.

Across these national differences three longer term trends and challenges are shared by several countries. Again the challenge related to sustainability and energy is common for all four countries. For Denmark, Sweden and Norway issues related to standards, expectations management, and benchmarking could be considered aspects of the same trend. Finally, workshop participants from both Norway and especially Sweden are focussing on issues related to costs and added value, and the pressure to provide more service for less cost.

The future need for new competences and new knowledge for the FM professionals also varied between the four countries. In Denmark the highest-ranking new competence was to understand clients' needs. In Sweden the focus was also on soft competences in terms of social abilities and personal competences. In Norway and Finland the focus was on more specific competences. For Norway competences related to KPI's (Key Performance indicators) and to new ways of working and the consequences for FM were both ranked highest with the same ranking. The most surprising result was that competences and new knowledge in relation to urban FM was ranked highest in Finland.

DISCUSSION AND CONCLUSION

This new study results in an estimation of the size of the FM market in all the five Nordic countries as € 66.7 billion for the total market and € 26.5 billion for the actual market equivalent to a degree of outsourcing of 40% as shown in table 6. It seems that the Danish and Norwegian markets have fairly similar structure except for the degree of outsourcing being much higher in Denmark than in Norway. Sweden represents by far the largest market among the Nordic countries, but it also seems to have a different structure from the other Nordic countries. Space is the highest among S&I activities in Denmark, Norway and Finland, which could indicate a strong building related focus, while the strong focus on Workplace among S&I activities and the dominating role of P&O activities in Sweden seem to indicate a strong service related focus and perhaps therefore also that FM organisations has stronger and closer relationships to their core businesses than FM organisations in the other Nordic countries.

This underlines that the maturity of FM in Sweden is high and particular the clients understanding of the importance of FM in general is at a higher level than in the other Nordic countries. Even though the degree of outsourcing is by far the largest in Denmark, which according to the market model of Teichmann should indicate a high degree of maturity of the FM market, this may merely be a consequence of the long and dominating position of ISS on their home market. It does not necessarily indicate a high level of understanding among clients of the importance of FM, but can mainly be a cost related factor. The megatrends influencing FM were regarded quite differently in the workshops about FM Futures in Denmark, Norway, Sweden and Finland with increasing focus on sustainability as the only common megatrend in all four countries. The current trends and challenges were completely different except for a short-term focus on energy issues in Denmark and Finland. The most surprising results concerned Finland with a long-term trend towards increased focus on housing FM and also the need for new competences and knowledge in relation to urban FM.

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EVALUATION OF INTEGRATED FACILITY MANAGEMENT AS TRUE VALUE FOR MID- TO LARGE ORGANIZATIONS

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The purpose of this paper is to examine the value proposition for mid- to large organizations for entering into an Integrated Facility Management (IFM) partnership and propose evaluation criteria for these contracts. Because the typical organization that adopts IFM is relatively large in size and complexity (IFM service providers tend to only consider those that offer extensive scope to manage in terms of some combination of spend, space, or sites), such deals including the associated contractual agreement are always customized, so in the end the value proposition depends upon the willingness of the organization to let go of significant responsibilities with some measure of risk vis-a-vis the level of oversight to ensure accountability. However the deal is structured, vital are a tangible metrics platform and periodic stakeholder assessment for both parties to validate the true value of the IFM partnership. While IFM is a promising concept that is increasingly being adopted by major global companies (see Figure 1), it remains to be seen how second tier suppliers, effectively disintermediated, will react. In addition, while IFM has been very successful in first and second generation outsourcing, will it prevail for corporations as the preferred model in the third and fourth generation? Will the model spawn a new set of IFM competitors, or will alternatives evolve; these will be two central questions watched closely by the \$150 Billion U.S. dollar corporate IFM outsourcing industry as outlined in Figure 1 (UMS Advisory).

Keywords: integrated facility management, service provision, outsourcing, value

Companies Consolidating FM Spend Are Selecting IFM Partners As Primary Suppliers

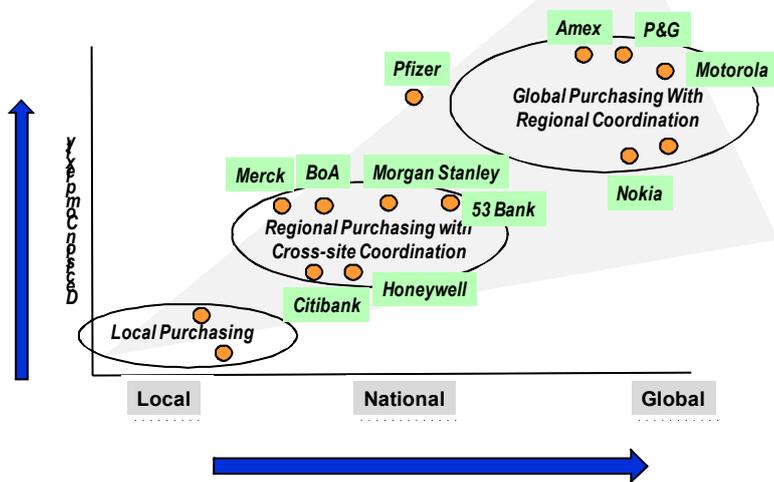


Figure 1: Companies with IFM partners

INTRODUCTION

With the feeble and unpredictable global economy, major businesses are looking for extraordinary ways to innovate while saving operating costs. Outsourcing facility management functions is the norm, albeit one that has evolved over the past 30 years. What has emerged over the past decade is a breakthrough in outsourcing strategy, with the integrator model. Integrating the management of facilities is more than the next iteration of traditional outsourcing i.e., bundling services to achieve economies of scale. Instead, moving to an integrator model of outsourcing concentrates the management of the sundry tactical elements of facility operations

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and services under an expert manager, specifically, a service provider with the core mission and technical competencies of facility management. This differs from earlier “integrated facilities management models” such as those limited to maintenance management, performance and risk management and energy and operations management models proposed for healthcare by Shoet and Lavey or computer integrated facility management in the late 1990’s and early 2000’s (Yu, 2000; Wang, 2002; Bröchner, 2003; Shen, 2010).

The definition used for Integrated Facility Management (IFM) used within this paper is that of integration of all property and service (non-core services) operations within the built environment. Similar definitions have been put forth as “total facility management (DeToni & Nenino, 2009) but have more recently been characterized as IFM. The integration of property, operations and maintenance, along with office administration is also not a new topic (Kincaid, 1994) but has gained strong acceptance over the last several years as more mid- and large-sized organizations continue to drive efficiencies, reductions in cost and outsourcing of non-core functions to attain these goals. Other goals to shift from complex specifications in the outsourcing process for many services has moved to performance-based contracts where providers are given incentives to innovate and provide increased value along with reduced costs (Kashiwagi, 2010). In a performance-based contract with the service provider, the client organization monitors the costs, quality, and service levels through key performance indicators. Under this arrangement, the client should be free to focus on aligning FM strategy with the overarching goals of the enterprise. This has been consistently reported as a key metric for effective facility management performance measurement (IFMA Trend Reports).

ESTABLISHING THE COMPELLING BUSINESS CASE

The prerequisites to establishing a business case for IFM are introspection of the need to do so, the potential value, and the risks. Does a high-performing FM organization need to consider IFM as a competitive requirement? The assumption in any organization is that any business needs to take careful stock of its cost centers, and FM is typically considered a counterweight to the profit centers (although an argument can be made that progressive FM practices will increase productivity and effectiveness of the profit centers). Given the inexorable advance of integrated FM outsourcing to the next generation of delivery models, it behooves the business to look to the marketplace for comparative assessment against its existing conventional service delivery model. To ensure an assessment without bias, the business should consider a review by a third party with the capability to assess FM service delivery and financial performance. This assessment may point toward the need to develop a business case for adopting IFM in one of its variant forms.

One major healthcare company structured its business case around the following objectives:

1. Drive 10 – 15% cost reduction from the total FM spend over a 5 year period. The reductions were expected from consolidating the disparate supplier base; in this case, the base consisted of over 2,000 suppliers. Many sites individually sourced to the same suppliers, but without benefit of leveraged contracting. Further reductions were expected from refining service level specifications and attaining process efficiencies.
2. Establish operational consistency across all sites in the portfolio. There were few common standards among the sites, such as in FM technology, work control, or regulatory compliance procedures
3. Establish a communications and collaboration network among the FM groups across the portfolio. There was limited sharing of best practices from site to site, especially with multiple business units involved.
4. Devise formal service level agreements and metrics to unmask performance constraints, reduce risks, and drive improvements. There was inconsistent satisfaction among customers in the lines of business, in part because measurements were vague or non-existent.
5. Attain optimal balance between internal and external management of FM services. There was a diverse (i.e., inconsistent) approach to managing functions, ranging from self-performance to consigning suppliers to manage isolated or bundled services.

This company considered its current versus desired state in constructing its objective to integrate the management of FM (see Figure 2).

- Fragmented contracts → ▪ **Leveraged contract**
- Task-based contracts → ▪ **Outcome based**
- Duplicate Management → ▪ **Single Accountable team**
- Fragmentation → ▪ **Consolidation**
- Inflexible → ▪ **Scalable**
- Pay for activity → ▪ **Pay for performance / improvement**

Figure 2 Performance-Based Supplier Relationship Model

Unstated, but perhaps an underlying objective is to shift the focus of FM leaders toward a reshaped core competency, one that is focused on setting strategy. The FM and Corporate Real Estate functions are more important than ever as businesses realize the strategic advantage of FM/CRE alignment to enterprise goals. The FM leader is often encumbered with tactical responsibilities that distract from setting strategy, especially as business reinvents and sheds products and services, engages in acquisitions and divestitures, and expands geographical reach around the globe.

The shift from tactical to strategic is enabled with the implementation of IFM and as shown in Figure 3 from Tim Tourville, Managing Director, North America at Mace Ltd., and graphically displays the shift from operational focus at 70% to a reduced 5% with implementation of outsourced IFM. This allows in-house facility management to focus half their value on strategic initiatives and relationship management with their internal customers/clients. This rebalancing is the critical improvement that IFM provides.

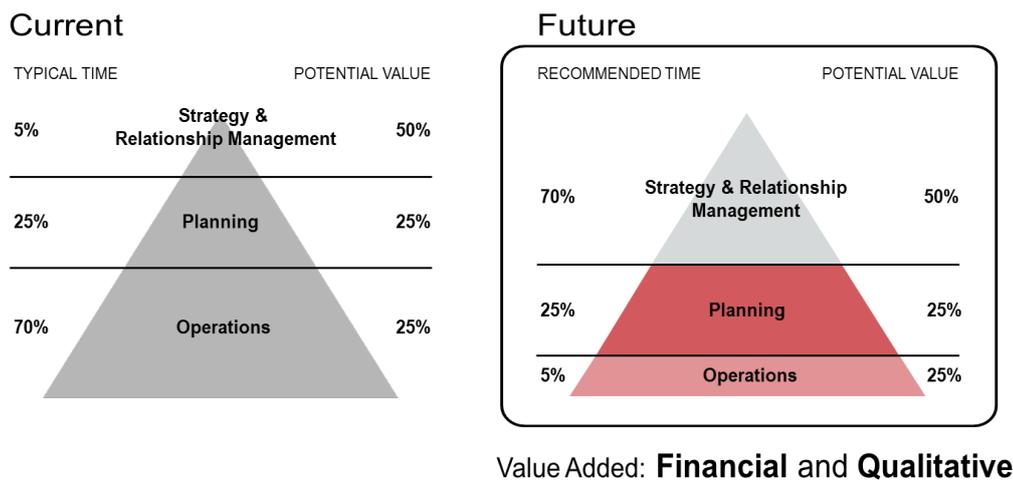


Figure 3. Shift from tactical to strategic focus with IFM

NEED

In conjunction with setting the primary objectives of the business case, the evaluation team determines the scope of services to be managed. This is a vital stage as the team begins the dialogue of whether it seeks a transformative or incremental approach. One may assume the former is the obvious choice, but it could collapse into failure if opposed by stakeholders who lack an appetite for risk, subsequently neutralized by those who were overlooked during the campaign for change, or even undermined by those directly impacted.

VALUE

Drivers to determining value

Once the scope of services is determined, the baseline of associated expenses can be established. The baseline is the linchpin for developing budgets incorporating savings guarantees, so it must be ascertained with utmost accuracy and full engagement of the client and service provider’s accountants. If not done with due diligence, it may resurface as a dispute requiring intervention by governance authorities.

For each service in scope, there are improvement levers that can be applied:

- Strategic sourcing – Increase purchasing power through preferred supplier partnerships, and economies of scale through pooling the spend across all sites.
- Best practices sharing – Improve processes to reduce labor and increase productivity.
- Bundling – Optimize the delivery model of self-perform versus subcontract.
- Competition – Market pressures drive pricing and innovation, and performance-based compensation for provider and suppliers induces an environment focused on value creation.



Figure 3 depicts typical services in scope alongside potential improvement levers.

A premise of IFM is scalability to adjust with the client’s business. It is not intended to be a stagnant model, but functions best with expanded services, scope, asset classes, and geographical reach. With such expansion, the service provider will be motivated to invest more in people, technology, and value creation.

GAUGING INCLINATION FOR CHANGE AGAINST INHERENT RISK FACTORS

A careful assessment of risks and the openness for change is needed to lead to a decision on which variation of IFM model to adopt, addressed later in the paper. There are a plethora of risks to consider that are unique to the business and can influence the direction of change. Specifically, here are some risk factors to consider:

- *Complexity and maturity of existing site FM organizations to function in synergy.* If there are organizational silos and/or misalignment, expecting the integrator to herd the defragmented client organizational elements into a unit will sidetrack the integrator’s primary attention for trying to do the same with the supplier base.
- *Constraints in transferring knowledge or data.* Some businesses have validated systems that cannot easily be co-opted by the provider. Or there may be resistance to transfer what is considered proprietary information.
- Client internal customers, especially those monitored by regulatory authorities, may be dead set *opposed to any disruption of business* during the tenuous phase of transition of FM services to the integrator. This may call for an extended timeline or incremental change strategy.
- *Client culture disinclined to change.* Reluctance to fully trust the provider as evidenced in the client retaining staff redundant to the provider’s staff for the purpose of oversight. This may be the single most important inhibitor for clients unwilling to risk a “trust, but verify” approach to the partnership with the provider, as once the retained (also known as “stayback”) staffing is set at the beginning of the IFM partnership, it is very difficult for the client to eliminate such staff as the opportunity to transfer to the provider has likely passed.
- *Exit Strategy: What if it does not work?* Can the relationship be expediently untangled after termination? Termination must not be regarded as an unthinkable event.

PATHWAY TO SUCCESS

There are ways to circumvent or minimize risk. According to Rakesh Kishan, Principal of UMS Advisory (personal communication, November, 12, 2011), there are six predictors of success in outsourcing to an integrator:

1. Strong sponsorship and project leadership – Careful design of the project team and recruitment of team members are essential. There should be alchemy of attributes for the team to suppress biases in favor of sacrifice for transformation. The team must be cross-functional yet sized to enable agility in positioning options, and members nominated who are discreet in handling matters of sensitivity, oriented to risk in pursuit of impactful change, and who have access to and credibility with the executive committee sponsors on decisions.

Nearly as important, is to not relegate peripheral stakeholders as an afterthought for ad hoc participation. Disregarding in the early stages of planning the managers of services on the fringe of FM control (e.g. managers of hazardous waste, laboratory services, calibrations) or financial analysts, will result in setbacks during the critical path of transition. And last but not least, one or more sponsors at or near the chief executive level is indispensable to the success of the project. To assure success, the sponsor(s) must be engaged at the start and throughout to steer past the temptation to hover at status quo.

2. Align Request for Proposal (RFP) strategy to cultural readiness and current operating model – The RFP is the linchpin to staging the change to the IFM model. A perfunctory RFP will quickly spell trouble if it does not reconcile differences among the respective cultures and operating models of the participating client sites, and it will elicit ambiguous supplier responses and muddle the process of review. Significant time invested in developing the RFP will lay the groundwork for a robust agreement between the counterparties, and yield dividends to offset various hurdles encountered during transition.
3. Time and control the flow of HR and Communications support – The prospect of changing to the IFM model will produce anxiety or resistance manifested in various ways, so customizing the communications in proportion to the audience (i.e., FM employees, internal stakeholders, and suppliers) and the particular culture of the sites is vital. Especially important is close collaboration with HR in dealing with the concerns of employees directly affected by the change.

Conveying a one-size fits all messaging approach will lessen the credibility of the leaders, so creative use of various media can help ensure connectivity. Also, ongoing communications of the IFM “brand” is advantageous, along with recurrent training on details of the master contract and site service level agreements, especially in assimilating new players and stakeholders.

4. Manage to the current market environment – The market of integrators and second tier suppliers is continually and rapidly evolving. Large FM/CRE firms are vying for industry’s attention as they position their respective model (typically, managing agent, or some variation of self-performance in soft or hard services) as optimal. Likewise, second tier suppliers are aligning themselves with certain major integrators, even as the same suppliers consider whether to become integrators, potentially complicating existing relationships. Successful integrators are staking out market segments, while joint ventures come and go, and global agreements are developing. With the state of flux in the IFM arena, businesses need to stay abreast of the current market environment in order to craft the best deal.
5. Create policies to support the initiative – Existing client policies and operating procedures in HR, procurement, and quality can hamper transition, which become substantially more complicated when individual sites have their own policies and procedures that take precedence. Therefore, it is essential to compile and review these documents across the portfolio so the integrator can improvise a framework for compliance. Also, because in most cases, there may be a relatively large transfer of employees from client to provider, it is especially important that HR policies are conducive to affecting such transfers by removing barriers and even creating incentives such as keeping employees whole in benefits and years of service, offering severance to offset disparity in compensation, etc. Providers should also be aware there are even contractual restrictions with second tier suppliers to prevent poaching of staff, so policies at this level need to be examined.
6. Build a transparent, performance-based contract as the centerpiece of your governance – Large scale outsourcing initiatives involving multiple sites, business units, and asset classes, require an unconventional master service agreement, one in which the client and service provider enter into a transparent partnership based on respective due diligence in terms of performance and oversight. Unlike fixed fee or cost plus contracts, a performance-based contract has an incentive structure in which supplier profits are tied to a matrix of key performance indicators, glide path savings, and gain-sharing. All routine expenses associated with labor, materials, and contracted services are bundled as pass-through to the client.

FRAMEWORK FOR ANALYSIS OF EVALUATION OF IFM SERVICE PROVIDERS

Over the past decade, the market among FM service providers has undergone a tectonic shift toward consolidation. Amid intense competition, service providers are offering aggressive pricing terms while sustaining or even improving service levels as competencies sharply develop. So, a business may discover its current method of FM service delivery, typically some mix of self-performance and selective or bundled outsourcing, may not be able to rival the potency of integration of FM services managed by a single provider. And the IFM model propagates i.e., the more it expands, the more prevalent and capable the providers become, leading to greater investments in technology and best practices, and so on.

As noted earlier, the mix of IFM service providers and the second tier of suppliers is dynamic. As depicted in Figure 4, there are multiple options in application of the IFM model, including whether to implement it in whole or in part depending upon the scope. Usually, a real estate services firm will act as a managing agent, although some have developed technical expertise in self-performing in areas such as maintenance, janitorial, and project management. Selection of firms with core expertise in the hard services of maintenance and engineering may be ideal for certain high technology or regulated client businesses, while providers with core expertise in the soft services may be better suited to clients with a focus on the corporate service functions. With that said, all IFM service providers are becoming more homogenous as they broaden their capabilities to appeal across industry sectors.

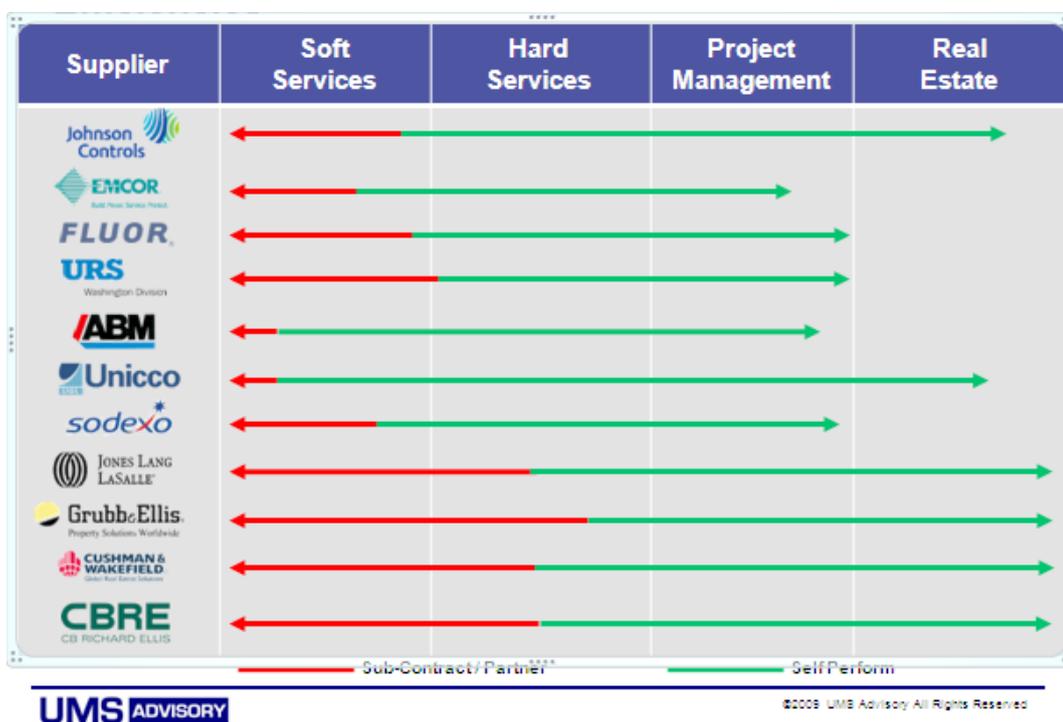


Figure 4 – Cross-section of IFM service providers in US market

The Figure 4 list of service providers is not intended to be a comprehensive list, as there are many more vying for segments of the market. As noted in item 4 of the predictors of success above, client businesses should manage to the current market, and start with a broad swath of potential providers. The project team charged with determining the pathway for implementation of IFM should objectively work to streamline the initial slate of providers responding to the RFP. Initial down-select criteria may include:

1. Assurance of supply – Do they have the bandwidth to manage the complexity of a large-scale business?
2. Service – Are they focused on cost reduction at the sacrifice of superior service?
3. Quality – Do they have the reputation to excel?
4. Innovation – Are they a pacesetter in change and continuous improvement?
5. Regulatory – Do they have the requisite experience to function in a regulated environment?
6. Cost – What is the best combination of fee, guaranteed savings, transition, overhead, and related costs?

Some client businesses even engage with the bidders at certain points in the RFP process, sometimes know as “yellow pad sessions” as part of a dialogue to ensure clarity of requirements and to refine the RFP before final proposals are submitted. When the potential service providers are narrowed down to the short list, then final evaluation criteria become more explicit. Here is a sample set of criteria from one client business, devising an associated intricate scorecard to ensure objectivity:

1. Financial value
 - a. Year over year savings
 - b. Guarantees/risk mitigation
 - c. Performance incentive structure
 - d. Cost of doing business
2. Ability to be a good partner
 - a. Cultural fit
 - b. Alignment with contractual terms/ability to reach agreement quickly
3. Operational solution/capability
 - a. Reference visits/feedback
 - b. Confidence in operationalizing the model

Of these criteria, the most foundational is for the IFM service provider to operationalize the model for the client, balancing deliberation with speed (“make haste, slowly”). Figure 5 depicts the major phases, beginning with pre-transition consisting of due diligence visits to each of the client sites involved, and development of the HR and communications strategy. The transition phase is usually 60 – 90 days in length, often managed by a special IFM service provider team of experts whose sole function is to manage transitions for hand-off at “go-live” to their operations counterparts to implement and manage going forward. Then the essence of provider and client partnership is manifested in the governance of the model, ensuring financial, service, and innovation goals are attained through transformation.

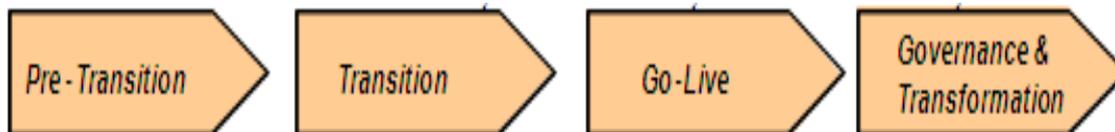


Figure 5 Process for operationalizing the IFM model

And finally, with the advent of IFM, niche consultancies in the field have emerged, with a spectrum of expertise in FM, sourcing, contract law, and finance. Is a consultant advantageous or necessary for guiding the client business through the RFP/sourcing process and beyond, such as in setting up the governance model? This decision largely depends upon the availability of internal resources to dedicate, keeping in mind that for large scale companies, the process from business case to transition may take 12 – 18 months. A consultant with the acumen and marketplace knowledge can help the client stay on track through the regimen of a complicated and customized process.

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SESSION 2

LAW & CONTRACT

ALTERNATE DISPUTE RESOLUTION PREFERENCES: CONFLICT, CLAIMS AND CONFUSION

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The South African Construction industry has adopted various methods of Alternate Dispute resolution (ADR) which differ in some respects from internationally practiced ADR. Some conflicting behaviours are evident in the construction industry where differences between parties to a construction contract occur in respect of rights and obligations and the interpretation thereof. As a result of these misinterpretations, the management of claims subsequently addresses these differences which inevitably lead to disputes which have to be resolved by a recognised method of dispute resolution. Some confusion as to the most appropriate method may exist because of the lack of knowledge and experience relating to the various ADR methods and the systematic application thereof. The purpose of the study was to clarify which of the ADR methods were most supportive in creating an effective systematic approach to dispute resolution. Various methods of ADR were sourced from literature, studied and analysed to discover which of these methods are best suited to the diverse nature of the industry. A questionnaire survey was conducted amongst established practicing professionals and their staff/employees who were active in the industry to identify the preferred methods, so as to determine the most effective dispute resolution approach. It was found that a systematic approach to the adjudication, conciliation, mediation and arbitration methods can be used to implement an effective system of ADR in the industry. Some confusion reigns with the numerous methods of ADR which can be applied in the industry. A systematic approach to ADR may prove to be effective.

Keywords: Alternate Dispute Resolution, effective, methods, systematic approach

INTRODUCTION

Disputes often arise in the construction industry and the practicing professional fulfilling the role of project manager faces the task of addressing claims and resolving disputes which may stem from these. The claims management process plays an important role in the successful completion of a project (Finsen, 2005:214-215; Verster, 2006:17). The demand for the timely completion of projects may call for clarity of the Claims management process and the effective resolution of disputes.

The South African construction industry contracts and the 1950 Arbitration Act are based on United Kingdom (UK) prototypes and as such, the UK approach to ADR has been adopted. The diverse and expeditious nature of the South African Construction industry has resulted in the evolution of a unique method of Alternate Dispute Resolution (ADR). Adjudication in the UK is based on legislation whereas in South Africa, the method is adopted by the contracting parties according to the agreement they have concluded (Finsen, 2005: 223).

In spite of the application of new methods to speed up the dispute resolution process; the nature of the construction industry may lend itself to even more time saving applications. There are numerous ADR methods practiced in the South African construction industry that may have evolved since arbitration to suit the different needs of a unique industry. Due to the flexible nature of ADR, there is no hard and fast rule for effective dispute resolution in the industry, hence the larger than what may be considered normal, variety of available methods (Verster, Ramabodu & Van Zyl, 2011: 3). The more regularly used methods however, may be those that are included in the Joint Building Contracts Committee (JBCC) (2007). Most professionals are familiar with these methods which are:

- Adjudication
- Arbitration
- Negotiation
- Conciliation
- Mediation
- Agent Resolution

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Judging by the popularity of the JBCC contract, the above methods may be considered the most relevant to the industry. These methods formed the basis of the research, however, the method “Agent resolution” was also included because the preference for the method was indicated in previous research (Verster et al., 2011: 8). The methods all enjoy some or all of the satisfactory end results referred to as the Four C’s namely, consensus, control, continuity and confidentiality. Mediation, conciliation and negotiation offer the benefits of the Four C’s however, adjudication and arbitration fall short in as much as parties only reach consensus on the procedure to be taken and the appointment of the facilitator. Parties are not in control and the continuity of an ongoing business relationship is questionable (Loots, 1991: 8-13).

Although the JBCC Clause 40 (2007: 31) provides for the resolution of disputes, the question raised, is this the most effective approach to dispute resolution? Adjudication, arbitration and mediation form the body of ADR in the South African construction industry and Agent resolution may be applied as a primary method of ADR due to the limitations which are placed on the agent’s authority by the client. The purpose of the paper is to determine what methods of ADR are particularly applicable in the South African construction industry in order to create a more simplistic and effective combination of the methods.

METHODS

ADJUDICATION

Adjudication has served as a primary method of dispute resolution in the JBCC agreements since it adopted the method, which was introduced by the Latham report (Scott & Markram, 2004: 1). The JBCC Clause 40 (2007: 31) allows disputing parties to submit to adjudication which is the first stage in the dispute resolution process. The decision is not final and binding and in the event of dissatisfaction with the outcome, parties may choose to submit to arbitration or mediation within ten days after the decision is made however; this would have further cost implications. Clause 40.6 of the JBCC provides for the entitlement of parties to submit a dispute to mediation. Unlike the UK method of adjudication where a binding decision is made; the decision in the South African construction industry is not final and binding and may be submitted to arbitration or mediation by the parties (Finsen, 2005: 223; Brown & Marriott, 1993: 19).

According to Finsen (2005:223), adjudication which is based on set rules published by the JBCC and supported by the Construction Industry Development Board (CIDB), is now included in most construction agreements. The inclusion of the method as a primary method of dispute resolution may give rise to a certain amount of debate. Is this the most appropriate method to primarily apply in a fast tracking industry?

AGENT RESOLUTION

The role of Principal Agent was originally intended to be of an authoritative nature and gradually evolved to include the duties of a project manager. Although an architect was normally appointed as the principal agent, his/her authoritative powers were somewhat limited by the client. The quantity surveyor with extensive costing skills was also considered for the role of principal agent in alteration type of projects (Verster, 2006:15). Agent resolution is referred to as quasi arbitral (Butler & Finsen, 1993: 112). The principal agent provided for the resolution of disputes and was often empowered to arbitrate in the first instance, with the right of appeal from his award to another arbitrator (McKenzie & McKenzie, 2009: 3; Verster, 2006: 15). In view of the decision of the agent, which is not final and binding with the right to appeal to another arbitrator, equates the method of agent resolution to the quasi arbitral function of adjudication.

ARBITRATION

According to Finsen (2005: 33) arbitration has become more formal with an improved decision making process, however, the cost and slower pace of arbitration has resulted in a move towards the more informal and speedy methods of dispute resolution. Agent resolution, mediation and adjudication were introduced to speed up the pace of arbitration (Finsen, 2005: 222; McKenzie & McKenzie, 2009: 3; Quail, 1978: 165). According to Samuel (2008: 1), dispute risk in Government contracts constitutes a challenge. In spite of the forfeit of time and cost implications, litigation remains a requirement for government contracts with the inherent right to appeal. However, the private sector may be more inclined to use mediation in order to optimise the dispute resolution process. Due to the ever-increasing competitive nature of the industry, it may have become necessary to use more speedy methods as a measure of survival. Arbitration was the first form of ADR to litigation and may be regarded as the backbone of dispute resolution in the construction industry. If all else fails, revert to arbitration.

Retired professionals equipped with the relevant expert knowledge were in an ideal position to fulfil the role of arbitrator in the

industry. However, with the increasing demand for mediation, arbitrators may have moved on to fulfil the role of mediator. This may have a correlation to the similarities between arbitration and mediation, hence the reference to mediation as being quasi-arbitral or a non-binding arbitration (Boulle & Rycroft, 1997 & Dison, 2005, cited in Du Preez et al., 2010: 5).

NEGOTIATION

Negotiation is addressed as a method and a skill and is considered a primary element of all ADR methods (Boulle & Rycroft, 1997: 60). Negotiation as a method of ADR which takes place between the disputing parties alone, may be referred to as unassisted or direct negotiations in so far as parties are not assisted and guided through the negotiation process.

Pretorius (1993:12) is of the opinion that relatively little is known of the science and art of negotiation and this may be due to the lack of negotiation skills education. Although tertiary institutions provide for negotiation skills education, the BSc. curriculums may address these intricate skills superficially and due to time constraints, students may be expected to address these themselves. In view of the above, unassisted negotiation may have a negative impact on the initial resolution of disputes. With the assistance of a knowledgeable facilitator, a more effective procedure may be followed. Mediation is the main form of assisted negotiation of which negotiation is a primary element (Boulle & Rycroft 1997: 61).

CONCILIATION

Conciliation is not considered to be an inferior process to mediation; it is based on the same principles and procedures up to the point where an impasse is reached. This is the facilitative procedure of mediation which prepares the parties psychologically for the evaluative process of mediation. The procedure is informal and may be used as an independent method of dispute resolution in order to settle differences between parties before these differences develop into a dispute (Du Preez et al., 2010: 9). The psychological component of conciliation identified by Moore (1986: 4, 124), creates an atmosphere of trust and co-operation and is only combined with mediation to address the evaluative approach to mediation. Arbitration, adjudication and agent resolution is based on an adjudicative procedure where the psychological components are rather judged than approached with conciliation.

Conciliation is also a facilitated procedure as opposed to unassisted negotiations where parties may be somewhat uninformed. There are however, those individuals who have the inherent ability to negotiate effectively. The method of conciliation in the construction industry is intended for the sole purpose of preparing the parties psychologically and guiding the parties to a settlement and the conciliator is not expected to offer his/her opinion of a settlement (Butler & Finsen, 1993: 10-11; Bevan, 1992: 15 & Pretorius, 1993: 4).

MEDIATION

In the South African construction industry, mediation is a process whereby the mediator is expected to recommend a non-binding solution should the parties fail to reach a settlement. However, this is at the discretion of the parties. Building contracts such as the Principal Building Agreement 1991 and the General Conditions of Contract for Works of Civil Engineering Construction (1990), state that the mediator may be required to offer his opinion on the dispute. This opinion is binding if it is not rejected by the parties within the stipulated 10-day period. Contrary to this, the JBCC Principal Building Agreement 2005 edition has no mention of the mediator expressing his/her own opinion and it is submitted that he/she not be too hasty to offer his/her opinion of a possible solution (cited in Finsen, 2005: 232). The Association of Arbitrators and the Engineering Council provide set guidelines for mediation. Mediation is not supported by an act and as such, the decision cannot be supported in a court of law. It is required from the mediator to conclude the mediation in writing, in which case it would be supported contractually (McKenzie & McKenzie, 2009: 225). The mediator need not be a legal person however; the construction industry invariably calls for a mediator who is a subject matter expert and the parties may well request his opinion for a solution to a settlement (Finsen, 2005: 232). A professional with mediation skills and the ability to facilitate negotiations may serve as a conciliator or mediator on his/her own project as well as serving as a mediator for the industry at large. Mediation in the South African construction industry may therefore be described as a hybrid method which has evolved from various other methods of ADR, hence the preference for the method based on a culmination of advantages drawn from other methods to suit the needs of the industry.

In light of the above, a comprehensive method as mediation may well be considered as a primary method of dispute resolution in the industry.

MEDIATION AS OPPOSED TO ADJUDICATION

Adjudication is the first option of Dispute Resolution in Clause 40 of the JBCC 2007. Adjudication was introduced to the industry, based on the Latham Report in the UK to speed up the resolution of disputes in the construction industry. It was stated that a

decision by the adjudicator should be made within 28 days of the dispute being declared and that the adjudicator is free to come to a decision in any way he/she pleases. The adjudicator has to be an expert but not necessarily a legal person (Finsen, 2005: 222-223). Adjudication is supported by rules set by the JBCC which state that the adjudicator should be appointed within five days of the dispute being declared and that the decision should be made within twenty days after the referral date (Adjudication Rules 2.1; 7.1.1, cited in Finsen, 2005: 468,471).

The mediator in the Construction industry may be required to raise his opinion when facilitating evaluative mediation, hence the need for expert knowledge which somewhat places him/her in the same category as the adjudicator. During mediation the parties are in control of the procedure and they can determine their own settlement within the time limits which they view as critical to the project.

In comparison to adjudication where an adjudicatory decision is made for the parties, mediation has been referred to by Boulle & Rycroft (1997: 66) as quasi arbitral and agent resolution by McKenzie & McKenzie (2009: 128) fits the same description. It may be said that the evaluative component of mediation correlates with adjudication however; the consensual element in mediation may be considered an added advantage. In support of this, a study conducted by Verster, Ramabodu & Van Zyl, (2011:accepted for publication) indicates that mediation is a preferred method of ADR in as much as it enjoys more advantages of satisfactory end results above those of adjudication. The initial facilitation process of mediation referred to as conciliation is intended to build positive psychological relationships, trust and co-operation to create a co-operative problem solving atmosphere. The process also improves communication between parties which creates a better understanding of the whole picture. Parties to mediation are in control of the procedure and they determine their own settlement which promotes continuity and satisfactory end results (Du Preez et al., 2010: 3-9). An advantage which adjudication enjoys above mediation is that the decision is final and binding. In the case of dissatisfaction of the adjudicator's decision, it is conditional to an arbitrator's award. This would have a negative impact on continuity as a satisfactory end result (Verster et al., 2011: accepted for publication).

Mediation is not subject to final and binding decisions and parties would be in control of the outcomes, however, as with adjudication, if parties are not satisfied they may be contractually bound to submit to arbitration (JBCC, 2007: 31-32). Adjudication may hold its stance of importance in as much as it is the primary contractual method however; when the advantages of the satisfactory end result outcomes and the speedy resolution are compared to this, mediation may well take preference. Both adjudication and mediation are applied successfully in the industry with research results recording success rates by the UK and the South African Institution of Civil Engineers at 75% (Finsen, 2005: 223). A study conducted by Verster et al., (2011: accepted for publication) indicates that mediation is a preferred method of ADR in as much as it enjoys more advantages of satisfactory end results above those of adjudication.

Adjudication and mediation compare favourably in many aspects. The advantages offered by mediation offer a more satisfactory end result to that of adjudication.

THE JBCC CONTRACT

With adjudication as a first option of ADR in the JBCC building contract, parties may still submit to either arbitration or mediation according to their contractual agreement. Conciliation or direct negotiations may serve as the initial method to settling a difference within ten days, before it is declared a dispute. This approach took effect after the change to adjudication, adopted from the Latham Report in the UK (Scott, & Markram, 2004:1).

The question raised, is this approach still effective for the changing needs of the industry and why should a system which works be adjusted?

RESEARCH METHODOLOGY

A literature review was conducted to identify the methods relating to ADR as practiced in the South African construction industry and the factors contributing to an effective systematic approach to dispute resolution. A quantitative analysis was conducted on practicing professionals in the form of a self administered questionnaire survey to determine how professionals rate the importance of and their knowledge and experience of the different ADR methods and the JBCC contract. Although negotiation is a method of ADR, it is applied as an unassisted method for which the need for assistance from a practicing professional is not required, hence the exclusion from the questionnaire.

Due to the size of the target population of architects, quantity surveyors and engineers in South Africa, the selection of a sample group for generalisation purposes would far exceed the resource constraints for the paper. The researcher therefore targeted eighty established practicing professionals who are active with the management of projects in the South African Construction industry upon which a 40% response was received. The researcher acknowledges that the sample group is too small to generalize the findings of the research however; the results will be useful in identifying areas for further research. It is important to note that the ADR methods are generic across all disciplines within the Construction industry and as such the respondents were grouped by age rather than by discipline. The responses were grouped as follows: 30 years, 30-40 years and over 40 years. The questionnaires were firstly analysed to determine how respondents perceived the importance of each method and their knowledge and experience in applying these methods. The importance ratings were used to determine the relevance of each method in the systematic approach to dispute resolution. In addition to this, the preferences for the methods were identified in secondary data in support of these findings. The advantages that the different methods enjoy were sourced from literature and the findings of the research on the different methods were analysed and compared.

FINDINGS

Unassisted negotiations or assisted negotiations in the form of conciliation may be applied as the resolution of disputes as required in the JBCC clause 40.2.

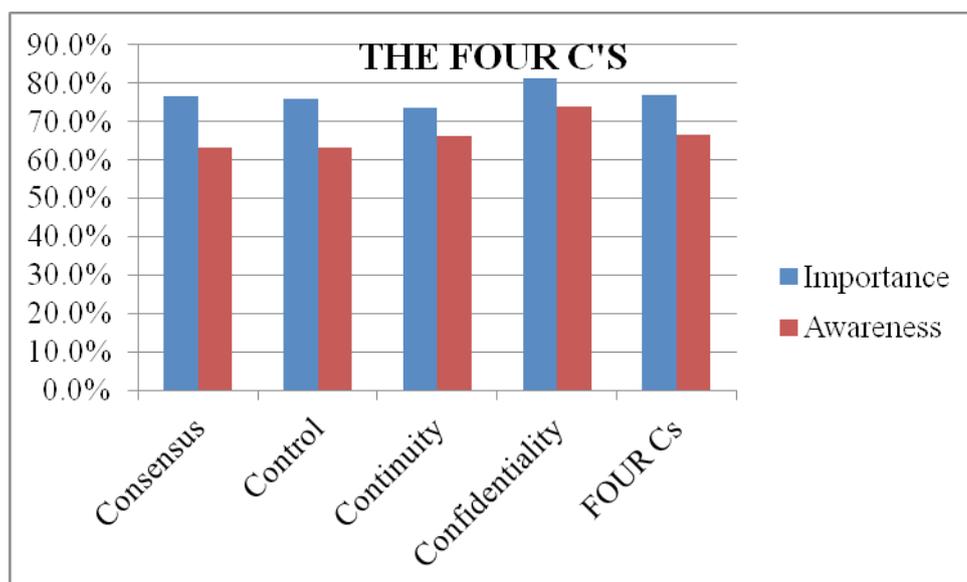


Figure 1: Survey results of practicing professionals' importance and awareness ratings of the advantages of the consensual methods of ADR.

As indicated in Figure 1, respondents are aware of the Four C's and consider them to be important. This is clearly an indication of the importance of satisfactory end results to the ADR process as opposed to the adjudicative approach. Figure 2 illustrates how important respondents view both adjudication and mediation in the construction industry with a minor variance in ratings.

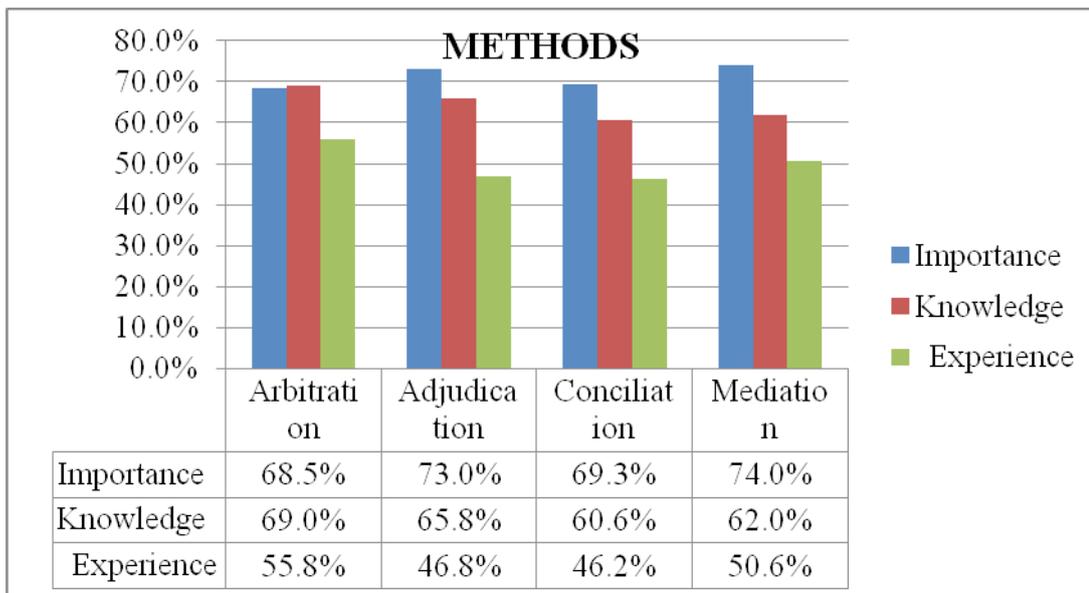


Figure 2: Survey results of practicing professionals' importance, knowledge and experience ratings of the ADR methods. Source: (Du Preez & Verster, 2011: own graph)

Contrary to the importance of adjudication illustrated in the response to the questionnaire, previous research by Verster et al., (2011: submitted for publication) highlights that there are more advantages enjoyed by mediation as opposed to adjudication. Although respondents regard the methods of adjudication and mediation as equally important and reflect similar knowledge and experience levels, the advantages enjoyed by mediation make this the preferred method for effective dispute resolution. Although the variance is small; Figure 3 illustrates the preference of respondents for mediation over adjudication and contrary to this, it is interesting to note that in spite of the trend toward the consensual methods of ADR, Arbitration and Agent resolution remain the preferred methods.

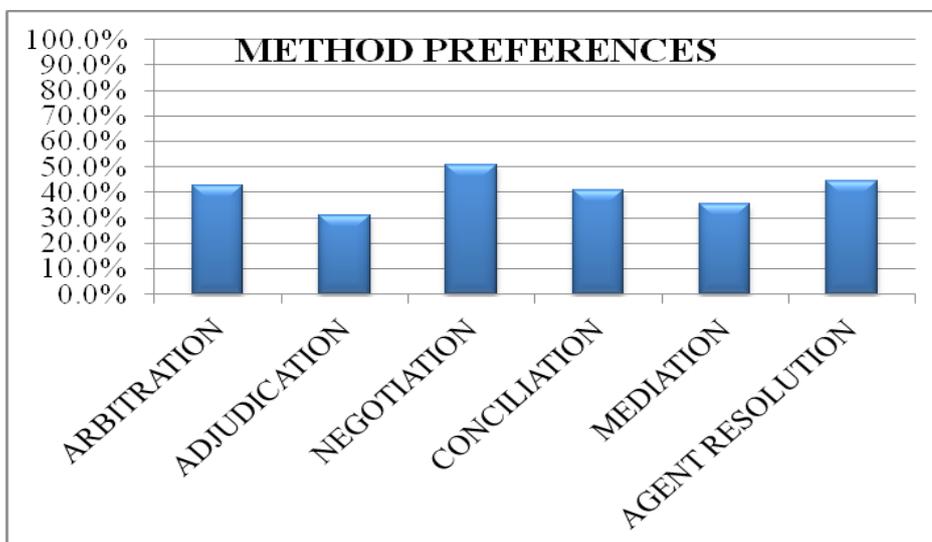


Figure 3: Survey results of practicing professionals method preferences

Arbitration which has become a more costly and lengthy procedure, may be referred to as the backbone of dispute resolution and holds its stance as the support system to dispute resolution in the industry. Although the method was initially rejected for its adversarial qualities, it is used as a last resort as opposed to Government contracts which only use litigation. In spite of the higher knowledge ratings attributed to arbitration as opposed to the other JBCC methods, respondents find adjudication and mediation to be more important.

The knowledge and experience ratings are an indication of the weighting of the methods in current practice. These ratings were used to compare practice to how important respondents perceive the different methods to be. The mediation and adjudication ratings are evenly matched and considered more important than conciliation and arbitration by respondents. The results indicated a

better understanding of the application of arbitration in the industry. This refers back to the suggestion that arbitration remains the backbone of ADR in the Construction industry.

CONCLUSIONS

In view of the above, participants are not in favour of change and are inclined to follow the status quo with an inherent reliance on arbitration. Adjudication and mediation compare favourably in many aspects. The advantages offered by mediation offer a more satisfactory end result to that of adjudication. Unassisted or assisted negotiations fulfil the requirements as stated in the JBCC 2007 clause 40.2.

Practicing professionals considered this approach important and most were competent in the application thereof. Although adjudication is considered important and is a well used method in the JBCC agreements, mediation seems to have more to offer in terms of satisfactory outcomes. If mediation was identified as the primary method of dispute resolution in the JBCC agreement with the provision of submitting to adjudication, more advantages and satisfactory end results may be offered in support of a more effective dispute resolution process.

RECOMMENDATIONS

It is recommended that the JBCC consider including mediation as a primary method of dispute resolution prior to submitting to adjudication, and that adjudication follows mediation as a quasi arbitral function. Institutions should provide opportunities for professionals in the industry to update their knowledge in the form of Continuous Professional Development and that the advantages of mediation as opposed to adjudication be identified and highlighted, placing emphasis on the entitlement of parties to submit to mediation.

The advantages of mediation should be addressed in the curriculums of tertiary institutions as well as the procedural application of mediation in building contracts.

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DISPUTE RESOLUTION METHODS IN THE SOUTH AFRICAN CONSTRUCTION INDUSTRY: WHERE TO FROM NOW?

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The study assessed the dispute resolution methods in the South African construction industry. Arbitration, Adjudication and Mediation are the most used methods in the construction industry. A literature review focused on Arbitration, Adjudication and Mediation in construction industry. Closed ended, open ended questionnaire and interview were done among the senior construction participants who included Architects, Quantity Surveyors, Construction managers, Project managers, attorneys. 70 construction participants completed the questionnaires. The research concluded that for ADR to be effective a proper appointment of Mediators, Arbitrators and Adjudicators with knowledge in construction industry should be applied. The survey compared the current development of ADR in the South African construction Industry with those in United Kingdom, Hong Kong and some African countries. It also only focused on three ADR methods which are Mediation, Arbitration and Adjudication. The literature review focused on the ADR developments and their effectiveness and it only focused on Gauteng Province only in South Africa. The study increases the awareness of available methods and how well can they be applied, it identified the causes of disputes in the construction industry, it also identified whether Arbitration, Adjudication and Mediation are appropriate dispute resolution methods for resolving South African Construction disputes. This study provides a basis for using ADR effectively in the construction industry. The findings are of value for clients, contractors and consultants.

Keywords: Alternative Dispute Resolution, arbitration, adjudication, mediation, construction, South Africa

INTRODUCTION

Alternative Dispute Resolution (ADR) encompasses a range of procedures other than litigation which are designed to resolve conflicts. In the last few decades the use of ADR has become more prevalent within both International and domestic contracts. The main reasons for this are that the costs of litigation are prohibitive and that it takes a long time to settle disputes or come to a ruling hence the parties to disputes and their advisers are now considering alternative methods to resolve disputes. The alternative methods are cheaper, quicker and do not easily lead to a break down in the working relationships of the parties. Alternative dispute resolution techniques fall into two discrete types, those which seek to persuade the parties to settle and those that provide a decision. Where a decision is given then such a decision may have binding effect or may simply be a recommendation that the parties can accept or ignore. Recently a number of hybrid forms of ADR have emerged. For instance there has been a growth in the med-arb; a process which incorporates both mediation and arbitration.

The essence of ADR is to resolve conflict differences or disputes that exist between parties. The ADR process seeks to resolve these differences in two ways. Where ADR process provides the parties with a decision, the process is about establishing rights and obligations. Where the process is facilitative then its purpose is about the acknowledgement and appreciation of differences. The aim for the parties must be to establish the correct process in order to resolve the dispute. Construction disputes are fairly common, although they vary in their nature, size, and complexity (Barth, 1991). A dispute within the construction industry covers a diverse range of issues that deserve to be addressed specifically and in depth. The construction industry is one that comprises a diversity of interests, professions and procedures which interact to create a completed project. All of those involved may share a common goal, but they inevitably have differing and often divergent purposes. The chances or the likelihood of disagreement or disharmony is great in the quest to achieve their goal (Gould, 1999). If unresolved in time, construction disputes become very expensive considering the finances, personnel, time, and opportunity costs. Visibly expensive costs include hiring of attorneys, expert witness and the dispute resolution process itself. The less visible costs (e.g., company resources assigned to the dispute, lost business opportunities) and the intangible costs (such as damage to business relationships, potential value lost due to inefficient dispute resolution) are also considerable, although difficult or impossible to quantify.

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OBJECTIVES OF THE PAPER

The research will be focusing on the current development and application of ADR methods in the South African construction industry. Although, there are many types of dispute resolution under the ADR spectrum that is dispute prevention, negotiation, mediation, a mix of mediation/arbitration or arbitration/mediation, mini trial, early neutral evaluation and arbitration (Fiadjoe, 2004:19). This research will only focus on Arbitration, Adjudication and Mediation due to their practicality in the South African construction industry. It will have the following objectives:

- To investigate the causes of disputes in the South African construction industry
- To investigate whether Arbitration, Adjudication and Mediation are appropriate dispute resolution methods for resolving South African Construction disputes.
- To investigate the appropriate ADR methods for the South African construction industry.

LITERATURE REVIEW

DISPUTE RESOLUTION IN THE CONSTRUCTION INDUSTRY

The construction industry has a long tradition of reliance on a dispute resolution process rather than formal litigation. It is only recently that some attempts have been made to involve dispute resolution practitioners and organisations in the construction industry in the mainstream of dispute resolution development. As a result of these separate developments, arbitration in the construction field reflects a more traditional approach. The highly complex and specialised nature of construction disputes has also contributed to the development of an arbitration practice peculiar to the construction industry. Standard forms of contracts in the construction industry have recently begun to reflect an attempt to modernise and expedite dispute resolution practices. An increasing number of construction contracts unfortunately end in disputes that require the intervention of either the courts or of an arbitrator, mediator or adjudicator to achieve resolution. It is obvious that an attempt to design or select the most appropriate form of dispute resolution for a particular dispute would involve a consideration of the advantages and disadvantages of all forms of dispute resolution including litigation. The field of dispute resolution therefore covers a broad range of mechanisms and processes designed to assist parties in resolving differences creatively and effectively (Finsen, 1993).

Pretorius (1993: 133) refers to three major categories of dispute resolution, which are: dispute resolution processes involving private decision-making by the parties themselves. This category would include negotiation and mediation. Dispute resolution processes involving private adjudication by third parties. Arbitration would fall into this category. Dispute resolution processes involving adjudication by public authority. This category would include administrative decision-making and formal litigation before the courts. Negotiation, mediation, arbitration and litigation may be regarded as the primary methods of dispute resolution.

THE INCREASED INCIDENCE OF DISPUTE

A growing number of building contracts end in disputes that require the intervention either of the court or of an arbitrator, mediator or adjudication to achieve resolution. There are various reasons for this. The scale of building projects has increased enormously in recent years, and their design and construction have grown in complexity. Such projects require an ever-increasing number of specialist subcontractors, and the growing variety of sophisticated mechanical and electrical installation and services require careful co-ordination and integration. The increase rates and cost escalation over the past few decades has made employers acutely aware of the importance of keeping construction time as short as possible, during which capital earns no returns. The pressure has been put on the construction industry to build more and more in less and less time. The first-track contract has become the norm. Circumstances often mitigate against the achievement of such tight construction programmes and under such pressure, mistakes, both by the contractor and the employer's agents are inevitable. The construction industry has experienced a chronic shortage of work in the past 15 years or more, during which time contractors have had to reduce their prices to the bare minimum to secure contracts, leaving no margin for losses. Contractors seeking ways to recoup such losses have formulated claims for compensation for damage allegedly due to unreasonable decisions by the employer's agent, or other real or imaginary breaches of explicit or implied term of the contract (Finsen, 2005).

CAUSES OF DISPUTES IN CONSTRUCTION PROJECTS

There is a great deal in the literature, as to the causes of conflict and disputes. Some writers refer to "causes" of conflict, others "sources" "reasons", or "triggers".

The following are identified by Botha (2000) as causes of disagreements:

- Misunderstandings usually occur because of poor communication.
- Values differ between people, professionals and skills,
- People often have unrealistic expectations. The client wants speedy completion and a quality building at a low price. The contractor may want more time, a more reasonable quality and maximum price.
- Emotions play a role, the ability to handle stress causes dispute. A person's self esteem (or lack of it) can cause also dispute. Factors under this heading include languages, dynamics, geography, childhood experiences, upbringing and religion.
- Education levels, both structured and unstructured learning can have an influence on conflict.
- Many things are different between projects. There are different teams, different financiers and designers.
- Not all people are equally skilled to visualize two-dimensional drawings in a three dimensional way.
- Changes to plans, deadlines, payment dates, and so on, can cause disputes.
- It does not matter whom or what one must blame for a delay. It could be the weather, a subcontractor, the bank or whoever. The mere fact that there is a delay could cause disputes.
- Parties often inadequately define quality. High quality may mean different things to a plasterer and to the project director or project manager. One must use objective standards to define materials and workmanship. One must precisely describe what one requires. A client may specify a much higher standard than what he really wants while wanting a lower price.
- A sub-contractor may misunderstand the actual requirements and may quote a lower price than other contractors may, then when he realizes his mistake, dispute results.

RESEARCH METHODOLOGY

To assess the dispute resolution methods in the South African construction industry, the following specific methodology of this study based on literature review and a questionnaire survey was employed to ensure a robust methodological design (Edwards and Holt, 2010).

SAMPLE TECHNIQUE

100 questionnaires were sent to the construction participants, and a total of 70 respondents including Construction consultants, Contractors and Clients in the Gauteng province were interviewed. The Province has population of so much Consultants and so.... etc Contractors, the researchers believe that they are representative of population of interest. Again, the researchers assumed that professional registered senior managers are the most likely to be involved in Construction disputes since they handle more complex projects involving many parties. By selecting respondents from different profiles, this gave an opportunity to the researcher to assess different types of disputes which ranged from financial, extension of times quality etc. Stoker (1985) cited by Strydom and De Vos, (1998, p. 192) suggested that for a population size of 30, at least 24 (80%) ought to be the sample size. Nevertheless, the questionnaire was sent to some of the respondents and interviews were also conducted. This was as a result of low rate response to the questionnaires, hence the researcher had to use interviews which is easy and quicker way of collecting data.

QUESTIONNAIRE DESIGN

Questionnaire was designed to determine the effectiveness, causes and the application of dispute resolution methods in the construction industry. The questionnaire was divided into two main parts. Part A related to general information for the respondents. Respondents were asked about their registration with profession bodies if any, their number of experience, age and the involvement in construction disputes. Part B, included questions related to the potential causes of disputes, cost and time effectiveness of disputes, relationships between disputing parties, methods being used in resolving construction disputes, processes followed when declaring the dispute and the impacts of disputes. This was done through qualitative method.

RESEARCH FINDINGS AND RESULTS

QUANTITATIVE DATA ANALYSIS AND PRESENTATION

Interviewee's gender

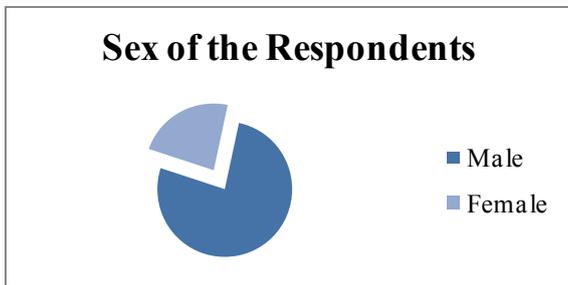


Figure 1: Interviewee's gender

The majority of the respondents in the survey were men representing 76% while 23% were women as shown in Figure 1. Even though the sample was randomly selected, it appears that there was a predominance of men.

Interviewee's Profession's registration

Figure 2 represents the respondent's profession registration, a total of 70 respondents. These respondents include 5 member of Association of Arbitrators, 7 members from South African council for the Quantity Surveyors, 10 members from Master Builders Association, 9 members from Council for Project and Construction Management, 5 non registered respondents, 8 members from Association of South African Quantity Surveyors, 14 members of a combination of different profession bodies which in Association of South African Quantity Surveyors, Association of Arbitrators, and South African council for the Quantity Surveyors, 2 members of Royal Institution of Chartered Surveyors, 6 members of a combination of organisations such as South African council for the Quantity Surveyors and Royal institute of Chartered Surveyors and 4 members from Law Society of South Africa. According to the results it appears Quantity Surveyors are more involved in dispute resolution followed by contractors from master builders association and contracts managers from project and construction management council.

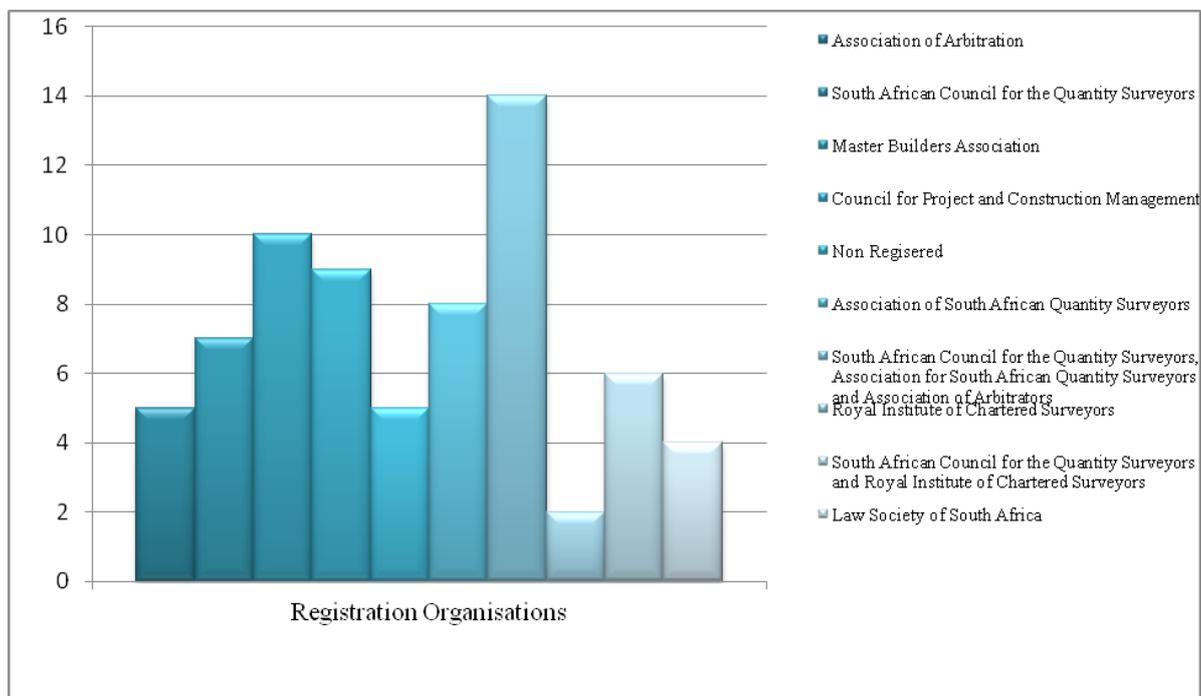


Figure 2: Interviewee's registrations with different organisations.

Interviewee's years of experience in the construction industry

Table 1: Number of years of experience by the Respondents

0 – 5		6 – 10		11 – 15		16 – 20		21 – 25	
No	%	No	%	No	%	No	%	No	%
		31	42	30	41	5	7	7	10

Table 1 above represents the respondents number of experience in terms of years, the majority of the respondents are of between 6 to 10 years experience representing a 42%, followed by those between 11 to 15 years experience representing a 41%, 21 to 25 years experience represent 7 respondents which represents a 10% and lastly those between 16 to 20 years representing 7%.

Interviewee's age distribution

The aim of this was know the age range of the construction participants involved in ADR. The responses obtained are represented below:

Table 2: Interviewee's age distribution

20 –25		26 – 35		36 – 45		46 – 55		56 – 65		Other	
No	%	No	%	No	%	No	%	No	%	No	%
		28	38	31	42	7	10	5	7	2	3

The survey result in Table 2 further shows that 42% of the respondents were of age between 36 to 45, 38% were of the age between 26 to 35, 10% were of age between 46 to 55, 7% of the respondents were of the age 56 to 65 and other were only 3%.

Involvement in construction disputes

Involved in construction dispute



Figure 3: illustrate the respondent's involvement in ADR.

Findings revealed in figure 3 that 80.2% of the respondents were involved in the construction disputes, while 10.8% were not involved in disputes.

QUALITATIVE ANALYSIS

Response to causes of Disputes

The majority of the respondents were of the opinion that nonpayment is a major problem, for instance one respondent identified a situation where a Contractor orders materials in bulk from suppliers hoping to get the job done in time only to be disappointed by the Client on payments. They also highlighted the issue of extension of time as the major problem in many construction projects; this is a result of re-works or delays by the contractor. They cited that contractors may cut corners in order to complete the work, for instance placing concrete without testing the cubes hence when the engineer request the test result, the concrete fails which usually result in re-works. On the other hand the problem in detailed drawings and updated drawings also causes the contractor to apply for extension of time, the project team sometimes takes a lot of time to give the updated information to the contractor which results in applying for extension of time in which in turn is denied by the team leader.

Poor communication between the project team in terms of information dissemination can also lead to disputes. This will affect the project time frame hence extension of time, where changes have been made on site and the Architect or Engineer takes time to issue revised drawings; this affects the time frame of completion which will end up on application of extension of time which the project manager might refuse to grant. Variation is also one of the major issues contributing to disputes in the construction industry. Many variations are issued before agreeing on the cost and as a result when the contractor claims for the work done on variation

the quantity surveyor or the project manager might not approve the cost. Frequently changes on the scope of works on the project by the project team or the client while the project is at the final stages. This leads to extra cost and time which many clients are not willing to be responsible. Late completion was also noted as one of the major challenges contributing to disputes in the construction industry. The respondent cited that many contractors have a tendency of completing the projects late as a result of mismanagement of funds, poor work quality results in re-work of some of the trades. On the other hand clients are also contributing to disputes through non- payments to the contractors, this is as a result of poor planning, failure to do proper budgeting on the project. This challenge will mostly lead to interest claims by the contractors which the clients are resistant to pay. This also sometimes contributes to poor workmanship and conflicts between the contractors and suppliers and sub-contractors.

Professional teams also are facing challenges of under budget or under estimating the project. Once the information has been passed to the client it will affect the appointment of the contractor. Many project estimates are prepared based on incomplete designs, this results in minimal information, provisional, a lot of assumptions used on the project estimate. Sometimes the project goes on tender with provisional drawings which results on more variations hence increase in costs on the project. Disagreements on final accounts, many of the contractors tender on a low price tender in order to win the projects. This affects their cash flow during the project and they end up claiming more on the final accounts to make profits.

Verbal instruction by the professional team on a project without consulting other team members on the cost implications may also result in disputes. This is a result of not seeking for funds from the client before implementing the changes. This usually happens during the final account when the contract value has increased. Tender price, the industry has slowed down in terms of volume of work hence competition is high. Contractors are tendering on low prices in order to win the project while excluding the works, they get stuck and abandon the works which leads to disputes.

Response to the method used to resolve dispute

The majority of the respondents were of the opinion that the Contract signed by the parties will determine the methods to be used on resolving disputes, citing that the NEC contract with clause for adjudication, and the JBCC contract with an arbitration clause included. But most of the respondents also highlighted mediation as the most popular method to be used as a result of its simplicity

Response to the process followed to resolve the dispute

Parties will generally agree on the process, in most cases the parties will agree prior to the commencement of the project as to who will mediate, adjudicate, and arbitrate the dispute if it occurs on the project. Unlike where the contract is not clear, the respondent said then the dispute goes to court for litigation, this is a major problem when the contract agreement did not include a dispute resolution clause.

Response to the relationship between the parties after the out comes

The majority of the respondents responded that most of the relationships will be poor when there is a dispute. They noted that parties will have lost time and money on the project, paying attorneys to represent them while others argue that the relationship will depend on the method being used. The relationship is cordial if mediation or adjudication is being used. While arbitration, the losing party pays all the cost of arbitration process hence poor relationship.

Response to how cost effectiveness are the methods to be used

In terms of cost effectiveness, the majority of the respondents said that the cost will depend on the method being used, citing that mediation is the cheapest and very effective method to be used followed by adjudication which has much cost than mediation but very effective. Unlike arbitration which can only depend on the representatives being represented, but mostly it is expensive and not effective.

Response to the impacts of disputes

The majority of the respondents were of the opinion that disputes have a very significant impact between the parties. They cited that it leads to the delays of the progress of the project. It is expensive to both parties and affects the relationship of the parties. Sometimes there is a possibility of the parties not to work together on the future projects, lack of trust between the parties, it is expensive to the losing parties, it also prolongs the duration of the project, increase in cost if the project is not completed and slows the progress of the works, loss of jobs to the construction participants, money is spent on re-works if the project is abandoned by the contractor, it also affects the cash flow of the project and focus of the project since parties will be much concerned about the dispute that the project and this results in poor quality of the works and poor workmanship.

Response to the causes of disputes in the construction industry

The majority of the respondents noted that the following are the major causes of the disputes:

- Clients failure or refusal to settle any claims brought on by the Contractor
- Use of improperly or poorly drafted contracts
- Extension of time claims
- Variations
- Late completion
- Poor workmanship by the Contractor and/or Consultancy team
- Poor communication
- Use of incomplete designs during tender
- Under pricing of the tender
- Mismanagement of funds by Contractors
- Poor planning by both professional team and Contractor
- Under budget or estimate
- Poor record keeping
- Final accounts disagreements

Response to how disputes are resolved in the South African construction industry

The majority of the respondents said that disputes are resolved depending on the contract being used, but mostly many contracts include the arbitration clause in their contracts. Apart from that they also noted that minor contracts have been applying mediation as a method of resolving the disputes. Some argue that some clients will rush to sue the contractors to court in which the court will refer to the contract and use the clause which is in the contract. Mediation is the preferred method being used since it allows the disputing parties to make a decision on their own with the guidance from the mediator. They also noted that adjudication is becoming popular in the major construction projects

Response to any recommended method to resolve disputes in the construction industry

The majority of the respondents recommend mediation as the best way of resolving disputes as a result of cost effectiveness and time. They cited that the method is cheap and does not take time for the parties to come to an agreement. On major projects, the respondents recommend adjudication as a method to be used, since the adjudicators are involved throughout the project and they hand a fully understanding of the project.

Responses to how effective are alternative dispute resolution methods in the South African construction industry

The majority of the respondents felt that the effectiveness of the methods will depend on the method being used giving an example of mediation as being the most effective method since it gives an opportunity to the disputants to agree on the final outcome, and also that in terms of cost it is the cheapest way of resolving the disputes. They also noted that adjudication is also effective in its practicality, i.e. it uses construction professionally with technical understanding and resolves disputes while the project is ongoing. According to the respondents they felt that arbitration is no longer effective especially when the attorneys are involved, citing that they prolong the process as in litigation hence it is expensive and analogous.

Response on how to improve the available methods

The majority of the respondents felt that construction disputes are more of technical nature, hence need to be resolved with the professionals with an understanding of the technicalities. They were of the opinion of encouraging the construction participants to use construction professionals when resolving disputes than the attorneys. Apart from being a technical problem, they also highlighted the problem with involving attorneys without construction knowledge as being a problem. By eliminating or using lawyers with construction specialize will help to improve the process. While others argue that there is no need to improve the available methods, but the focus should be on the conflict management. According to the respondents, managing the conflicts on projects will prevent or minimize the number of disputes in the industry. They were also of the opinion that there is need for public awareness of the available methods citing that little has been done to the public to let them know of the available methods. They also felt that the construction participants should be encouraged to use the adjudication process as the first method to resolve disputes since the method appoints the adjudicators prior the commencement of the project hence they have an understanding of the whole project and that it also makes the adjudicators attends the project meetings and resolves the disputes while the construction is going on. They also noted that the clause in the contract does not specify when to declare the disputes. By declaring the disputes early will help and will not affect the project i.e. disputes should be declared early and not at the end of the project. On the other hand the clause does not specify the duration of resolving the dispute i.e. there is need to define the duration of resolving disputes citing that some disputes take a year before an award is given hence the method does not serve its purpose.

CONCLUSION AND RECOMMENDATION

The objectives of the study were to evaluate the dispute resolution methods in the South African construction industry these include; To investigate the causes of dispute in the South African construction industry; To investigate whether Arbitration, Adjudication and Mediation are appropriate dispute resolution methods for resolving South African Construction disputes; To investigate the appropriate ADR methods for the South African construction industry.

As per respondent's response and the literature review the causes of disputes have been highlighted as non payments by Client and also by sub-contractors, the issue of extension of time, lack of detailed drawings during tender, poor communication, variations, frequently changes of scope of works and late completion.

On whether Arbitration, mediation and Adjudication were the appropriate methods to be used the respondents preferred Mediation and Adjudication as the appropriate methods to be used in the construction industry, this was as a result of the advantages the methods have and the applications of the methods. The majority of the respondents responded that mediation is the appropriate method to be used since it is cheap, quick and the parties make their own decision to the dispute. They also highlighted that the method does not ruin the parties relationship and it has a potential for the parties to continue working together on future project.

The following conclusions can be drawn from the research: ADR is to a certain extent, effectively used in contracts in the construction industry, Mediation is the mostly used in resolving disputes in construction industry, The majority of construction participants have a moderate knowledge of ADR methods and experiences the methods not to be flexible and somewhat complex to a certain extent. Apart from the Mediation, Adjudication and Arbitration, other forms of ADR are also used in the construction industry, such as the negotiation, med-arb, and reconciliation. The majority of respondents would prefer the inclusion of the adjudication as the priority in resolving dispute before arbitration.

The analysed results suggested that although ADR is effective and acceptable in general, the following were to be considered to some extent to eliminate any problems that may exist. Clients must pay particular attention to the Progress payments must be paid to contractors as and when they are due. It means that sufficient financial arrangements must be made before construction projects are initiated. Additionally, the long bureaucratic processes involved in honouring payments of contractor's claim must be curtailed to conform strictly to the provisions of the contract; The resources and capabilities of contractors must be thoroughly investigated prior to awarding of contract to the lowest bidder or any bidder. A comprehensive and thorough brief to the design team is necessary to enable it prepare detailed contract documents that leave no doubt in the minds of the contractor regarding what must be constructed. This is a key to avoiding design errors and omissions and the consequent variations on site; All members of the design team must be employed at the onset and must be involved in the evolution and production of working drawings. There must be proper coordination of design process.

Generally, effective communication between the parties before and during the construction of the project must be a priority. Issues concerning design, payment and compensation, variations in scope of works and others must be communicated efficiently and in a timely manner by the originator to the recipient. Effective communication must be supported by good record keeping by all parties. Before work begins, the parties should foresee possible future problems establish procedures to organise and retain complete and accurate records concerning the progress of work. Taking photographs of the works as it progresses, carefully documenting all discussions particularly on site project meetings and recording all instructions received and actions taken on those instructions are absolutely valuable.

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CULTURAL ASPECTS OF CLAIMS MANAGEMENT IN INTERNATIONAL CONSTRUCTION JOINT VENTURES

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Joint ventures, a special type of strategic alliances, have been enjoying increasing popularity in global competition. Employees of international joint ventures may come from different countries and thus hold diverse values. It is therefore important to address cultural differences in the context of international construction joint ventures (ICJVs). During the implementation of international construction projects, there will always be many kinds of claims arousal from all contractual parties. In this context, claims management has become more and more important and imminent in the international construction contract environment. This paper aims to focus on cultural differences in explaining how claims management situation affects international construction companies. Besides, it explores to answer additional supportive questions like; what causes the claims and what are the claim conditions applied and what are their interpretation and related resolution. A questionnaire survey was designed to achieve this objective. It included questions regarding causes of claims, factors affecting claim management, and self-construal statements of Marcus & Kitiyama (1991). On the basis of the findings, this paper corroborates the argument that the dominant cultural values and/or perceptions of the society are not very much influential on individuals' perceptions, and may differ from the same values of the society.

Keywords: claims, claims management, culture, dispute avoidance, joint-ventures, international construction joint-ventures, organizational culture

INTRODUCTION

Internationalization of construction firms, by exceeding the national boundaries and having operations in other countries, increases the need of forming partnerships with construction firms from other nations. Sometimes this need becomes essential. Joint venturing is not only the best partnership model meeting the dynamic requirements of the project based construction industry but also the most preferred type of business making. Even though the purpose is to strengthen the capacity, still some conflicts may occur within time owing to the different nationalities and business cultures of the partnering companies. Many of these conflicts are usually resolved in short time without issues whereas some cases bring along a claim situation due to lack of common understanding of the partners.

As the claims management is closely related to the way and attitude they are dealt, the method of handling potential claim cases therefore is the most important phase in the whole process.

In a wider scale, socio-cultural elements and the dominant business culture of the society can be listed as factors affecting differences in perceptions of events ending up in claims. Inner dynamics, group culture and business culture of a firm can be listed as mid-scale factors. Educational backgrounds, level of individualism and the professional backgrounds of the professionals involved in the decision making processes can be listed as narrow scale factors, in other words individual factors.

This study basically examines the impact of culture on claims management and it is basically focused on the claims among partners of international joint venture projects, which is a very specific field of research. The main purpose of the study is to investigate the relationship between the cultural perceptions of decision makers who are involved in claim processes and claims management mechanisms among partners of international joint ventures in construction industry. As an expansion to the main purpose of the study, some specific purposes can be listed as follows:

- Review and examine the current views about claim management in international joint ventures,
- Classify the causes of claims by their levels of importance,
- Analyse the general approaches in claim management by level of agreement,
- Determine the relationship between culture and claim among partners of international joint ventures.

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In this context, the events that may cause claim cases and the mechanisms of claim management are identified and the results are examined on the basis of cultural elements.

LITERATURE REVIEW

In the literature, studies regarding claims management are mostly based on the cases among employees and contractors, “claims among partners” has not been a quite popular subject. Likewise, the main research areas such as reasons of claims, avoiding of claims and precautions for disputes are limited with the contractual issues. Again the relationship between culture and claims management has not been a subject of interest. Hence the research subject, impact of culture on claim management among partners of ICJVs, was a quite narrow field, it was handled with its 3 aspects separately; claims management, international joint ventures and culture. In this context, the intersections of these subjects were sought during the literature review.

In handling the topic “culture”, the early opinion was to use the Hofstede’s Individualism Value (IDV) which takes the individualism level as a key factor in measuring the culture. The main intention for using IDV was to distinguish the differences in perceptions of the professionals who were involved in claims management, on the bases of individualism and collectivism. However the intention of using Hofstede’s IDV as a measuring tool lost its adequacy, as the results of the survey led to an unbalanced sampling of collectivist respondents and individualist respondents.

In addition to this, some researchers mentioned about their doubts in adequacy of Hofstede’s IDV. According to Gudykunst and Lee (2003), individualism degree of the survey sample and society’s general IDV characteristics may not fit each other and in order not to face with this possibility; cultural dimension should be measured on individual basis. Also Wasti and Erdil (2007) mentioned that, a prediction that a unity of the cultural tendency of each member of the same society shall be defective, especially in countries with high development acceleration.

Under the light of these, Self-Construal Model was chosen as the measuring tool of the respondents’ perceptions. In Self-Construal Model, there are two types of perceptions; interdependency and independency. People who have interdependent perceptions relate themselves with other and people who have independent perceptions district themselves from others (Kapoor et al., 2003). According to Markus and Kitayama (1991), achievements of personal goals and fulfilment of individual necessities define the behaviour and attitudes of people having independent perceptions. Conversely, the state of belonging to a community and responsibilities toward each other come before achievements of personal goals for the people having interdependent perceptions (Wasti and Erdil, 2007).

Cultural values and the perceptions of the professionals, who are involved in the claims management processes in ICJV projects, shall have a strong and undeniable influence on taking of actions. In relation to this, perceptions of interdependent professionals and independent professionals shall vary from each other.

RESEARCH METHODOLOGY

QUESTIONNAIRE SURVEY

In order to better understand the relationship and determine the correlation, if any, between culture and main dynamics of claims management in ICJV projects, a survey was conducted.

One of the primary purposes of the survey was gathering sufficient data for determination and analysing of the basic approaches adopted by the construction professionals during claims management among partners in ICJV projects. Another primary purpose was to identify the personal attitudes of the construction professionals who were involved in these processes, whether they were independent or interdependent.

As the study is constructed on the basis of the assumption that culture had a significant effect on the attitudes of the construction professionals in the area of claims management, these processes would be most probably affected by the perceptions of these professionals. Starting from this assumption as the reference point of the survey, through the questions requested from the participants to respond, their individual ideas, usual managerial approaches and priorities are measured. To accomplish this aim successfully, the

respondents are asked to consider only their professional life and experiences as a whole, regardless the companies' business cultures and managerial approaches.

To achieve the abovementioned research objectives, the research methodology was based on a questionnaire survey and it was designed in both Turkish and English and composed of 6 sections:

- Section 1: An ethic letter giving a brief explanation to the participants about the questionnaire,
- Section 2: Demographical questions (age, gender, nationality, profession etc.),
- Section 3: Determination of levels of importance given to the listed 18 potential causes of claim,
- Section 4: Determination of claim occurrence frequencies for the classified project types, determination of claim management mechanisms by measuring the level of agreement to the given 7 statements and the frequencies of the given 4 probable precautions to be taken in a case of potential dispute,
- Section 5: Identification of the participants' self-construal profile as "independent" or "interdependent" by 29 statements generated from Markus & Kitayama's (1991) self-construal scale,
- Section 6: An appendix with definitions of the terminological terms used in the questionnaire.

A 5-point Likert scale was selected as a measuring tool for determining the frequencies, importance and level of agreement to the given statements and choices. Section four had a key role in the questionnaire for determining the main mechanisms of claims management processes by measuring the participants' level of agreement to the given statements and some probable precautions for a dispute case. Likewise section six also had a key role in the questionnaire for identifying the participants' perceptions in terms of culture. A pilot study was conducted subsequent to design of the questionnaire. It was sent to three academicians, one economist and one civil engineer via e-mail. The main purposes of conducting a pilot study were to determine and minimize the possible misunderstandings and confusions about the questions and terminological terms used in the questionnaire and to estimate the duration of filling the questionnaire.

SAMPLING

The type of acquiring the sample was "non-random". As the research was constructed on ICJV projects, the survey sample was formed by selection of the professionals like engineers, architects, contractors, economists and lawyers who had ICJV project experience in their professional life regardless of their organizations' field of activity. The questionnaire was sent to 191 construction industry professionals and 43 of them filled it, which corresponds to a response rate of 22.51 %. Personal information of the respondents' are kept confidential and the anonymity of the survey is maintained during all the phases of the research.

DATA EVALUATION METHODS

Statistical Package for the Social Sciences software (SPSS 16.0) was used to analyse the collected raw data. As SPSS required numerical values for raw data input, a coding list was prepared for assigning numerical values to the answered questions. In section five, the 29 statements of Markus and Kitayama's (1996) self-construal scale were categorized into two groups: independency and interdependency. 14 statements like "My personal identity is very important to me" were categorized under independency and used to measure the respondents' independency score. On the other hand 15 statements like "I respect decisions made by my group" were categorized under interdependency and used to measure the respondents' interdependency score.

As analysis methods, descriptive statistics and correlation analysis were chosen. Descriptive statistics were used for section one to display the demographical characteristics of the survey sample. For determining the relationship between variables correlation analyses were conducted.

DATA ANALYSIS

DESCRIPTIVE ANALYSIS

The questionnaire sample is consisted of 41 respondents who are working as construction industry professionals and had ICJV project experience in their professional life. The demographical characteristics of the questionnaire sample included gender, profession, nationality, tenure, educational background and tenure. Age values of respondents' are categorized into 4 groups: 25-34 years, 35-44 years, 45-54 years, 55 years and over. Percentages of these age intervals are 23.26%, 25.58%, 18.60% and 32.56% respectively. The most frequent age interval is "55 years and over". In gender categorization, male respondents with the rate of 83.72% formed the majority and female respondents formed 16.28% of the sample. Nationality profiles of the respondents' are consisted of Turks, Americans, Italian, British, Indian, Chinese, Japanese and Venezuelan. The majority is formed by Turkish construction professionals with the rate of 69.77%, followed by American construction professionals with 11.63%.

In the classification of professions of the respondents, 53.49% of the sample is formed by engineers and followed by architects with 39.53% and 6.98% of the sample is formed by economists and consultants.

In educational background demographics, the respondents having a graduate degree formed the 48.84% of the sample, followed by the respondents having an undergraduate degree and the respondents having a bachelor degree with the rates of 27.91% and 13.95% respectively. Respondents having a post-graduate degree form 9.30% of the sample. On the light of these findings, it can easily be said that educational background of the respondents' is relatively high. In tenure classification, 32.56% of the respondents had at least 30 years of professional experience. 16.28% had a professional experience of 20 to 29 years. 32.56% had professional experience of 10 to 19 years and 18.60% had maximum 9 years of professional experience.

As classifying the causes of claims by their levels of importance and analysing the statements regarding claims management by their level of agreement and dispute precautions by their frequencies were the main objectives of the study, mean values of the causes, statements and precautions were calculated on the basis of 5-point Likert scale, where "5" represented the most important, the most frequent and strongest agreement and "1" represented the least important, the least frequent and strongest disagreement. Mean values of the causes, statements and precautions are presented in Table 1.

According to the respondents, "poor administration / management" the most important causes of claim with a mean of 4.21. "Design or engineering errors" and "violation of contract terms" are the second and third most important causes of claim, with means of 4.19 and 4.14, respectively. Followed by the causes "variations", "unclear and/or defective contract terms", "partner's financial problems" and "poor definition of scope of work" by means of 4.09, 4.07, 4.05 and 4.05 respectively.

Table 1: Descriptive statistics

	N	Mean	Std. Deviation
Causes			
Variations	43	4.09	1.130
Extension of Time	43	3.93	1.142
Poor Quality and/or Defective Work	43	3.91	0.947
Poor Definition of Scope of Work	43	4.05	1.022
Poor Administration / Management	43	4.21	0.965
Deficiency in Sharing of Information	43	3.84	0.898
Unclear and/or Defective Contract Terms	43	4.07	1.009
Difference in Ways of Doing Things	43	3.40	1.027
Adversarial Approach in Handling Disputes	43	3.40	1.014
Lack of Team Spirit	43	3.58	1.220
Lack of Knowledge of Legal Systems	43	3.37	1.215
Unfamiliarity with Local Conditions	43	3.58	1.052
Jurisdictional Problems	43	3.42	0.982
Partner's Financial Problems	43	4.05	1.090
Planning and Scheduling Errors	43	3.79	0.888
Design or Engineering Errors	43	4.19	0.906
Under Insurance of One Partner	43	2.88	0.931
Violation of Contract Terms	43	4.14	1.125
Other	5	4.00	0.707
Statements			
Claims should be submitted only for the cases that have high possibility of acceptance.	43	3.23	1.461
Claims should be submitted unless they harm the relations or lead to a dispute with the opposing party.	43	2.81	1.332
Claims should be submitted only if the claimed amount is considerably high.	43	2.33	1.107
In submission of claims the business culture of the opposing party should be considered.	43	3.49	1.162
Claims should be submitted at the hand-over process of the projects if it is contractually possible.	43	2.86	1.373
In a possibility of a counter-claim, the claim should not be submitted.	43	2.21	1.036
Claims should be submitted in any available case.	43	3.33	1.340
Precautions			
Waive the claim	43	2.60	1.137
Evaluation of the direct costs only	43	3.35	1.044
Reduction by a particular percentage	43	3.63	1.070
No precautions	42	2.17	1.267
Other	1	3.00	-

For the given 7 statements, most widely-accepted one by the respondents was “in submission of claims the business culture of the opposing party should be considered” with a mean of 3.49. Followed by the statements “claims should be submitted in any available case” and “claims should be submitted only for the cases that have high possibility of acceptance” with the means of 3.33 and 3.23 respectively.

For the given 4 precautions, the most frequently taken precaution in a potential dispute case, according to the respondents, was reducing the claimed amount by a particular percentage with a mean of 3.63. Second most frequent precaution was evaluating the direct costs only in the claim package with a mean of 3.35.

INFERENCE ANALYSIS

Subsequent to descriptive analyses, various correlations analyses were conducted. Correlations were tested with Pearson coefficients on two-tailed 0.05 significance levels for each analysis (see Table 2). To determine the impact of culture on claim management, Hofstede’s IDV scale was used as well as Markus & Kitayama’s self-construal scale. Firstly, a correlation analysis is conducted between the variables causes of claim and Hofstede’s individualism/collectivism level (IDV). Subsequently, separate correlation analyses are conducted between IDV and given 7 statements regarding claim management and precautions.

Table 2: Correlation analyses for IDV with the Pearson correlation coefficient

Causes	IDV
Variations	-0,060
Extension of Time	-0,320
Poor Quality and/or Defective Work	0.316*
Poor Definition of Scope of Work	0.137
Poor Administration / Management	-0.067
Deficiency in Sharing of Information	0.292
Unclear and/or Defective Contract Terms	0.151
Difference in Ways of Doing Things	0.088
Adversarial Approach in Handling Disputes	0.075
Lack of Team Spirit	0.343*
Lack of Knowledge of Legal Systems	0.302*
Unfamiliarity with Local Conditions	0.178
Jurisdictional Problems	0.458**
Partner’s Financial Problems	0.606**
Planning and Scheduling Errors	0.398**
Design or Engineering Errors	0.234
Under Insurance of One Partner	0.370*
Violation of Contract Terms	0.527**
Other	0.645
Statements	IDV
Claims should be submitted only for the cases that have high possibility of acceptance.	0.202
Claims should be submitted unless they harm the relations or lead to a dispute with the opposing party.	0.101
Claims should be submitted only if the claimed amount is considerably high.	-0.108
In submission of claims the business culture of the opposing party should be considered	-0.030
Claims should be submitted at the hand-over process of the projects if it is contractually possible.	0.031
In a possibility of a counter-claim, the claim should not be submitted.	-0.18
Claims should be submitted in any available case.	0.213
Precautions	IDV
Waive the claim	-0.181
Evaluation of the direct costs only	-0.214
Reduction by a particular percentage	-0.073
No precautions	-0.209

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The main intention of these analyses was to determine the relationship between causes of claim, statements regarding claim management and precautions and cultural perceptions on nationality basis where, as coding, “0” was used to represent the individualist respondents and “1” was used to represent the collectivist respondents. Another set of correlation analyses are conducted between causes of claim, statements and precautions and “self-construal” scale of Markus & Kitayama’s, separately. The results are presented in Table 3.

Considering the correlations between causes of claim and self-construal scale, it can be stated that the professionals having high independency levels do not feel comfortable with unclear and unfamiliar conditions and poor information. According to the analyses results, it can be deduced that abovementioned conditions can be a cause of claim according to them.

Considering the correlations between statements and self-construal scale it can be stated that professionals having high interdependency levels do take the opposing party’s business culture into consideration when submitting their claims. Contrary to this inference, professionals having high independency levels do take the possibility of acceptance of the claim into consideration regardless the business culture of the opposing party.

For the correlation analysis conducted between precautions and self-construal scale, it can be deduced that professionals having high independency levels do not prefer to take any precaution even the claim process contains a high possibility of turning into a dispute case.

Subsequent to the correlation analyses, the results of IDV and self-construal values obtained from the correlation analysis are compared. As a result of this comparison, it is found that IDV and self-construal values are not consistent.

To be more specific, in individualist countries it is expected that people tend to be independent, and likewise in interdependent countries it is expected that people tend to be collectivist. However according to the result of this comparison and the inconsistency between IDV and self-construal values it can be said that the dominant cultural values and/or perceptions of the society are not very much influential on individuals’ perceptions.

Table 3: Correlation analyses for self – construal scale with the Pearson correlation coefficient

Causes	Interdependency	Independency
Variations	0.233	0.067
Extension of Time	0.019	-0.046
Poor Quality and/or Defective Work	-0.022	0.014
Poor Definition of Scope of Work	0.148	-0.292
Poor Administration / Management	-0.173	0.148
Deficiency in Sharing of Information	0.014	0.100
Unclear and/or Defective Contract Terms	-0,021	0.312*
Difference in Ways of Doing Things	0.052	-0.029
Adversarial Approach in Handling Disputes	-0.184	-0.227
Lack of Team Spirit	0.130	-0.283
Lack of Knowledge of Legal Systems	-0.095	0.303*
Unfamiliarity with Local Conditions	0.072	0.356*
Jurisdictional Problems	0.142	0.155
Partner’s Financial Problems	0.260	0.146
Planning and Scheduling Errors	-0.027	-0.090
Design or Engineering Errors	0.138	-0.252
Under Insurance of One Partner	0.108	0.093
Violation of Contract Terms	0.022	0.018
Other	0.403	0.698
Statements	Interdependency	Independency
Claims should be submitted only for the cases that have high possibility of acceptance.	0.247	0.322*
Claims should be submitted unless they harm the relations or lead to a dispute with the opposing party.	0.306*	0.157
Claims should be submitted only if the claimed amount is considerably high.	0.230	0.144
In submission of claims the business culture of the opposing party should be considered.	0.311*	-0.220

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Statements	Interdependency	Independency
Claims should be submitted at the hand-over process of the projects if it is contractually possible.	0.080	-0.087
In a possibility of a counter-claim, the claim should not be submitted.	0.142	0.038
Claims should be submitted in any available case.	-0.069	-0.134
Precautions	Interdependency	Independency
Waive the claim	-0.051	0.184
Evaluation of the direct costs only	-0.124	0.222
Reduction by a particular percentage	-0.104	0.288
No precautions	-0.135	0.317*

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

The claims originated from cultural issues are usually be the most unforeseeable ones among all the claim situations. Moreover, these types of claims situations are usually the most distinct ones in terms of the ways the cases are handled by the decision making professionals who are involved in the claim management process.

Analyses show that the importance given to each claim cause and the method of approach concerning the claim case as well as the precautions taken for disputes by the professionals involved in the claim management processes, have a variety of differences based on their independent or interdependent perceptions.

According to the results of the correlation analyses, it is found that the professionals having a high independency level do not feel comfortable with making of business in unclear conditions. They also do not take the opposing party's business culture into consideration as much as interdependent professionals in submission of claims. Furthermore they do not tend to take any precaution for a potential dispute situation emerging from a claim which they submitted.

However these results do not correspond with Hofstede's model of culture where he categorized societies, whether they are individualist or collectivist. According to Hofstede, in individualist countries it is expected that people tend to be independent, and likewise in interdependent countries it is expected that people tend to be collectivist. But as a result of the comparison between IDV levels and self-construal values, this expectation did not correspond with the respondents' perceptions. Namely, the respondents expected to be collectivist as they were the members of a collectivist society, turned out to be individualist when their self-construal values are calculated. Likewise the respondents expected to be individualist as they were the members of an individualist society, turned out to be collectivist when their self-construal values are calculated. This result corroborates the critics brought to Hofstede's model of culture.

As a result of the findings, it can easily be said that the dominant cultural values and/or perceptions of the society are not very much influential on individuals' perceptions and their perceive in life, and may differ from the same values of the society which corroborates the other studies in literature. It is highly recommended especially for further studies in due diligence to determine professionals' individual perceptions and to evaluate the findings accordingly.

In conclusion, claim management is obviously a matter of issue, a phenomenon rapidly growing in the globalized construction world which is very much influenced by subjective elements and the perceptions of the decision makers in this area.

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SESSION 3

VALUE ENHANCEMENT

SOCIAL SUSTAINABILITY HEALTH CHECK: A MODEL FOR INTEGRATING STAKEHOLDERS' INTERESTS IN EVALUATING AND OPTIMISING SOCIAL SUSTAINABILITY PERFORMANCE OF CONSTRUCTION PROJECTS

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This research proposes the development of an assessment model based on the stakeholder's approach to check the health of the social sustainability performance of construction projects. Based on the equity principle, this research argues that the level of satisfying diverse and extended stakeholders' needs indicates the health of the social sustainability performance. The different interests of the project stakeholders are integrated using Social Network Analysis (SNA). The mapping of the relationship between the members within the stakeholder communities enables the weighting of the measurement criteria for the proposed assessment model, with respect to the stakeholders' positions within the project. The proposed model uses a multi-dimensional indicator to quantify the social sustainability values to be delivered to the project stakeholders across project life cycle. Hence, a benchmark is provided that monitor performance, which, in turn, facilitates making decisions for sustainability enhancement. The proposed model will provide the opportunity to identify problems associated with sustainable project creation and enhance the optimisation of the overall project performance.

Keywords: social sustainability, sustainability assessment, sustainable construction, social network analysis, stakeholder management

INTRODUCTION

Sustainability development is premised on systems theory, which stipulates that society, the economy and the environment are interrelated; thus, each needs to function probably to ensure maintenance of the larger system (Dillard and King 2008). The International Union for the Conservation (IUCN 1991) defined sustainability development as development that improves the quality of human life within the carrying capacity of supporting ecosystems. Unfortunately, the social dimension has received less appreciation within the context of sustainable development (McKenzie 2004; Edum-Fotwe and Price 2009).

Therefore, there is an increased realisation of the need to develop new sustainability assessment tools that address all the TBL dimensions, especially the social dimension (Zhenhong, Wennersten et al. 2006; Edum-Fotwe and Price 2009). Previous researches and the tools developed are derived from environmental impact assessment (EIA) or strategic environmental assessment (SEA), which were then extended to accommodate both the social and economic dimensions (Pope, Annandale et al. 2004). While an EIA-driven integrated assessment tends to eliminate the negative impacts of a proposal, it fails to address sustainability as a societal goal. Missimer et al. (2010) have scrutinized the existing sustainability frameworks with respect to the social dimension. They found that the social dimension lacked robustness, and was not equally operational with the environmental and economic dimensions.

Moreover, the aim of sustainability development is to meet the overall satisfaction of human needs, which include the environmental, economic and social benefits (Brundtland 1987). However, the priorities of human needs differ; for example, Talukhaba, Ngowi et al. (2005) argued that, in developing countries, the focus of sustainability development should centre on the socio-economic issues instead of on environmental concerns. The main reason for this assessment is that the social system in developing countries is suffering from many issues, such as inequity, health problems, poverty and illiteracy. As a consequence, a different approach is required in those countries from the approach taken in the developed countries (Du Plessis 2002). In Saudi Arabia, billions of dollars are spent in the construction industry; unfortunately, the money spent does not provide many opportunities for jobs, skills developments, or improvements in the local economy (Allam 2011). The end result has been the collapse of the apprenticeship system and, subsequently, a reduction in the national skills base, as well as spread of inequity within the society.

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SOCIAL SUSTAINABILITY

McKenzie (2004) developed the term “sustainable society“ to distinguish the social dimensions from the other concerns of sustainability development. The definition of social sustainability describes “a positive condition within communities, and a process within communities that can achieve that condition”. The conditions highlighted within McKenzie’s definition include equity, culture, political participation, and psychological needs. This notion was expanded by Littig and Griessler (2005), who characterized social sustainability as being about satisfying an extended set of human needs, preserving nature, and fulfilling social justice, as well as human dignity and political participation. A further redefinition was developed by Dillard and King (2008) to include four universal principles: equity, human well-being, democratic government, and democratic civil society. However, there is little agreement about social sustainability definition, with various authors proposing different criteria and addressing different issues. The eight most frequently addressed social issues and discussed in the literature are health, safety, job opportunity, security, accessibility education, identity, participation (Burdge 1987; McKenzie 2004; Labuschagne, Brent et al. 2005; Littig and Griessler 2005; Chan and Lee 2008; Herd-smith and fewings 2008; Lamprinidi and Ringland 2008; Valdes-Vasquez, Klotz et al. 2010).

Within this framework social issues are created through the relationship between nature and society, and mediated by work, as well as the relationships within the society (Littig and Griessler 2005). Further, the research by Edum-Fotwe and Price (2009) also stated that social realities are created by the dynamic interaction of individuals’ values within a society. Therefore, it can be stated that construction projects create new relationships and interactions within a community, as well as between a community and nature, with the consequent production of social issues. Hence, social issues through construction projects require development that meets sustainability objectives. Herd-Smith and Fewings (2008) advocate that social sustainability is about meeting the needs of the people and communities; and it is achieved by engaging with employees, local communities, clients, and the supply chain.

The need for research on the social sustainability is widely acknowledged. However, a range of impediments have created barriers that need to be overcome, especially at the micro level. For example, Vanclay (2004) highlighted that social indicators are unlike economic and environmental indicators, which are easy to be identified, selected and measured. The undefined socio-related factors, their subjectivity, as well as the different views and priorities of stakeholders make it difficult to identify what improvements are required (Bentivegna 1997; Missimer, Robert et al. 2010). Therefore, focusing on the social sustainability within the assessment of triple bottom line (TBL), this research aims to define the underlying social sustainability factors and develop a dynamic assessment model of sustainability in social context. The model is expected to facilitate evaluating the performance of a construction project in contributing to social sustainability to its stakeholders over the entire lifecycle.

CONSTRUCTION PROJECT STAKEHOLDERS

Presley and Meade (2010) argues that sustainable construction refers to the building and spaces, construction process, and the surrounding built environment. This interpretation of sustainable construction highlights three communities of stakeholders which are user’s community who use the building, industry community who involves in the construction activities, and neighbourhood community who share the built environment with the new project. These different communities interact with the project along its life cycle differently. As a construction project evolves along its life, the project stakeholders also change. At times, new stakeholders, relationships and rules within these communities emerge and others disappear. The construction project stakeholders’ communities are:

Industry community: Are the people that concerned with the construction activities such as designing, constructing, manufacturing and supplying. This group covers building owner, architect, project manager, engineers, construction contractors, operation and maintenance contractors, suppliers, manufacturers and demolition contractors. Mostly the interest of this group is, making money from initiating such a construction project.

User’s community: Are the people who use the building in the operation stage. Those people require the building to run their business. People in this group are changeable according to the business that runs in the building. Consequently, the interests, benefits and impacts of such construction project on the social sustainability are varied based on who run the business and use the project.

Neighborhood community: Are the people who live nearby and/ or affected by the project location. This group covers resident neighbours, commercial neighbours, people who use surrounded paths and roads.

For Industry community, a construction project can deliver social harmony, health, safety and welfare of the workers; further, the project can make a positive enhancement to people’s well-being (Talukhaba, Ngowi et al. 2005). The outcome of a construction

project has enormous repercussion within the society. For example, the construction industry is considered to be the largest industrial employer world-wide, with 111 million employees. Additionally, the employment intensity of the construction industry is much higher in low-income countries than in the high-income (Wells 2001). Therefore, construction projects have the capacity to enhance social sustainability and to contribute to sustainable development (Du Plessis 2002). Thus, a number of initiatives have been established in the United Kingdom construction industry, such as the Construction Skills Certification Scheme, in response to social sustainability issues. These initiatives provide both training and employment opportunities for construction workers.

A number of construction organisations use the Global Reporting Initiative (GRI) guidelines to enhance their position as being committed to sustainability development. Sustainability reporting incorporates the practice of measuring, disclosing, and being accountable (to internal and external stakeholders) for the organizational performance to reach the sustainable development goal. Lamprinidi and Ringland (2008) provided a snapshot of the reporting practice in the construction industry; they identified the social themes reported, including diversity, employment, health, safety, community involvement, education and training.

The relationship between a construction project and its surrounding environment, or neighbourhood community, is usually addressed under topics such as urban sustainability, sustainably built environments, and sustainable livelihoods. Chan and Lee (2008) identified the social sustainability factors of urban renewal projects through a questionnaire survey carried out in Hong Kong. The study found that ‘provisions facilitating daily life operations’, ‘satisfaction of welfare requirements’, ‘creation of harmonious living environment’, ‘conservation of resources & the surroundings’, ‘form of development’ and ‘availability of open spaces’ were significant underlying factors that enhanced the social sustainability of local urban.

In the UK the government issued the Section 106 planning agreement to minimise the negative impact of development on local communities and to encourage the delivery of social sustainability objectives, such as job opportunities for locals. The Considerate Constructor’s Scheme was also instigated to focus on construction activities that involved being a good neighbour, as well as being clean, respectful, safe, and to provide volunteering jobs (Herd-smith and fewings 2008). Other activities to enhance the social sustainability of project’s neighbourhoods are being practised, such as public hearings, community engagement, and knowledge transfer.

Social issues research, related to a building users have been widely studied, especially in terms of the users’ satisfaction, psychological and physical comfort, health and productivity (Leaman and Bordass 2001). Indeed this field is well understood; there are criteria and measurement tools including LEED, BREAM and Green star. Most rating system tools measure accessibility, comfort, and space efficiency, and others as shown in Table 1. However, Baird (2010) assessed the performance, in practice, of 30 sustainable buildings, in terms of the users’ perceived comfort, health and productivity; interestingly 60% of the respondents comments were negative.

The identified social issues can be applied to the stakeholders’ communities, especially as related to the construction industry, the neighbourhood and the users as listed in Table 1.

Table 1 Social factors related to the stakeholders’ communities

CONSTRUCTION INDUSTRY	NEIGHBOURHOOD	USERS
<ul style="list-style-type: none"> • Job opportunity • Equity • Safe work site • Communication and information • Health • Skills development • Comfort (physical, psychological) • Enhancing the local economy 	<ul style="list-style-type: none"> • Availability of open spaces • Identity and heritage. • Safe neighbourhood • Security • Health • Knowledge transfer • Volunteering jobs • Conservation of resources and the environment • Enhancing the local economy • Communication and information 	<ul style="list-style-type: none"> • Comfort (physical, psychological) • Health • Accessibility • Safe work place • Functionality • Communication and information

SOCIAL SUSTAINABILITY HEALTH CHECK MODEL

Having identified the different communities of construction project stakeholders and their potential social interests, the current research aims to develop a dynamic model for social sustainability assessment (see Figure 1), based on a project’s ability to deliver social values to its stakeholders over the project life cycle.

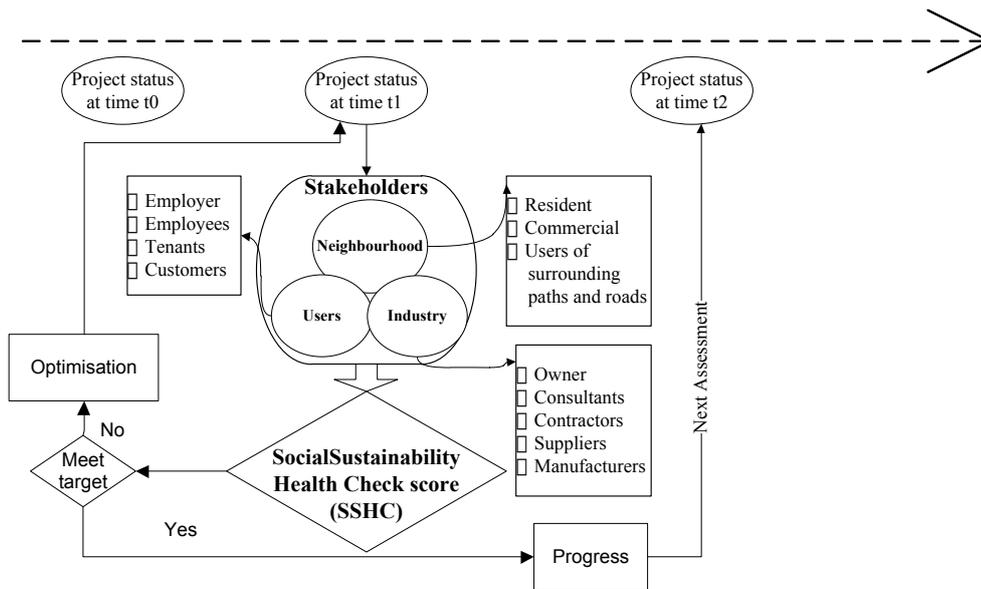


Figure 1 Assessment theoretical framework

As shown in Figure 1, the assessment score of the Social Sustainability Health Check (SSHHC) is the function of the Social Sustainability Performance (SSP), over the Project Life Cycle (PLC), with respect to project stakeholder communities. How a project performs and satisfies the needs of its stakeholders indicates its social sustainability health. Thus, if the score does not meet the target assigned by the project developers, performance optimisation should be attained through identifying which indicator has failed to satisfy the corresponding stakeholder.

One barrier arises with diverse stakeholders having different purposes for a project; hence, they expect different benefits/impacts which need to be satisfied. This results in a range of understandings and evaluations of the reality of social sustainability performance (Pearce 2006). Bentivegna (1997) stated that the evaluation techniques are only able to represent some of the aspects of the whole system of effects, along with the sharing of only a few of the interests involved in the decision process. While Gibson (2006) notes that expertise, tools and techniques for sustainability evaluation are very helpful, unfortunately these are unavoidably value laden. Consequently, an important question arises as to whose value will take the dominant position; the answer is crucial as sustainable projects are concerned with equity. In other words, the response depends on which sustainability criteria are used, and how it is used. Indeed, the term Sustainability is interpreted variously, depending on the stakeholders' interests. For example, some people emphasize sustainability development through economic growth, while others stress the importance of environment protection. Interestingly, a number of environmentalists suspect that the term sustainability development is used to obfuscate the destruction of the natural world (O'Riordan 1988). In contrast, a number of economists argue that sustainability development is concerned with the future and the reserve natural resources, which can lead to sacrifices in economic growth (Jacobs 1991).

Therefore, integrating stakeholders' interests in the assessment helps to avoid the ambiguous values assigned and increases the equity values. According to Clarkson (1995), the stakeholder interest approach is the best way to transfer the intangible issues (such as social performance) into tangible business objectives. Indeed, Van der Sluijs (2002) highlighted the need for a new generation of assessment models that could accommodate stakeholder value diversity, as well as interactive with them.

To achieve that, the assessment model utilises Social Network Analysis (SNA) as a tool for mapping the stakeholders' communities and providing a complete picture of the different interactions with project. Thus the social issues that were created through interactions with the project and communities can be addressed according to the network system of the actors. This will enable measuring the social performance of the project with respect to stakeholder's position. Further, Analytical Hierarchy Process (AHP) is employed to incorporate stakeholders' preferences in assigning weights of the social criteria.

SOCIAL NETWORK ANALYSIS (SNA)

Recently, SNA is becoming increasingly popular methodology for understanding and mapping the complex patterns of actors' interactions within a network system. SNA is predominately useful to identify and measure the position of the actors and their influences. Prell, Hubacek et al. (2009) use social network analysis to inform stakeholder analysis in the context of national resource management. As they advocated that stakeholder's categorization method often overlooked the importance of the stakeholders'

communication while SNA helps to identify which individuals and categories of stakeholders played more central role in the network and which were more peripheral.

The SNA uses the functions such as the degree of centrality of an actor which is the sum of direct ties to other actors. Strong and extensive ties to other nodes in the network indicate that the one stakeholder is more likely to influence others with respect to a project environment, thus more important (central) in the network (Prell, Hubacek et al. 2009).

Hossain (2009) examined the effect of organisational position and network centrality on project coordination and found there is a strong correlation between network centrality and coordination. As stakeholders of construction projects are connected within communities, their coordination toward project success is important. Thus, measuring the health of social performance of a project should consider the network system within the community.

In the context of social sustainability, the success of a project determines by the amount of social values delivered to the stakeholders. Thus, identifying stakeholders' positions within their networks enables evaluating the social value received from a project. The degree of centrality of a stakeholder represents his/her importance in the network so the social value received is measured with respect to stakeholders' positions. Therefore, SNA will be used in the assessment to overcome the multiplicity of social values and effects of a construction project.

MATHEMATICAL MODEL DEVELOPMENT

The Social Sustainability Performance (SSP) of a project is the sum satisfaction of the social needs that stakeholders received from the project. Hence, the SSHC, at a given time, is the sum of the SSP with respect to stakeholders' communities at the same given time, which can be written as:

$$SSHHC\ t = Industry\ SSP\ t + Users\ SSP\ t + Neighbourhood\ SSP\ t. \quad (1)$$

A community SSP, at a given time, is the sum satisfaction of the stakeholders' needs with respect to their position within their communities. However, not all indicators can be perceived equally; for this reason the score has to be multiplied by the indicator weight. This can be written as follows:

$$A\ community\ SSP\ \sum_{i=1}^n C_i \sum a_j \cdot b_j = \quad (2)$$

$$a = \frac{CD(stakeholder)}{\sum CD(community)} \quad (3)$$

a = relative degree of centrality (CD) of stakeholder to its community which means the relative stake within the community =

b = assessment score of the indicator with respect to stakeholder which measured by indicators assessment methods. The maximum score of an indicator is 10.

C = Indicator weight assigned by stakeholders using AHP method.

i = Indicators index

j = Stakeholders' CD index

Figure 2 shows the overall assessment framework for assessing the social performance of a project over its life cycle. The maximum cumulative score in the SSHC index when the three communities interact with the project is 30 because the satisfaction index for each community is 10. The SSHC assessment outputs, at a given time, are the three scores of the SSP, the planned score of the SSP (based on developer's target), the actual score of the SSP (based on stakeholders' perceiving), and the maximum possible score in that time. The maximum possible score was adopted because the stakeholders and their interests vary along the project cycle. The social indicators that belong to each community are the measurement bases. The degree of fulfilment the social indicators will be aggregated through the use of SNA as discussed earlier. The difference between actual and planned can be measured along the project life cycle. The resultant allows understanding of the difference in social performance so that corrective action is taken to meeting or exceeding the target over the entire life of the project.

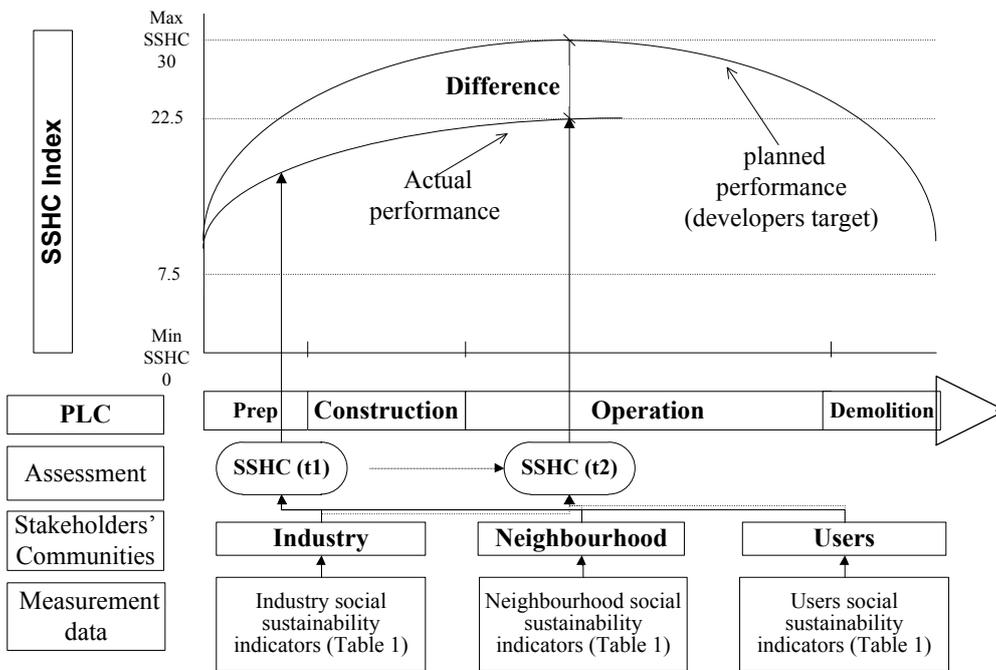


Figure 2 SSHC assessment framework

APPLICATION OF SSHC IN A CASE STUDY

A recent major decision has been made to demolish the Architecture, Building and Planning (ABP) building in the University of Melbourne and build a new one. This building is 50 years old, facilitating teaching, researching and administrating for staff and students in architecture school. In addition, two commercial tenants run their business in this building, a branch of Commonwealth Bank and Post Office. In the neighborhood there are some schools so their staff and students interact with the building facilities. Two cafes in the neighborhood also, so their customers use building surrounding paths. These activities create social interaction and provide social values for two stakeholders' communities, Users and Neighbourhood.

For the purpose of illustrating the SSHC application, the social performance of the project was assessed using the tool. In this project, the stakeholders are identified and clustered in their respective communities associated in the project. SNA was used to construct the network system of the stakeholders which enables defining the degree of centrality of the actors and measuring the relative stake as shown in the Table 2.

Table 2 SSHC for ABP building

Community	Stakeholder	Relative stake (equation 3)	Social Value	SSP (equation 2)
Users	ABP students	0.31	5.4	6
	ABP staff	0.33	5.7	
	Tenants	0.21	6.8	
	Customers	0.15	7.1	
Neighborhoods	Staff in neighbor	0.31	6.7	6.6
	Students in neighbor	0.26	6.6	
	The Cafes	0.23	8.1	
	Path users	0.2	4.6	

The social value of the project in the stakeholders' perspective is derived from the assessment of their satisfaction level of the indicators in Table 1 using Likert scale of 1- 10, where 10 is an outstanding satisfaction and 1 is extreme dissatisfaction. Application of the AHP method used to weigh the indicators was not discussed for the sake of brevity. Applying the equations 1 and 2, the SSHC score for the project is determined as below:

$$SSHHC = SSP(Users) + SSP(Neighbourhood) = 12.6.$$

The score of 12.6 is out of 20 which is the maximum possible social sustainability performance in this time of the project life. The assessment shows that the most central stakeholders in the network system (students and staff) are not satisfying with the project. Thermal comfort, daylight and functionality of the spaces were the major concern of the students and staff. Psychological comfort in terms of enabling communication, group formation, space controlling and territory needs, are also missing which affect the social performance and the teaching process.

In order to enhance the social performance (from a current score of 12.6 to a maximum possible score of 20) of the project at this stage, necessary improvement is needed. However, the question whether the capital-intensive refurbishment or refitting would general an appropriate level of social benefit (e.g. SSHC score) at this stage of the project is difficult to answer. Anecdotally, real benefit realised out of such investment towards the end of the service life of projects is highly subjective. For this reason alone, perhaps the decision of a complete replacement of the building with a new one is justified.

The new project aims to fill the gap identified in the social performance of the project. Therefore, an outstanding social performance is planned for the new project through enhancing the accessibility and integration between the project and the surrounding area. Historic facade of the existed building and the heritage of the place will be preserved. The construction process is planned to deliver education and advance research. Job opportunities and research places will be created in the new project. The project focuses on making student feel valued by enabling space controlling, informal interaction and group formation. Following the contemporary design of the new building with fully modernised facilities, the assessment of the social sustainability score (SSHC) is expected to be close to the target. Dynamic assess of the SSHC score over project development and operational phases will ensure maintaining the social sustainability outcome in the project.

CONCLUSION

This research presents a framework for social sustainability assessment of construction projects. Construction projects create interactions between stakeholders which produce social issues that need to be developed under sustainability principles. The long life cycle that construction projects have and the huge diverse people interact with it, raises the importance of the social dimension in construction. The SSHC model aims to advance the social dimension of the sustainability development. As well as provides means to consider and account the diverse stakeholders of construction projects.

The application of the SSHC in a case study project, enable identifying and measuring the underperformed social criteria in the existed project. Hence, enhance the creation of the new project through optimising the social sustainability performance planned. Defining stakeholders' network system assists to enhance the optimisation of social sustainability performance.

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LIFE CYCLE COST ANALYSIS UNDER IRELAND'S CAPITAL WORKS MANAGEMENT FRAMEWORK

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The Capital Works Management Framework (CWMF) is a structure that has been developed to deliver the Irish government's objectives in relation to public sector construction procurement reform. This research provides practical guidance and assistance for construction cost professionals in carrying out Whole Life Cycle Cost Analysis (WLCCA) and producing Life Cycle Cost Models (LCCMs) under the CWMF. The research outlines how LCCA calculations can be carried out for cost planning purposes and recommends a standard methodology for presenting LCCMs under the CWMF. The CWMF states that Whole Life Costs (WLC) are an important consideration throughout the design process and should be integrated at each stage of the cost planning process. This research investigated a number of international methodologies and standard method of measurements on Life Cycle Costing (LCC) along with a literature review of journal papers, professional publications and research articles. A template was subsequently developed that can be used to aid construction professionals in producing LCCMs. The template puts forward a standard response to the CWMF and was produced in consultation with one of the international methodologies in LCC. A WLCCA case study of a secondary school building in Dublin, Ireland was carried out using the template outlined above. The WLCCA was prepared to provide an example of how LCCA could be carried out and presented in accordance with Ireland's CWMF. The resultant WLCCA outlines a sixty year analysis of the school considering the proportional present value breakdown between investment costs and operational costs. The construction costs represent 42% of the overall present value WLC of the building over a 60 year study period.

Keywords: life cycle, life cycle cost analysis, whole life cycle cost, sustainability

INTRODUCTION

The Society of Chartered Surveyors Ireland (SCSI) is the professional body for construction, land and property professionals in Ireland. The SCSI has a number of working groups researching best practise and procedures within the Institute's professional groups. The SCSI 'Working Group in Life Cycle Costing' has as its aim to provide practical guidance and assistance for quantity surveyors and the Irish government in carrying out WLCCA and producing Life Cycle Cost Models (LCCM). The working group as part of their research put forward a number of definitions of Life Cycle Costing (LCC) and WLCC. The group's research as outlined in this paper examined a number of international methodologies and standard method of measurements on Life Cycle Costing (LCC) along with a literature review of journal papers, professional publications and research articles. In addition, the group outlined how LCC calculations can be carried out and proposed a structure and methodology for presenting LCCMs through a standard template. As part of the project the working group undertook a WLCCA of a secondary school in the greater Dublin area. The objective of the analysis was to provide SCSI members with a worked example of a WLCCA under the proposed structure and methodology and to investigate the overall proportional breakdown between investment and operational costs on a recently built school in Ireland.

The project commenced in mid 2010 and was in the final stages of development in October 2011. The working group started its research by discussing with its members, whether they carried out LCC and if they used any methodology or standard method of measurement in the production of WLCC estimates. Many cost professionals and local governments are unfamiliar with the concept of LCC, how to carry out LCC calculations and how to present this in a meaningful way (Hunter et al. 2005).

The SCSI invited Robert Charette from the Building Engineering Faculty of Concordia, University in Montreal, Canada, in May 2010 to carry out a seminar and workshop for its members on WLCC. Mr Charette guided the participants through the calculation methodology and practical application of LCC exercises (Charette 2010). The attendees gained the knowledge required to carry out isolated option appraisal of building components over a selected study period. After the workshop it was established by the SCSI that

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there was a requirement to cumulatively present these calculations within a standard structure, so that a WLCCA on an entire project could be presented to a perspective client (Kehily 2011).

Carrying out individual LCC calculations of every component of a building is very time consuming, even with the aid of financial tables (Hunter et al. 2005). The working group set out to provide a common approach within a recommended template, so that LCC calculations could be carried out in a manner which automates the mechanical and time consuming calculations. This approach provides the user with an application to quickly and accurately present a WLCC estimate to a client within a standard structure. This requirement in Ireland was heightened by the introduction of the CWMF in May 2010 by the Irish government, which contains an “integrated set of contractual provisions, guidance material, technical templates and procedures, which cover all aspects of the delivery process of a public works project from inception to final project delivery and review” (G N 2.2. 2009). One of the provisions to be provided by quantity surveyors on all future projects is the requirement for WLCC on public works contracts as a standard service.

WHOLE LIFE CYCLE COSTING

The first step in examining WLCC is to clearly define the meaning and scope of LCC and WLCC. The National Institute of Standards and Technology (Fuller et al. 1995) in the United States defines the WLCC of a facility as “an economic evaluation in which all costs arising from owning operating and maintaining a building over a certain study period or building life cycle are considered to be potentially important in option appraisal, design decisions and cash flow forecasting”. The Office of Government and Commerce (OGC) (2003) in the United Kingdom defines WLCC “as the costs of acquiring it, the costs of operating it and the costs of maintaining it over its whole life through to its disposal – that is, the total ownership costs”. The International Standards Organisation, BS ISO 15686 – Part 5 (2008) describes whole WLCC as a “methodology for the systematic economic consideration of all whole life costs and benefits over a period of analysis, as defined in the agreed scope”. In this paper “Life Cycle Cost”, “Whole Life Cycle Cost”, “Whole Life Costs”, “Life Cycle Cost Analysis” and “Life Cycle Cost Model” are terms used interchangeably defining the same concept, although not necessarily defining the same action within the concept. This paper, however, predominantly uses the term WLCC as outlined in the definitions above.

A Building Research Establishment (BRE) study of WLCC conducted by Cliff and Bourke (1999) found that although the significance of LCC has been recognised on construction projects, as early as the 1980’s and substantial amounts of research into the field has taken place, the application has not been implemented into standard practice. A number of papers in the field, including Fischer and Kunz (2004), Chanter and Swallow (1996), Cliff and Bourke (1999) and Flanagan and Norman (1984) (as cited in Kaya et al. 2007) has determined that the reason for this includes the lack of historical data and databases on operation and maintenance; the significant absence of standardisation across the construction industry, in terms of scope; and the complexity of calculating the factors involved in LCC. The CWMF is a structure that has been developed to deliver the Irish Government’s objectives in relation to public sector construction procurement reform. The CWMF guidance notes on cost management include a requirement to provide LCC on publically procured projects. In response to this requirement the SCSi working group on LCC produced a standardised template that could be used to provide LCC estimates in line with the CWMF.

CAPITAL WORKS MANAGEMENT FRAMEWORK

The CWMF consists of a suite of best practice guidance, standard contracts and generic template documents that form four pillars that support the framework (G N 2.2. 2009). Pillar three and pillar four are applicable to construction cost management. Pillar three consists of cost control, planning forms and suitability assessment forms for construction works and services and pillar four provides guidance notes aimed at facilitating the implementation of the measures and forms in the previous three pillars (G N 2.2. 2009). ‘The Planning and Control of Capital Costs, GN 2.2’ (2009) in pillar four states that “whole life costs are an important consideration throughout the design process, and should be integrated at each stage in cost plan development”. The framework provides cost planning excel templates for cost management throughout the design process and these cost planning templates are included in pillar three to download. However, other than a suggested WLCC summary page included in guidance notes 2.2, there is no template or suggested methodology to present WLCC information.

SCSI: GUIDANCE NOTES ON LIFE CYCLE COSTING

The guidance notes produced, as part of the SCSI's Working Group in LCC provides practical guidance and assistance for the Society's members and quantity surveyors in Ireland, in carrying out LCCA and producing LCCM's in line with the CWMF (Kehily, 2011). The guidance notes are divided into seven sections. Section 1.0 outlines a number of definitions for LCC and WLCC from international methodologies and standard method of measurements in LCC. The section also addresses the Irish governments CWMF and discusses the applicability of WLLC in sustainable construction, risk management and tendering.

Section 2.0 outlines and describes the data required in calculating Present Value (PV) factors, while section 3.0 outlines the different PV formulae used and when they may be used in LCC calculations. A scientific calculator can be used to carry out PV calculations but this method can be quite time consuming as each variable must be inputted to determine the relevant factor (Kaya et al. 2007). The LCC calculation must be repeated for each building component or system to determine the cumulative present value WLCC (Charette 2010). Section 4.0 of the guidance describes how financial tables may be used to quickly calculate the relevant PV factors, outlining an example calculation for each of the PV factors, Single Present Value (SPV), Uniform Present Value (UPV), Single Present Value Modified (SPV*) and Uniform Present Value Modified (UPV*). The excel template provided by the working group includes the PV factors as formulae within the relevant cells. Once the data requirements and cost information are inputted into the template they are automatically calculated.

Section 5.0 of the guidance notes demonstrates how PV factors can be written as formulae into excel cells. Using this information cost professionals can build their own templates and/or manipulate the template recommended by the working group, if they wish to do so. Section 6.0 of the guidance notes provide a fully worked example of an option appraisal of a building system over a given study period. One of the main objectives of the SCSI working group was to research and evaluate a standard methodology that could be recommended to cost professionals carrying out WLLC calculations and presenting WLCCA in accordance with the CWMF. A review of these methodologies is presented in the last section of the guidance notes, Section 7.0 and is also addressed below.

STANDARD METHOD OF MEASUREMENT FOR LIFE CYCLE COSTING

There are a number of methodologies and standard method of measurements on WLCC. In The United States, the National Institute of Standards and Technology (NIST) published handbook 135 (1995), thirteen years before a similar standard methodology from the International Standard Organisation (ISO). 'NIST handbook 135' (1995) outlines in detail the LLC method "defining the criteria used and describing the assumptions and procedures to follow in performing evaluations and gives examples on to how to carry out LCC calculations". The handbook, however, does not give a breakdown structure for preparing LCC. In 2007 Davis Langdon published a report on the contribution of LCC to sustainable construction; the report provides an account of a research and development project to develop a common European methodology for LCC in sustainable construction within the European Union (Davis Langdon 2007). Hunter and Kelly, (2009) published a Royal Institution of Chartered Surveyors (RICS) research paper which also considers LCC as an economic evaluation of sustainable construction. The Office of Government Commerce (OGC) in the UK provides, as part of their suite in 'Achieving Excellence in Construction Procurement Guides', a guide for WLCC and cost management (2003), the guide outlines the principles of WLCC and describes a process made up of a framework for cost management and WLCC. The equivalent document in Ireland was published by the Department of Finance in 2009. 'Planning and Control of Capital Costs GN 2.2' (2009) is one of a number of guidance notes aimed at facilitating the implementation the measures in the CWMF. Although the OGC and the CWMF documents are guides rather than methodologies the CWMF guidance notes do provide a simple summary page for presenting LCC and sets out the different stages that LCC should be carried out on publically procured projects in Ireland. However, in order to carry out a detailed LCC or provide backup to the CWMF summary page a quantity surveyor carrying out LCCA should consult with one of the methodologies outlined above or refer to the International Standard Organisation's, 'BS ISO 15686-5' (2008) or the BSI/BCIS supplement (2008).

BSI/BCIS 'STANDARISED METHOD OF MEASUREMENT FOR LIFE CYCLE COSTING'

International Standards Organisation, 'BS ISO 15686' (2008) "is a multi part series of international standards giving guidance on various aspects of planning the service life of buildings and constructed assets". Part 5 of the series "provides guidelines, definitions, principles and informative text on the application of LCC techniques in the context of service-life planning". The British Standards Institute (BSI) and the British Cost Information Service (BCIS) in the UK jointly published a document which put forward a standardised method for producing LCC (2008) applicable to the Irish/UK construction industry and to the key stages of the procurement process. The document provides a cost data structure and a method of measurement for LCC which aligns with the ISO 15685-5. The SCSI working group used this methodology and standard format in the production of the recommended WLCC template and WLCC example. Table 1 below represents the cost breakdown structure applicable to both the ISO document and BSI/BCIS supplement documentation. The table indicates that WLCC are broken up into four classification categories, non construction costs, life cycle costs, income and externalities. Life cycle costs are in turn broken up into a number of sub-categories construction, maintenance, operation, occupancy and end of life costs.

Table 1: Classification of Life Cycle Costs, ISO 15868-5

Whole Life Cycle Costs	Non Construction Costs	
	Life Cycle Costs	Construction, Maintenance, Operation, Occupancy, End of Life Costs
	Income	
	Externalities	

LIFE CYCLE COST TEMPLATE

The SCSI working group in LCC produced a template to aid construction professionals producing LCCMs under the CWMF. The template is designed and formatted per the 'classification categories' of the ISO 15868-5 (2008), identified in Table 1 and is also produced in consultation with the BSI/BCIS supplement to the ISO standard (2008). This template provides a suggested layout and includes descriptions and formulae that can be changed and manipulated to suit the building type, client requirements and the stage of the project the LLC analysis is carried out. The template provides a step-by-step process to carrying out a WLCC estimate supported through a series of spreadsheets. The tool is not very complex, providing only the key elements of WLCCA. The spreadsheet, however, can be expanded to include more information, including graphical representation of the data for cash flow forecasts and maintenance and replacement profiles. The key benefits to cost professionals are; the ability to complete a WLLC exercise without having to do any of the PV calculations; the format is standardised per the ISO 15885-5; and the document can be saved to record data that may be used on estimates in the future. In total there are seven sheets in the tool representing the LCC classifications in Table 1, including input screens for project details, parameters, areas and scope.

The first sheet is a blank sheet, which provides for the company preparing the WLCC to include their company details or 'cover page'; the second sheet is a index page outlining the 'table of contents' and subsequent detail to follow; the third sheet includes input cells for relevant project details and 'parameters'; and the fourth sheet outlines the 'basis of the estimate', which includes information on overall areas, exclusions, inclusions and the documents used in the preparation of the LCCA.

The next sheets outlined in Figure 1 and Figure 2 below provides a summary of the information, included in the WLLC estimate. There is no data input required in these sheets, as all the succeeding input sheets are linked and formulated to roll the input forward to populate the summarises within the coded classification categories. The overall summary, shown in Figure 1, provides a breakdown of the high level cost classification categories from ISO 15868-5 as shown in Table 1. Each classification category is represented in 'Life Cycle Cost' (costs without escalation and discount) and also 'Present Value' costs. The summary includes a pie chart at the bottom of the page to graphically represent the LCC breakdown. This chart is not shown in Figure 1, as it is not clear in monochrome print.

WLCC Whole Life Cycle Cost		Life Cycle Cost	€/m2	Total Present Value	€/m2
CC	Construction Costs	0	0.00	0	0.00
	2.0 Maintenance Costs	17,004	0.00	9,550	0.00
	3.0 Operations Costs	1,800,000	0.00	1,057,691	0.00
	4.0 Occupancy Costs	0	0.00	0	0.00
	5.0 End of Life Costs	0	0.00	0	0.00
LLC	Life Cycle Cost (2.0 - 5.0)	1,817,004	0.00	1,067,241	0.00
TLLC	Total Life Cycle Cost (Incl Construction)	1,817,004	0.00	1,067,241	0.00
	6.0 Non Construction Costs	0	0.00	0	0.00
	7.0 Income	0	0.00	0	0.00
	8.0 Externalities	0	0.00	0	0.00
WLC	Whole Life Cycle Cost (ex VAT)	1,817,004	0.00	1,067,241	0.00
VAT	Vat	245,296	0.00	144,078	0.00
WLC VAT	Whole Life Cycle Cost (Inc. VAT)	2,062,300	0.00	1,211,319	0.00

NAE Net Annual Expenditure		Annual Costs	€/m2	%
	2.0 Maintenance Costs	283	0.00	1%
	3.0 Operations Costs	30,000	0.00	99%
	4.0 Occupancy Costs	0	0.00	0%
NAE	Net Annual Expenditure	30,283	0.00	100%
	7.0 Annual Income	0	0.00	
WNAE	Whole Net Annual Expenditure	30,283	0.00	

Figure 1: Level 1 – Life Cycle Cost Summary

The next sheet is a more detailed summary, outlined in Figure 2, which provides further breakdown within each of the ISO classification categories.

LLC Life Cycle Costs Analysis - BCIS				60 Years		
	Ref	BCIS	Annual Amount	Life Cycle Cost	Escalated Life Cycle Cost	Total Present Value
Construction Costs	1.0	Construction Costs				
	1.1	Construction works costs				
	1.2	Other construction related costs				
		Total Construction Costs		0	0	0
Maintenance, Operations and Occupancy Costs	2.0	Maintenance Costs				
	2.1	Major replacement	283	17,004	41,273	9,550
	2.3	Redecoration - internal / external				
	2.4	Minor replacement, repairs and PPM maintenance costs				
	2.5	Unscheduled repairs, replacement and maintenance				
	2.6	Grounds maintenance				
	2.7	Client definable costs				
		Total Maintenance Costs	283	17,004	41,273	9,550
	3.0	Operations Costs				
	3.1	Cleaning costs				
	3.1.1	Windows and external surfaces				
	3.1.2	Internal cleaning				
	3.1.3	Specialist cleaning				
	3.1.4	External works cleaning				
3.2	Utilities costs gas and electric					
3.2.1	Fuel Costs	30,000	1,800,000	5,038,351	1,057,691	
3.2.2	Water and Drainage					
3.3	Administration Costs					
3.3.1	Property management					
3.3.2	Staff engaged with servicing the building					
3.3.3	Waste management disposal					
	Total Operations Costs	30,000	1,800,000	5,038,351	1,057,691	
4.0	Occupancy Costs					
4.3	Security					
4.5	Switchboard / telephones					
4.6	Postroom - mail services					
4.7	ICT and IT services					
4.12	Occupiers furniture, fittings and equipment					
4.14	Stationary and reprographics					
	Total Occupancy Costs	0	0	0	0	

Figure 2: Level 2 Life Cycle Cost Summary

The subsequent sheets provide for data input per the ISO 15868-5 classification categories in construction costs, maintenance costs, replacement costs, operations costs, occupancy costs, end of life costs, income costs and costs related to externalities. The sheet for 'operations and maintenance costs' is outlined in Figure 3. This sheet provides a formatted spreadsheet, which includes the coded cost holding categories and sub-categories and also the PV to automatically calculate the inputted costs. The template provides an example of electricity (ESB costs) which can be traced from the input sheet in Figure 3, to the level 2 summary in Figure 2 and ultimately to the summary page shown in Figure 1.

O&M Operations and Maintenance							Years	60			
Ref	BCIS	Description	Unit	Rate	Annual Cost	Life Cycle Cost (e)	Escalated Life Cycle Cost (i)	Present Value			
2.0	Maintenance Costs										
2.1	Major replacement										
2.1	AP3 - Replacement Costs				283	17,004	41,273	9,550			
2.2	Subsequent refurbishment and adaptation costs										
2.2	State client requirements, standards required, working restrictions and procurement context										
2.3	Redecoration - internal / external										
2.3	State client requirements, standards required, working restrictions and procurement context										
2.4	Minor replacement, repairs and PPM maintenance costs										
2.4	State client requirements, standards required, working restrictions and procurement context										
2.5	Unscheduled repairs, replacement and maintenance										
2.5	State client requirements, standards required, working restrictions and procurement context										
2.6	Grounds maintenance										
2.6	State client requirements, standards required, working restrictions and procurement context										
2.7	Client definable costs										
	Total Maintenance Costs				283	17,004	41,273	9,550			
3.0	Operations Costs										
3.1	Cleaning costs										
3.1	3.1.1 <u>Windows and external surfaces</u>										
3.1	3.1.1 State client requirements, standards required, working restrictions and procurement context										
3.1	3.1.2 <u>Internal cleaning</u>										
3.1	3.1.2 State client requirements, standards required, working restrictions and procurement context										
3.1	3.1.3 <u>Specialist cleaning</u>										
3.1	3.1.3 State client requirements, standards required, working restrictions and procurement context										
3.1	3.1.4 <u>External works cleaning</u>										
3.1	3.1.4 State client requirements, standards required, working restrictions and procurement context										
3.2	Utilities costs gas and electric										
3.2	3.2.1 <u>Fuel Costs</u>										
3.2	3.2.1 ESB		1 LS	30,000.00	30,000	1,800,000	3.00%	5,038,351	5.00%	1,057,691	1
3.2	3.2.2 <u>Water and Drainage</u>										
3.2	3.2.2 State client requirements, standards required, working restrictions and procurement context										

Figure 3: Operations and Maintenance

LIFE CYCLE COST EXAMPLE

The SCSI working group carried out an example WLCCA for Colasite Bhríde, Secondary School in Clondalkin, Dublin. The WLCCA was prepared in excel using the recommended template and carried out with cost information provided by Kerrigan Sheanon Newman (KSN) Quantity Surveyors. The WLCCA was prepared by the working group to provide an example of how a WLCCA could be carried out and presented on a school building using the template. Figure 4 represents a screen-shot of the WLCCA summary page. The total PV WLCC of the school building over a sixty year study is €34,332,870. This figure is broken down into eight coded classification categories from the ISO 15868-5. The WLCC summary in figure 4 outlines the proportional breakdowns of the WLCC estimate. Given that non-construction costs, including wages and salaries, income and externalities are not included in the estimate, the construction costs account for 42% of the 'Total Present Value' costs. Maintenance accounts for 32%, operations costs 15% and occupancy costs 11%. Once the model is complete it can be used to run sensitivity analysis on the effects of different escalation and inflation rates, additional costs and alternative replacement profiles. A significant change in proportional breakdown of the WLLC was observed when the escalation rate for electricity and fuel costs was changed from 5% to 10% pa. The total present value WLCC increased from €34 million to €45 million with occupancy costs significantly increasing from 15% to 43% of the total WLLC. The affects of this change also had a bearing on the overall proportional breakdown of construction costs which decreased from 42% to 29% of the present value WLLC.

WLCC	Whole Life Cycle Cost	Life Cycle Cost	€/m2	Total Present Value	€/m2
CC	Construction Costs	12,774,063	1716.94	12,774,063	1716.94
2.0	Maintenance Costs	17,412,454	2340.38	9,636,031	1295.17
3.0	Operations Costs	5,640,000	758.06	4,625,512	621.71
4.0	Occupancy Costs	5,469,000	735.08	3,213,619	431.94
5.0	End of Life Costs	0	0.00	0	0.00
LLC	Life Cycle Cost (2.0 - 5.0)	28,521,454	3833.53	17,475,162	2348.81
TLLC	Total Life Cycle Cost (Incl Construction)	41,295,517	5550.47	30,249,225	4065.76
6.0	Non Construction Costs	0	0.00	0	0.00
7.0	Income	0	0.00	0	0.00
8.0	Externalities	0	0.00	0	0.00
WLC	Whole Life Cycle Cost (ex VAT)	41,295,517	5550.47	30,249,225	4065.76
VAT	Vat	5,574,895	749.31	4,083,645	548.88
WLC VAT	Whole Life Cycle Cost (Inc. VAT)	46,870,412	6299.79	34,332,870	4614.63

NAE	Net Annual Expenditure	Annual Costs	€/m2	%
2.0	Maintenance Costs	290,208	39.01	61%
3.0	Operations Costs	94,000	12.63	20%
4.0	Occupancy Costs	91,150	12.25	19%
NAE	Net Annual Expeniture	475,358	63.89	100%
7.0	Annual Income			
WNAE	Whole Net Annual Expeniture	475,358	63.89	

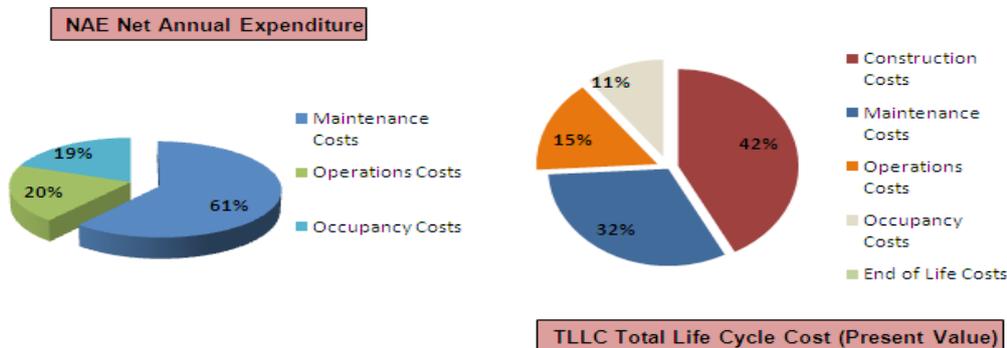


Figure 4: Whole Life Cycle Cost Summary

Table 2 provides an example of the input involved in the input sheets (operations and maintenance sheet). The PV factor calculations are carried out outside the print area; the factors are calculated from formulae, which extract the escalation (e), discount rate (i) and study period (n) from the relevant cells to include them in the calculation. If any of the variables are changed the result would proliferate through the estimate. The ‘utilities gas and electric costs’ are one of the costs associated with the ISO15868-5 classification category, ‘operations costs.’ Changing variables in this sheet, through the inherent linkages will have an effect on the total present value WLLC, as can be seen from the change in escalation rates above. Table 2 provides an example of a UPV* formulae used in the sheet which is typical to the other sheets used in the template. The UPV factor (column f2/row 3.2.2) which is calculated outside the print area is calculated with the relevant escalation rate (e), discount rate (i) and study period (n) through a number of calculations in the cells of row 3.2.2, columns f, f1 and f2. The formulae in f accounts for the top half of the UPV formulae, f1 accounts for the bottom half and f2 is a result of dividing f1 into f to achieve the UPV factor in f2. The resultant UPV* factor in f2 is multiplied by the annual amount to determine the PV cost (35.2564 x 6000 = 211,538). The text boxes above the screen shot show the formulae in the cells outside the print area. The formulae are included to show how the UPV* factor is broken up into three calculations.

Table 2: Example of PV Calculation

BCIS	Description	Qty	Unit	Rate	Annual Cost	Life Cycle Cost	(e)	Escalated Life Cycle Cost	(i)	Present Value	f	f1	f2	(n)	Annual Amount
Utilities costs gas and electric															
3.2.1 Fuel Costs															
3.2.1	Heating	1	LS	23,000.00	23,000	1,380,000	5.00%	8,539,047	5.00%	1,380,000	0.0000	0.0000	60.0000	60.00	23000
3.2.1	ESB	1	LS	30,000.00	30,000	1,800,000	5.00%	11,137,887	5.00%	1,800,000	0.0000	0.0000	60.0000	60.00	30000
3.2.2 Water and Drainage															
3.2.2	Water	1	LS	6,000.00	6,000	360,000	3.00%	1,007,670	5.00%	211,538	0.6846	0.0194	35.2564	60.00	6000

CONCLUSIONS

The SCSI ‘Working Group in LCCA has developed a template that can be used to aid construction professionals in producing LCCMs. The template puts forward a standard response to the CWMF and is produced in consultation with the International Standard Organisation 15686-5. The template which is available in a spreadsheet includes the relevant factors and formulae required to carry out PV calculations automatically. The template will be available to quantity surveyors in Ireland to aid them in carrying out WLLCA and should be analysed and used in conjunction with the SCSI guidance notes on LCC. A WLCCA case study of a secondary school in Dublin, Ireland was carried out using the template outlined above. The WLCCA was prepared to provide an example of how WLCCA could be carried out and presented in accordance with Ireland’s CWMF. The resultant WLCCA outlines a sixty year analysis of the school considering the proportional present value breakdown between investment costs and operational costs. The construction costs represent 42% of the overall present value WLC of the building over a 60 year study period.

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DOES FACILITIES MANAGEMENT MEET THE REQUIREMENTS OF AN ACADEMIC DISCIPLINE?

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The extent to which facilities management can be regarded as an academic discipline is discussed. The characteristics of an academic discipline are presented and used to apply established criteria regarding the definition of an academic discipline to facilities management. There is a general need to develop facilities management into an established academic field. However, the study indicates that facilities management does not yet meet all the requirements of a traditional academic discipline, although it is moving in that direction. It is also questioned how important and realistic it is to meet such requirements, as other practitioner and management related fields, such as project management, are observed as being in a similar situation regarding their status as academic disciplines. The research focus in facilities management journals is studied and information from the Euro FM network utilized. A framework is used to analyze facilities management. In addition, the way in which facilities management and some related fields see themselves in relation to the academic discipline status are studied. The finding is that FM research covers a wide range of academic disciplines. The term academic discipline has different meanings, and the definitions vary depending on the particular disciplinary perspective that is taken.

Keywords: academic discipline, facilities management, professionalism, research focus

INTRODUCTION

Facilities management (FM) is a relatively new scientific field. In the 1990s, facilities management was characterized as the practice of coordinating the physical workplace with the people and work of an organization. Facilities management was considered an interdisciplinary approach, integrating principles of business administration, architecture, and the behavioural and engineering sciences (Cotts et al. 1992; Cotts 1999; IFMA 1998). Has the knowledge of FM advanced since then? Does FM meet the requirements of an academic discipline?

There is a general need to develop theoretical frameworks and categorize existing knowledge. There is also a need to gain more insights into the different services that are managed, as this would help practitioners and researchers when searching for information and could also stimulate more research. This is not new thinking. Other authors from outside FM have asked similar questions: "Is FM just a profession or has it a theoretical basis? This question has to be answered to give FM a position in the academic world" (Wagenberg 1997). But given that an adequate answer is still missing, a deeper study of the topic is justified. Working within a discipline can give a scholar a sense of belonging, an identity. The term discipline is related to tools, methods, procedures, concepts, and theories which coherently account for the objects or subjects studied (Holland 2008; Krishnan 2009). A wide array of research disciplines have touched upon facilities management, and this has created a need for not only mapping research but also for categorizing the research. The "Frascati manual" (OECD 2002:30) provides the following definition of research: "Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."

Tondl (1998) points out that modern research activities are typically regarded as interdisciplinary or multidisciplinary. Contributions to FM-related research cover a wide range of academic disciplines, including architecture, various engineering disciplines, the social sciences, management, and finance. The term "disciplina" relates to the field of learning and teaching. It originates from the Latin words "discipulus" (pupil) and "disciplina" (teaching). Over time, disciplines are shaped and reshaped by external contingencies and internal intellectual demands. In this manner, a discipline becomes a way to organize and concentrate experiences (Goodlad 1979) into a particular world view (Miller 1982). A new discipline can be founded by creating a professorial chair devoted to it at an established university. Disciplines may have different degrees of formality and organization.

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The term “academic discipline” incorporates several elements of the above-mentioned meanings. Its exact definition varies depending on the context of discussion. The term has frequently been used in relation to the organization of knowledge. A discipline is usually defined as the specialized exploration of particular objects and subjects by applying six particular characteristics: methods, concepts, tools, exempla, laws, and theories (Holland 2008). Krishnan’s (2009) list of the characteristics of disciplines is somewhat similar:

1. Disciplines have a particular object of research (e.g., law, society, politics), but the object of research may be shared with another discipline
2. Disciplines have a body of accumulated specialist knowledge referring to their object of research, specific to them and not generally shared with another discipline
3. Disciplines have theories and concepts that can organize the accumulated specialist knowledge effectively
4. Disciplines use specific terminologies or a specific technical language adjusted to their research object
5. Disciplines have developed specific research methods according to their specific research requirements; and maybe most crucially
6. Disciplines must have some institutional manifestation in the form of subjects taught at universities or colleges, respective academic departments and professional associations connected to it.

Towards the end of this paper, Krishnan’s list will be referred to in the discussion on the extent to which FM meets such criteria of an academic discipline. FM is not the only academic area that has asked “Are we an academic discipline?” Stanford (1998) describes women’s studies as an emergent discipline. She believes that the field of women’s studies is interdisciplinary, generating exciting transformations of knowledge across disciplinary boundaries. She also points out that for boundaries to be crossed, they must exist. Terras (2006) discusses to what extent humanities computing can be regarded as a discipline. She argues that it exists as an academic discipline without being a formal university subject, and that this gives the scholars a sense of freedom: they are free to develop their own research and career paths and develop their research agenda in the direction they may chose. Schalcher (2007) recognized similarities about research following practice between the practice-driven approach to FM and the use of knowledge from cybernetics before the scientific bases were completed. He calls it a “necessary and unavoidable learning process” and a methodological approach of “trial and error” (Schalcher 2007).

Berner and Hahr (2006) have presented the development of “Construction Management and Building Industry” in the faculties of civil engineering in German-speaking universities and institutes of technology. Berner is one of twenty-four professors representing the chairs in construction management and building industry who developed a “Professor memorandum” in team work in 2005. The objective was a consistent external presentation of the German-speaking chairs and departments, because of the importance for the construction industry. The industry depends on proper functioning of all production capacities and services. Diversity is a characteristic of the related education and research. The above mentioned German speaking universities and research institutions integrated knowledge in fields such as management, organization, structural engineering, business administration, building law, and contract law. The professors regarded the superior position of their knowledge and research field in civil engineering as an outcome of the approach (Berner and Hahr 2006).

STATE OF THE ART IN FM

A number of publications have documented the development of FM. Key publications have been written by professors from outside the FM field. Keith Alexander created a first structure for the FM work field, identifying processes, services, facilities, and objectives as important categories with regard to organizations’ primary activities, and distinguishing FM from other disciplines: “It is the emphasis on process and service and the relationship between facilities and the objectives of an organization which characterize facilities management and distinguish it from the established professional disciplines of the industries which it calls construction, hospitality, support and other service industries” (Alexander 1992). Schalcher has described the unique combination of different disciplines as a real challenge of research in FM. In his opinion the different disciplines are macro- and micro-economics, building and information technology, and behavioural sciences: “Thus, it is truly inter- and trans- disciplinary research” (Schalcher 2007).

Jensen recorded the institutionalization of the work field as one of the main drivers for the development of the FM discipline: “A discipline arises when persons within a work field create a community to define the discipline and ensure its development through a kind of institutionalization of the discipline. Disciplines do not emerge from technological and structural changes in society” (Jensen 2008). The managerial side of FM has special importance, and FM is often regarded as a management discipline (Jensen 2008). In Italy, FM has been defined as a practice for managing non core business services. Alberto F. De Toni and Fabio Nonino proposed their theory around the FM discipline and described a new model, named Open Facility Management: “It is presented as a multidisciplinary approach for the integrated and coordinated design, planning and management of non core services” (De Toni et al. 2009). In the United States, the first educational program in FM was established in the 1980s. Professor Bill Sims established the BS and MS degree programs in FM at Cornell University. By the end of 1990 approximately fifty programs in FM had been established at American Universities (Cotts 1999).

FM started to become an academic discipline in Europe after research centers and institutes were established at universities. The first European FM research centers were established in the UK, Netherlands, Norway, and Denmark:

- 1990, Glasgow; 2000, relocated to Salford: Centre for Facilities Management (CFM) at the University of Salford, Professor Keith Alexander, Architecture.
- 2001, Delft: Center for People and Buildings, at the Delft University of Technology, Professor Hans de Jonge, Real Estate Management, Wim Pullen, Director of CfPB.
- 2002, Trondheim: Metamorphosis – Centre for Real Estate and Facilities Management at the Norwegian University of Science and Technology (NTNU), Professor Tore Haugen, Architecture, and Engineering.
- 2008, Copenhagen: Centre for Facilities Management (CFM) at the Technical University of Denmark (DTU), Professor Per Anker Jensen, Engineering.

Researchers from all over Europe participate in the Research Network Group (RNG). RNG is a workgroup of the European Facility Management network (EuroFM). The vision of EuroFM is: “Advancement of knowledge in Facility Management in Europe and its application in practice, education and research, in order to communicate best practice through Europe.” EuroFM holds an annual research symposium and European FM conferences (EFMCs). These activities take place at different locations in Europe. The topics of the research symposiums are connected to the topics of the business symposiums and support the cooperation of business and science. To date, ten research symposiums have been held since the start in Salford (UK) in 2002. The eleventh EuroFM research symposium will be EFMC 2012 in Copenhagen (Junghans 2011d).

ARGUMENTS PRO FM AS AN ACADEMIC DISCIPLINE

FM can be discussed as an academic discipline regarding to the high number of education programs provided since the 1990s. Approximately 50 FM education programs are listed in “The facility management handbook” (Cotts 1999). They are located at universities in the United States and fall into the following categories: IFMA-recognized programs, other degree programs, programs with facility management related courses, and certificate programs in facility management (Cotts 1999). The “European Facility Management Education Guide” documents information about academic education programs in Europe (EuroFM 2009).

In addition a high number of FM specific books were published. Andrea Fornasier and Gianluca Zanutto have presented a list of more than 100 service management books regarding FM and global service contracts (Fornasier and Zanutto 2009). The books are mainly written in English and were published between 1989 and 2007. A common understanding about the object of research as non core business services can be recognized (Alexander 1992; De Toni and Nonino 2009; Schalcher 2007). The institutional manifestation of FM in Europe started with the establishment of research centers at universities (Jensen 2008). Beginning of 2011 the European Facility Management research network group (RNG) has participants from twenty-two universities in ten countries. The participants are mainly Professors of facilities management and also researchers (Junghans 2011c).

ARGUMENTS CONTRA FM AS ACADEMIC DISCIPLINE

FM can be discussed as a work field. Persons managing this work field have different professional and educational backgrounds (Jensen 2008). FM research in Europe might be not as much developed as in the United States. A literature research within the European library of earlier studies revealed a relatively small number of FM publications from Europe compared with the high amount of publications from the United States (Junghans 2011b).

APPROACH TO A NEW DISCUSSION OF FM AS ACADEMIC DISCIPLINE

The above-mentioned characteristics of an academic discipline will be used to discuss to what extent facilities management can be regarded as an academic discipline. Established criteria on what an academic discipline are applied to facilities management. Background information about the development of a European research agenda in FM was gathered from earlier studies. The EuroFM Research Network Group formed an additional source of information. By the beginning of 2011, the group consisted of representatives from twenty-two universities from ten countries. At this time Antje Junghans was chairman of the RNG. Junghans conducted a survey among the RNG members, and representatives from seventeen universities from nine countries participated. The survey delivered information related to ten international FM research fields (Junghans 2011c). In addition, the research focus in facilities management journals was studied and information from the Euro FM network utilized.

A systematic selection of papers was made in four main steps. The research fields were used as keywords for additional keyword

research in the “Journal of Facility Management” (“JFM”) and “Facilities.” Both of the aforementioned journals are recognized as important scientific journals in the FM field. A comparison of the survey results and the journal results identified “workplace” as the most important object of research. A search on the keyword “workplace” yielded 20 papers in the “JFM” and 27 in “Facilities.” The top five research papers were selected in historical order for further analysis (Figure 1).

EUROFM RNG

The Research Network Group (RNG) of the European Facility Management network (EuroFM) conducted a survey of the goals, reality, option, and will of FM research in European universities: FHS Kufstein Bildungs GmbH (A); ZHAW Züricher Hochschule für angewandte Wissenschaften (CH); Fachhochschule Frankfurt am Main – University of Applied Sciences (D); HTW Berlin – Hochschule für Technik und Wirtschaft Berlin (D); Karlsruhe Institute of Technology, Universität Karlsruhe (D); DTU Management Engineering, Technical University of Denmark (DK); Alto University of Technology (FI); Inholland, University of Applied Sciences, Inst. of Higher Prof. Ed. (NL); NHTV Facility Management School Breda (NL); TU Delft (NL); Saxion Hospitality Business School (NL); Hanze University Groningen (NL); Akershus University College (NO); Norwegian University of Science and Technology NTNU (NO); IST – Technical University (PT); University of Bolton Built Environment (UK); and the Centre for Facilities Management, Manchester (UK).

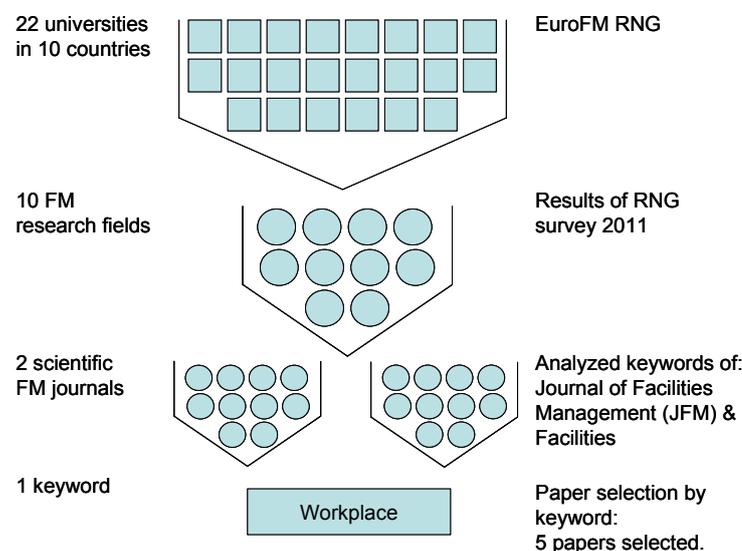


Figure 1: Paper selection process

IDENTIFICATION OF TEN FM RESEARCH FIELDS WITHIN THE RNG SURVEY

Within the RNG survey, ten European FM research fields were identified. First, the research fields were assessed using three criteria: number of participating institutions per research field, number of contributions per research field, and number of participating countries. Then, the total number for all three criteria was used to prioritize the ten research fields, as follows: sustainability (47), knowledge (45), added value (35), workplace (30), demand and supply (24), built environment (22), usability (21), future (20), health care (20), and work organization (17) (Junghans 2011d). Most of the identified research fields are related to earlier EuroFM projects or publications (e.g., added value (Jensen 2008), future (Alexander 2009), workplace (Nenonen et al. 2009), usability (Alexander 2010; Blakstad et al. 2010), health care (Lavy and Shohet 2009), sustainability (Balslev Nielsen et al. 2009; Junghans 2011a). The findings may indicate that EuroFM is a close community with relatively consistent research activities. They may also indicate that EuroFM research fields react to the mainstream and the notion of a common research focus.

KEYWORD RESEARCH IN SCIENTIFIC JOURNALS

In addition to the survey results and analyses of EuroFM projects and publications, a keyword research in two scientific journals was conducted, namely “Facilities” and the “Journal of Facilities Management” (“JFM”) (Table 1).

SELECTION OF FIVE RESEARCH PAPERS

The above-mentioned results underline that “workplace” is a main topic for FM research. Deeper insight into the use of this keyword was gained by examining the top five listed publications from “Facilities” and “JFM”, written by Becker (2002), Shabha (2007), Haynes (2008), Bakker and van der Voordt (2010), and Sailer (2011).

Table 1: Keyword research in two scientific journals

“FACILITIES”		“JFM”	
Keywords	Results	Keywords	Results
1. Workplace	27	1. Workplace	20
2. Knowledge	18	2. Knowledge	6
3. Health care	13	3. Sustainability	6
4. Built environment	1	4. Added value	1
5. Sustainability	6	5. Future	1
6. Added value	4	6. Health care	1
7. Work organization	4	7. Built environment	0
8. Demand and supply	0	8. Work organization	0
9. Future	0	9. Demand and supply	0
10. Usability	0	10. Usability	0

The five articles and additional information about their authors was discussed regarding to Krishnan’s (2009) sixth criterion: “Disciplines must have some institutional manifestation in the form of subjects taught at universities or colleges, respective academic departments and professional associations connected to it.” The authors come from different disciplines, and hence FM encompasses multiple disciplines (Figure 2).

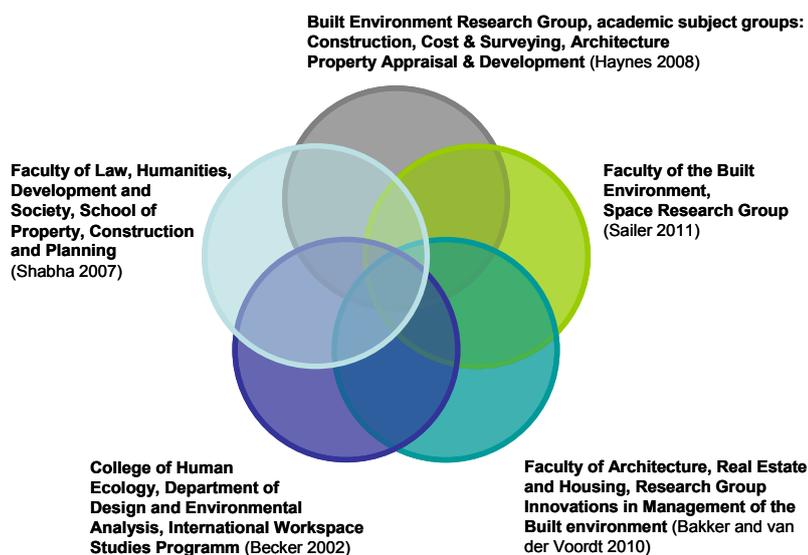


Figure 2: Institutional manifestation of FM research

CONCLUSIONS

The following discussion of the extent to which FM meets the established criteria of an academic discipline is based on the work of Armin Krishnan (2009).

PARTICULAR OBJECT OF RESEARCH

“Disciplines have a particular object of research (e.g., law, society, politics), but the object of research may be shared with another discipline.” (Krishnan 2009; criterion 1). FM has a particular object of research, which is characterized by its belonging to non core business services, focusing on workplaces and their management. Indications of this were found through literature research. A common understanding of the FM research focus on non core business services can be underlined (Alexander 1992; Cotts 1999; De Toni and Nonino 2009; Schalcher 2007). And FM can be seen in close relation to the design and management of workplaces (Alexander 1992; Cotts 1999; IFMA 1998; Wagenberg 1997). Further, FM is often regarded as a management discipline (Jensen 2008).

BODY OF SPECIALIST KNOWLEDGE

“Disciplines have a body of accumulated specialist knowledge referring to their object of research, which is specific to them and not generally shared with another discipline.” (Krishnan 2009; criterion 2). FM has a body of specialist knowledge. The indications of this are the high numbers of FM education programs which have been developed since the 1980s. More than fifty American universities are listed in “The facility management handbook” (Cotts 1999). FM is a work field. Even though persons working in this field might have different educational and professional backgrounds (Jensen 2008) they are likely to share common specialist knowledge. How much of this knowledge is shared with other disciplines can be questioned.

THEORIES AND CONCEPTS THAT CAN BE USED TO ORGANIZE KNOWLEDGE

“Disciplines have theories and concepts that can organize the accumulated specialist knowledge effectively.” (Krishnan 2009; criterion 3). The theories and concepts of FM are shared with a number of other disciplines. In general, research seems to follow practice. The methodological approach has been described as “trial and error” (Schalcher 2007). Thus, FM does not have any common theories and concepts that can be used to organize knowledge.

SPECIFIC TERMINOLOGIES

“Disciplines use specific terminologies or a specific technical language adjusted to their research object.” (Krishnan 2009; criterion 4). FM has specific terminologies. Under the European standardization (EN 15221-1:2007), the terms and definitions are documented: “The purpose of this standard is to define the terms in the area of Facility Management.”

SPECIFIC RESEARCH METHODS

“Disciplines have developed specific research methods according to their specific research requirements.” (Krishnan 2009; criterion 5). The theories and concepts of FM are common to a number of other disciplines. It is not apparent that there is a need for specific FM research methods.

INSTITUTIONAL MANIFESTATION

“Disciplines must have some institutional manifestation in the form of subjects taught at universities or colleges, respective academic departments and professional associations connected to it.” (Krishnan 2009; criterion 6). FM has a large and growing institutional manifestation. The starting point was the development of FM programs in the US at the beginning of the 1980s (Cotts 1999). Today, many universities in different countries offer FM courses. The Research Network Group of the European Facility Management network currently has twenty-two members representing universities in ten countries (Junghans 2011c).

Based on recent developments in the field, FM meets several of the criteria that qualify a subject as an academic discipline. Important questions concern to what extent FM knowledge is unique to the FM field, and to what extent there is a unique FM research methodology, and whether there is a need for such a methodology. FM appears to be on the way to becoming an academic discipline, even though it also has clear multidisciplinary characteristics. Depending on what criteria are applied, it may already be one. It may also be questioned to what extent it is important for FM, as a multidisciplinary, interdisciplinary and practitioner-focused “discipline,” to meet all the defined criteria.

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VALUE ENHANCING PROCESSES IN BUILDING AND REAL ESTATE

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ValPro (value driven procurement of buildings and real estate) is a case based R&D project in an Eracobuild network with participants from Norway, Denmark, Sweden, Finland, France and Cyprus. The R&D project aims at defining frameworks and business scenarios for a value driven vision, based on state of art and trends, barriers and drivers that can be identified in case studies. This paper discusses barriers and drivers related to value creation in case study of a new office building project procured by a large oil and gas company. The case study shows that despite the clearly defined strategic goals aimed at creating use value for the end user in the procurement documents, the project delivery organizations' value and business models are focused at project efficiency goals and quality as defined by their own discipline. In the paper we argue that in order for an end user organization to make sure the end product will deliver value in use, the organization must exert governance throughout the project, related to strategic business goals and concrete success criteria. Our main thesis is that understanding building projects as critical enablers for realizing operational goals in the short run and sustainable values in the long run is essential to consolidate strategic value creation related to project goals. Establishing a business model for a project means establishing a building project context where corporate strategies and long term value creation are emphasized. In the paper we present a Governance Model framework that may enable both the demand and the supply side to focus on both effectiveness and efficiency related project goals.

Keywords: value enhancement, business model, project governance

INTRODUCTION

ValPro (Value driven procurement of buildings and real estate) is a case based R&D project in the Eracobuildii network with participants from Norway, Denmark, Sweden, Finland, France and Cyprus. ValPro aims at defining frameworks and business scenarios for a value driven vision related to building projects; based on state of art and trends, barriers and drivers that can be identified in case studies.

An important objective of the Norwegian ValPro project is to investigate what hampers and what enhances the delivery organization's ability and possibility to create value for the society, user and owner in the initial and pre design phases of building projects. This paper presents the results of one case study in the Norwegian research project. The case is a new office building project procured by a large oil and gas company.

By delivery organization we mean the project team that is responsible for the delivery of the project and includes consultants, designers, contractors, evaluators and managers (Blyth and Worthington, 2010). By initial and pre-design phases we mean all project related activities executed before detailed design and construction. They may be called by different names, but usually include feasibility studies, strategic and detailed briefing, concept development and choice, and scheme or pre-project design.

The concept of value is important in projects. Samset (2003) concludes that three perspectives are needed to have successful projects: the owner perspective focusing on the long-term outcomes of the project; the user perspective focusing on the effects related to using the product i.e. the finished building; and the building delivery organization's perspective focusing on the deliverables or outputs from the project. Satisfying the goals of these three perspectives results in project success and business value for the project owner, but does not necessarily include societal issues and concerns. Therefore the five requirements or success factors endorsed by OECD (as well as by UN and the European Commission) in project evaluations: efficiency, effectiveness, relevance, impact and sustainability (OECD 2010) are the most appropriate criteria against which project value or success should be measured.

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ii. ERA-Net Eracobuild is a network of national R&D programs focusing on construction and sustainable built environments and aims to develop synergies between national programs by sharing strategies and establishing joint programs and projects. Eracobuild has so far defined two thematic frameworks for transnational cooperation: "Sustainable Renovation" and "Value Driven Processes".

International experts conclude however that the biggest challenges in large investment projects are (Klakegg 2009:1):

- User needs unknown, misunderstood or ignored
- Project goals unknown or misunderstood
- Missing commitment from key stakeholders
- Conflicts about goals and/or strategies in the project
- Low economical/financial benefit against investment and cost in use and operation
- Business perspective changes between initial phase and delivery phases

The assertions in the R&D project reported in this paper therefore are two-fold:

In order to make sure that value for the project owner, user and society are fulfilled in building projects:

- A project framework ensuring corporate governance must be in place
- The project owner's business model must be reflected in the delivery organization's business models

VALUE CREATION – VALUE CAPTURE

Value can be defined in different ways. The common definition is linked to financial measurements of how much a customer is willing to pay for a specified product. However, it is individuals and groups that create the product value. Therefore it is necessary to look at drivers for innovation and creativity as well as how to create value for the client or buyer as well as for the company that develops the product or a building. And how does the management empower the delivery organization and build an ideology that supports and directs an organizational behaviour which will be able to meet the client's needs.

HUMAN RESOURCE AS A VALUE

Bowman and Ambrosi (2000) define resources as a value when it enables customer needs to be satisfied. In the construction industry resources in this perspective are mainly human resources which are crucial to enable a firm to conceive of or implement strategies that improve its efficiency and effectiveness. Ind (2003) maintains that “using the brain power and creativity” of employees needs to achieve a balance of what the economist Ernst Schumacher called freedom and order. If the organization has a clear ideology, it provides a focus for employees. This is the element of order, and it allows employees to deliver customer focused products and services in the most appropriate way.”

USE VALUE AND EXCHANGE VALUE

Bowman and Ambrosi (2000) distinguish between value creation and capture of value. They focus on the fact that literature tends to use the term “value” to refer to different phenomena. This leads them to a question of how value is measured by the customer. Does the product meet their needs and how do the customers make judgements about the value of the product. The classical first order effect for users may be difficult to measure in financial terms and at the moment, but will provide value through the use and operation. The use value regarding to Bowman and Ambrosini (2000) refers to specific qualities of the product (building) perceived by customers in relation to their needs, e.g. a hospital building which supports efficient health care, an office building which stimulate and inspires the employees or the acceleration of a car, the texture of the apple etc. Judgements of use value are subjective and individual. Use value is what is perceived by the customer. Customers choose the good that will confer on them the largest consumer surplus (the difference between the customers' valuation of the product and the price paid). The chosen product must therefore be differentiated in ways which are valued by the customer; it must deliver more customer surplus than the alternatives (Bowman and Ambrosini 2000).

Exchange value on the other hand refers to price. The processes which lead to a completion of a building are the result of processes inside the participating companies which create use value and subsequently realize exchange value. In operation the building owner and user capture and realize use value in the building. The amount of the benefits or value depends on to which extent user needs are satisfied. The building in itself still has an exchange value depending on its quality and ability to satisfy future demands. This value depends on to which extent the building is flexible and adaptable, and may adapt to new legislation as well as be transformed to a different use.

If the use value perception applies to all kinds of purchases, as Bowman and Ambrosini (2000) say, the same type of use value judgement should be made by a company when procuring a new building. The belief is that a new building better suited to the core

business is likely to create profit through use value. This requires that the company understands the cause-effect linkage between the use value of the purchased resource and the ultimate delivery of profit. In building design the interventions and skills of consultants and architects are vital to value creation provided they are able to understand the needs of the customer and design a building that are capable of supporting the users value (profit) creation in operation.

The exchange value is normally realized first time at project completion and should be considered as a process throughout the lifecycle. The exchange value at any moment in time will then be dependent of the buildings capability of adapting to changes and subsequently the transformed use value.

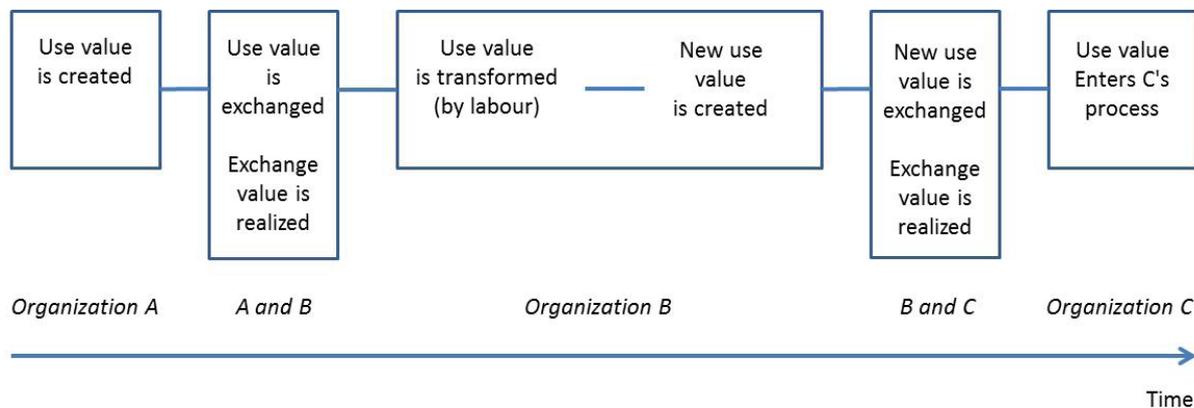


Figure 1: The process of value creation (based on Bowman & Ambrosini, 2000)

TWO DIFFERENT ORGANIZATIONAL PERSPECTIVES: OUTSIDE IN VERSUS INSIDE OUT

Porter and Kramer (2006) claim that in order to improve a company's competitive edge you need an "Outside-In linkage" that affects its ability to improve productivity and execute strategy. The Outside In strategy takes customer value as its starting and end point. Companies using this approach are focused on creating and nurturing their customers by providing high calibre customer value. They put themselves in the position of their customers, and look at the services or products they are going to deliver from their customer's perspective. The Outside In strategy is also about having a business vision that is forward looking and not looking backwardsⁱⁱⁱ. In contrast, the Inside Out perspective only focuses on the company's own capabilities and strengths. With this approach a company will give a customer an account of the company's resources and aim at providing them in the most efficient way. The problem with the Inside Out approach is that by nature it is limiting organizational development and demonstrates lack of agility towards adapting to changes in the market place. Comparing the two approaches suggests a conflict between two fundamental stakeholders which a company needs to deliver to: its customers and its shareholders. If incorporated appropriately, pleasing and keeping customers will increase profits, which then will secure shareholder returns. However, this does suggest a shift in emphasis away from directly trying to deliver to shareholders. Keeping the main focus on shareholder value can easily lead to short-term thinking and an Inside Out approach to business.

The key is to understand that the customer is the source of value, and the market will reward the best value proposition. This is a realignment of values that places shareholder value as an outcome of customer value. Customer value should always be the primary focus.

Outside In strategy focuses on customer value and is based on the belief that the ability to compete is dependent on market insight and ensuring that every part of the company puts customer value first.

iii. <http://www.brandmatters.com.au/outside-in-and-inside-out-strategy/>

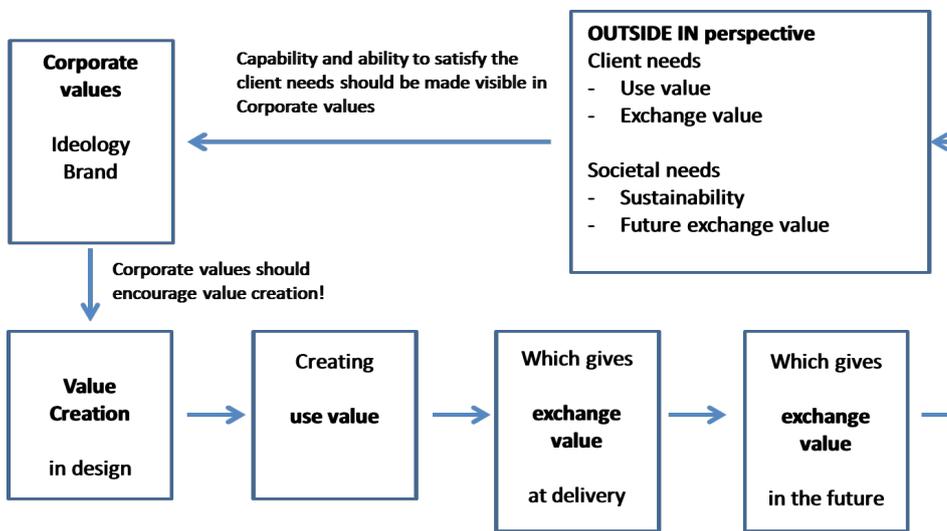


Figure 2: Model illustrating Outside-In perspective on value creation

Collins and Porras (1998) studied eighteen visionary and long-established companies and concluded that throughout the history most of the visionary companies had a core ideology that transcended purely economic considerations. And – this is the key point– they had to a greater degree than the comparison companies in their study a core ideology. Core ideology consists of core values and core purposes. Core purpose is a *raison d'être*, not a goal or business strategy, according to Collins and Porras (1996). They define core ideology as the enduring character of an organization – a consistent identity that transcends product or market life cycles, technological breakthroughs, management fads and individual leaders. The core ideology provides the glue that holds an organization together through time. And they continue saying that the ideology consists of two distinct parts: Core Values – a system for guiding principles and tenets; and Core Purpose, the organization's most fundamental reasons for existence.

This core ideology according to Ind (2003), reminds one that the purpose of building employee commitment is to deliver value to customers. Collins and Porras (1998) argue that the content of the core values does not matter, any words will do. The important thing is to have the values and to integrate them into the organization.

While the “outside–in linkage” tells you what is expected from customers and society and reflects a market driven strategy, the “inside–out linkage” focuses on the company's resources and capabilities of creating value. The inside out- focus is limiting the company's ability to adapt to changes in market conditions and reflects a strategy relying on internal capabilities such as processes, technology and design. Typically an inside-out driven company focuses on systems and planning and a belief that this is what the market asks for.

A VALUE MODEL

A value model is the systematic approach to a value creation culture. In diagnosing and changing organizational culture Cameron and Quinn (1999) state that organizational culture is reflected by what is valued by the organization, the dominant managerial and leadership styles, the language and symbols, the procedures and routines and the definitions of success that make an organization unique.

A value model should thus reflect client's expectations of value creation and how the delivery organizations are expected to solve the problems for internal and external benefits. The focus on use value and the outside in market strategy underline the importance of an alignment of production and design strategy with the customers' expectation of created value. The model of creating values should clarify the usefulness of the delivery team's resources in the use value creation process.

The project owner's value models are vital for value creation in projects –as a basis for defining the performance criteria governing the project success, and for guiding the procurement and execution process. Likewise the project delivery organizations' value models are important as a basis for composing projects teams that are able to answer in an intelligent way the project owner's value quest for value creation in a project.

A FRAMEWORK FOR CREATING VALUE IN BUILDING AND REAL ESTATE PROJECTS

A literature survey has been conducted related to governance and business models aimed at building a theoretical framework for creating value in building and real estate projects. The framework created is presented in the next chapter.

GOVERNANCE

Projects must have their reason based on organizations' business strategy. Governance also includes structures which make it possible to establish goals and choose instruments for achieving the goals. In accordance with this principle, the project organization must establish a strategy and define long-term goals, aligned with the project owner's strategy. A model must be established showing how the relationship between the permanent owner-user organization and the temporary project organization shall be handled. The model must secure the strategic goals of the owner, i.e. the project success, and at the same time avoid reducing the scope and productivity of the project, i.e. the project management success.

Cooke-Davis (2004) points to the fact that factors for project management success does not necessarily lead to project success. While factors for project management success are often directed at time- and cost measures, project success is related to the project owner's major goals. In a professional project delivery organization put together and managed according to project management success factors, the probability for achieving goals related to success criteria like time and cost are high. The project delivery organization are expected to deliver the project in accordance with the given input; while effect related goals and benefits realization are normally left to the owner organization, who by operations management must realize organizational success (Cooke-Davis, 2004).

A critical success factor for project success therefore is the existence of an effective benefits delivery and management process that involves the mutual co-operation of project management and client organization line management functions.

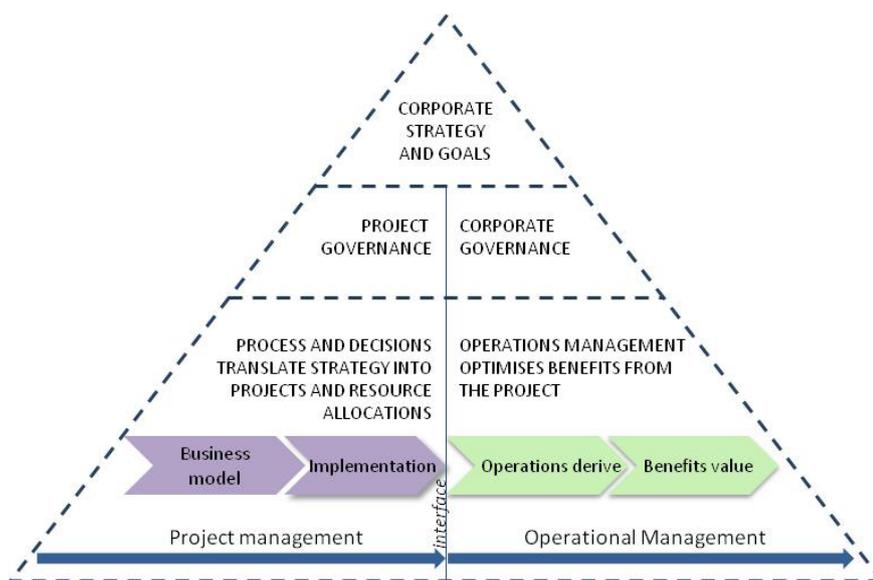


Figure 3: Cooperation between Project and Operations Management in a strategic perspective (based on Cook-Davis 2004)

Corporate governance involves a set of relationships between a company's management, its board, its shareholders and other stakeholders. Corporate governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined (Müller, 2009).

Project Governance involves the same basic structure as Corporate Governance and is the responsibility of the organization's board of directors. Their main task is to establish definitions and goals for the project. A major governance activity is to put in place the means to achieve these goals. While the corporate governance handles the way benefits are realised in operation, the project governance is dealing with how to deliver the capability to realize benefits or values in operation (OGC, 2007).

STAGE GATE PROCESS™ MODEL

The so called Stage–Gate Process Model™ (Cooper, 1988) is regarded by several organizations to be an appropriate tool for developing not only project management success, but also project success. The model is characterized by an efficient cross-disciplinary teamwork towards decision points, with set deliveries and related demands and a continuous interaction with the project owner. This process aims at optimizing the dialogue between the project owner and the project, and decisions aimed at value creation. Attention to project success factors and coordination against project management success factors occurs by interaction between the project owner and the project execution organization in a stage- gate model. Typical features in a stage- gate model are:

- Clearer definition of roles than in conventional Project Models
- Corporate Management/project owner is the ultimate decision level, at the decision gates
- Project manager and project management team are responsible for the progress, and project performance, including generation of decision facts and material at the decision gates (DG)

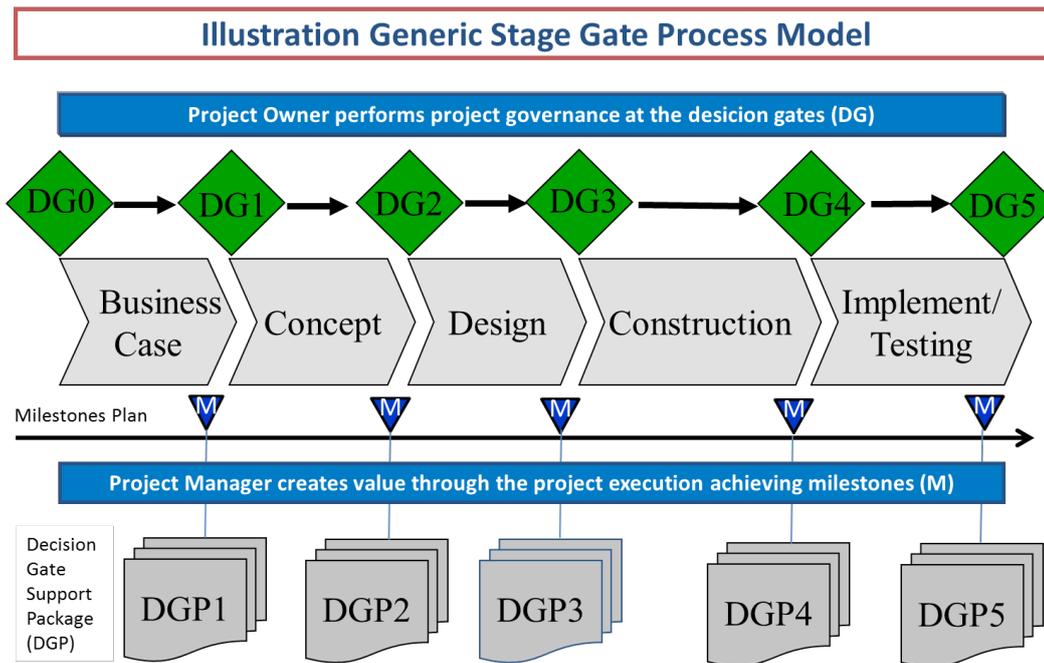


Figure 4 Generic Stage Gate Process Model (source: Jon Lereim 2010)

BUSINESS MODELS

As said before, the building sector is mainly focused on reducing investment costs, rather than applying more comprehensive approaches for optimizing total facility life cycle values for the benefit of owners, users, and the society. This is of course due to several factors, among which current business models that do not provide for innovation and value creation are assessed by the R&D project as one of the most important.

No generally accepted definition of the term business model has emerged till now, and there is also confusion about terminology (Morris et al. 2005; Shafer et al. 2005; Zott et al. 2010). Wikipedia's definition of Business Model is general and easy to understand: "a business model describes the rationale of how an organization creates, delivers, and captures value – be that economic, social or other forms of value". In theory and practice, according to the same reference (Wikipedia 2011), the term business model is used for a broad range of informal and formal descriptions to represent core aspects of a business, including purpose, offerings, strategies, infrastructure, organizational structures, trading practices, and operational processes and policies.

Shafer et al. (2005), after reviewing relevant literature, concluded that business is fundamentally concerned with creating value and capturing returns from that value, and a model is simply a representation of reality. They also concluded that neither value creation nor value capture occurs in a vacuum. Referring to Hamel (2000) both value creation and capture occur within a network which can include suppliers, partners, distribution channels and coalitions that extend the company's own resources.

Morris et al. (2005) claim that a standard framework for characterizing a business model must be reasonably simple, logical, measurable, comprehensive, and operationally meaningful. They suggest a framework that consists of three increasingly specific levels of decision making: Foundation level; Proprietary level; and Rules level. The three levels reflect the different managerial purposes of a model.

While the foundation level is adequate to capture the essence of a model for many firms, sustainable advantage ultimately depends on the ability of the firm to apply unique approaches to one or more of the foundation components. The proprietary level entails innovation unique to a particular venture. Where the foundation level is generic, the proprietary level becomes strategy specific. Where the foundation level is fairly simple to replicate by competitors, the proprietary is not. Once implemented, a model's success can be tied to a basic set of operating rules or guiding principles. These guidelines ensure that the model's foundation and proprietary elements are reflected in on-going strategic actions.

A well-formulated business model must address six key questions on each of the above levels:

- How do we create value?
- Who do we create value for?
- What is our source of competence?
- How do we competitively position ourselves?
- How do we make money?
- What are our time, scope, and size ambitions?

The Morris et al.'s (2005) business model framework is a tool for both checking and securing compatibility between the different stakeholders' business models in projects.

PROJECT RELATED PERFORMANCE CRITERIA

UN, OECD and the European Commission have endorsed five criteria for what projects ought to strive for: efficiency, effectiveness, relevance, impact and sustainability. Delivering efficiently and successfully a well-defined, pre-specified project within a clearly defined constant environment are usually considered to be correspondent to the efficiency requirement. According to Samset (2010) efficiency represents only the immediate indications of a project's success in delivering the outputs. There are many projects that score highly on efficiency, but prove to be disastrous in terms of their impact and utility in the short and long run. The IMEC study by Miller and Lessard (2001) distinguish between efficiency and effectiveness of project success, where the latter points to the value generated by the project. Samset (2010) distinguish between a project's strategic and tactical performance. Success in tactical terms means meeting short-term performance targets, such as producing agreed outputs within budget and on time. These are essentially project management issues. Strategic performance includes broader and longer-term considerations as to whether the project should have sustainable impact and remain relevant and effective over its lifespan.

Strategic project performance is what should be strived for in order to create value for the project owner. In the Governance model presented in this paper we have divided strategic performance criteria in two groups: User effectiveness and Long term effectiveness goals. They can be concretized in different ways by project owners. Here we have concretized User effectiveness goals as Life cycle costs, Quality (functionality), Flexibility and Usability, and Long term effectiveness goals as Adaptability, Transformability and Environmental impact.

A FRAMEWORK FOR CREATING VALUE IN BUILDING AND REAL ESTATE PROJECTS

The study of theory related to cooperation between corporate governance and project governance (see Figure 1) and business models has led us to develop a framework shown in Figure 3. Named a Governance model, it serves as a theoretical framework for understanding what hampers and/or enhances value creation in the early phases of building projects.

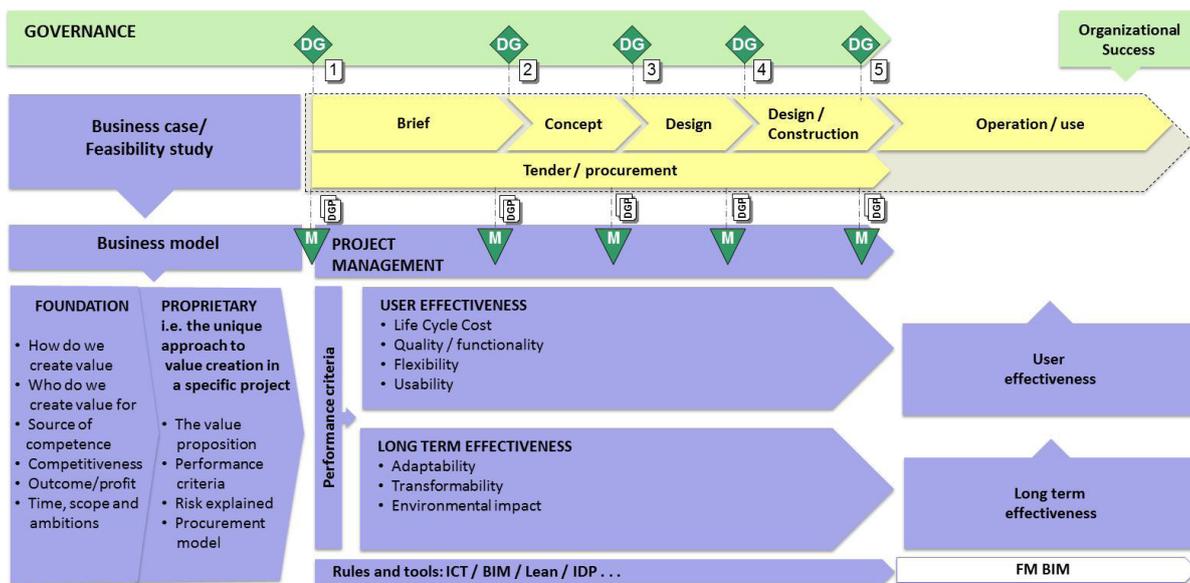


Figure 5 Outline for a Governance framework. SINTEF (source: Byggforsk & Rambøll Norge 2011)

RESEARCH DESIGN AND METHOD

References to the use of theory usually involve the formation of hypothesis of cause-effect relationships. These theories would therefore be considered relevant to explanatory case studies. Theories however also can be important for descriptive case studies. A descriptive theory is not an expression of a cause effect relationship. Rather, a descriptive theory covers the scope and depth of the object (case) being described (Yin 2003). This theory, Yin continues, should be openly stated ahead of time, should be subject to review and debate, and will later serve as the design for a descriptive case study. In our situation, a rich literature and debate about the limitations of project management and delivery organizations to deliver strategic project value, allowed us to create the theoretical model for value creation in building projects – the Governance model described in the previous chapter. The assertions behind the model as described earlier in the paper are:

In order to make sure that user effectiveness and long term effectiveness for owner and society goals are fulfilled in building projects:

- Project governance (the use of governing mechanisms) on behalf of the project owner and user organization is needed
- The delivery organization's business model must reflect the project owner's business model

The study is a descriptive case study (Yin 2003) where the theoretical model has been used as a framework for analyzing two project cases, focusing on two elements:

- the project owner's governance model
- the main stakeholders' value and business models

The cases are two major projects, one private and one public, chosen by the project owners who are participating in the R&D project. The logic for the selection of the cases is based on the relevance of the cases being test-sites for the theory (Denscombe 2003), the theory being the Value theory explained and the Governance model developed in the project.

The empirical data have been collected by document studies and interviews with the main stakeholders in the project delivery organizations and project owner and user organizations. The theoretical model and empirical findings have been presented and discussed in workshops with the main case stakeholders. In late 2011 the findings and preliminary conclusions will be presented and discussed in a wider audience with invited stakeholders from real estate and building organizations. One of the case studies constitutes the empirical basis for conclusions presented in this paper. However, the empirical findings in the other case study confirm this paper's conclusions.

CASE DESCRIPTION

The project case, here called FBO, is the new international headquarter of one of the world's leading oil companies, for 2500 employees. It encompasses approximately 65.500 m² and the company will start moving into the HQ in September 2012. The project was procured by the oil company in a competition where they received 40 different real estate proposals from developers in the region. Among the forty proposals the oil company chose five for further development and negotiations about cost and functional and other building qualities. Four months later they chose the winning concept and started the final contract negotiations with the developer. In the contract the company had an option to either buy or rent the finished building. They eventually decided to rent the building on a 15-year lease contract. The company is named the project owner in this paper, while the real estate developer is seen as part of the delivery organization.

THE PROJECT OWNER'S VALUE AND BUSINESS MODEL

On the foundation level, the oil company's business model is of course to create value through up-, mid- and downstream activities related to oil & gas, and pursuing business opportunities for renewable energy production and carbon structure. They position themselves competitively by using their core expertise, competence and capabilities to create profitable business in their existing positions and develop new opportunities for value creation. They make money by finding and/or getting access to national and international oil- and gas resources. What does the oil company do on the proprietary level of their business model in order to attract and retain their core expertise and create profitable business in new and existing positions? Merging with another company in 2007 is one action. Co-locating new and existing employees in a common building is one element in the integration process. Creating a workplace which enhances the integration of and collaboration between employees is another. "Value is created through collaboration" says the oil company's Handbook 2010. The company's work space design model shall enhance collaboration and their vision for the new headquarter is that "FBO will be an exceptional place to perform and develop". In the contract documents they explain what their business model implies for the design of the building and the work space:

- Arrange for future ways of working by
 - Architecture and technology that support new ways of working
 - Stimulate new work processes
 - Integrate collaborating partners in our work processes
- Support collaboration, communication and learning
 - Company adapted work space solutions that are robust for change
 - Flexible work space solutions with ample opportunities for meeting spaces
 - Functional and reliable ICT solutions
- Express well-being, solidity and safety related to company goals to be a
 - Leading organization related to EHS
 - Preferred organization to work for employees and an attractive and innovative workplace when recruiting

CORPORATE GOVERNANCE BY THE PROJECT OWNER

The oil company's governance philosophy and model is based upon procurement of large off-shore and on-shore oil & gas installations. The company's project director and the director for procurement underline two important factors behind governance success in projects:

- Using substantial resources up-front
- "Preparing is everything"
- "It's the up front preparations which determine the results and value creation for the company".
- Using the right resources in the project
- "Very competent persons designing and negotiating the contract"
- "Everything is based on knowledge and competence... in important project functions"

The company has a risk-based approach to governance. Three elements are fundamental in their governance model:

- The preparations done up front embodied in the contract and specifications. The contract is comprehensive and detailed and gives the oil company all rights reserved regarding design or other changes in the project
- Risk assessment of own and delivery organization's competence and complementing where necessary. The oil company's focus on knowledge and competence implies that their building projects are too important for them to be left to chance
- Continuous quality and risk management and control throughout from the start to the end of the project process – including the warranty period

The company's governance function and quality and risk management and control are organized in two internal sub-projects:

- Quality assurance and risk management of the building project – including enhancing building elements and products innovation
- Quality assurance and risk management of the work space/interior space project – including piloting collaborative workplace solutions and technologies as well as products

Decisions are taken on two levels, depending on the time/cost effects of the issue:

- Project director
- Governing committee representing the tenant i.e. the oil company's top management

The oil company both want and expect suppliers to innovate in this project, and their right to push innovation is stated in the contract with the real estate developer.

THE REAL ESTATE DEVELOPER'S BUSINESS MODEL

The real estate developer is a small business organization, in charge of developing a large former airport site into a knowledge based industrial area including housing and services. For project development and execution the developer contracts with a project management firm as well as with architects, engineers and other consultants. The developer practiced two different business models in this project case, one initially, in the competition phase, and one after the contract was signed.

Phase one

Winning the competition and capturing the oil company as a customer was important for the developer. The oil company is a large and well-known organization which may also attract other companies to the site. The business question raised on proprietary level was "how do we competitively position ourselves" and create a unique proposal. The developer used extensive resources in the competition and concept development phase. They were uncertain about the oil company's architectural preferences and project cost expectations. Therefore they developed two competition proposals on two different sites, by two different architects firms. The proposal situated on the sea site and characterized by a more spectacular architectural design than the other one and was chosen by the oil company for further development in the competition. Subsequently this proposal was also the winner of the final competition. The developer and the team of the project manager and the architects worked hard to develop a concept scheme and a video presentation that eventually would convince the oil company to choose them, which they did. According to the developer "the video really convinced them".

Phase two

Having won the competition, the real estate developer's business model no longer dealt with winning a competition. Their business model in phase two was about design and execution of the building project, as it was defined in the contract, project brief and specifications.

The relatively young architects firm who developed the winning concept was regarded as strong on concept design, but as a potential risk by the project manager because of their lack of design management experience. The project manager therefore contracted another architects firm to supplement them. The oil company likewise contracted an architect on their team to advise them on functional and usability issues related to the building design.

There is nothing in the developer or the project manager's business model that indicates any unique approaches on how to create value in phase two of the project. As the real estate developer says: "The value was created in the competition phase". The project is managed according to well known project management rules, except for one thing; the procurement of the office building contractor. In the contract, the oil company has a right to influence the choice of main contractor for the office building. The reason why the company was concerned about which main contractor was chosen is that the company's brand may be damaged if anything happens in the execution phase. The bidders' key personnel for project management in the construction phase was interviewed by an experienced head hunter firm as part of the decision process, and was an influencing factor on the choice of the bidder who is constructing the office building.

THE DESIGN GROUP'S VALUE AND BUSINESS MODEL

The architects

The architects firm behind the winning concept was founded in 2000. Their business model is "to work with big scale projects, to

effectively merge the commercial potential with conceptual value in architecture^{iv}”. During the past 10 years they have participated in a large number of architectural competitions and position themselves competitively by “exploring conceptual and technical processes and navigating between experimental fields and methods”. They try to “challenge established processes, and involve the key decision makers from the very early stages of the projects. They question different alternatives, finding synergies and curating the different interests involved in the projects”.

The oil company’s office building is one of two big scale commercial office building projects that the architects are designing at the moment. One important success criteria for the architects has been that the oil company would choose their architectural concept in the competition and not alter it much during the following process. The concept with five similar lamellas crossing above each other is genial according to the architects. Not only is the buildings’ footprint small compared to the total size of the building, but the concept is such that a person can only see three lamellas at the same time. The concept and the fact that the oil company was the user were the reasons why the municipality accepted rezoning of the site from housing to business purposes. The real estate developer understood this early in the process according to the architect.

The architects’ goal was to “create an architectural landmark” and “an integrated technical solution while retaining the initiative in the design process”. They perceive the office building as “a machine, where white steel and glass in the facade contrast the outdoor park area”. The architects see the oil company as being focused on functional and technical issues, their corporate image more related to interiors than architecture. Inside the building the architects believed it right to reflect the park using wood as a main material on the floors, communication towers etc. This however was turned down by the oil company for use and maintenance reasons.

The architects have found it challenging to deal with “two clients” i.e. the developer and the oil company in the pre-design phase. The governance model in the project does not resemble models used in “speculative” commercial development projects. They find it challenging to deal with the oil company’s own architect advisor, receiving user requirements presented in the shape of a design lay-out for the common areas which are the architects’ responsibility. The oil company has responsibility for the lay-out of the work space areas and furniture.

The civil engineers

The company contracted for almost all the civil engineering disciplines in the case project is one of five large engineering companies in the country, but had never worked for the real estate company before. Their business service concept (business model) is to “improve the client’s operations and secure his investments. The expected results of a project, as perceived by the client, shall form the basis for their activities, secured by:

- Clarifying the client’s needs and challenges initially
- Offering the client what he actually wants, not what we would like to provide
- Focusing on results and profitable solutions, not just by providing our “efforts”
- Carrying out projects as mutual learning processes for all the people involved
- Facilitating a good working relationship with the client, by ensuring that the project is carried out in an open, timely and effective manner and that the output from the project meets client expectations^{vi}

The company wants to position themselves competitively by being front runners regarding innovation. A PhD candidate is hired to develop a work shop methodology for developing new ideas and solutions and a system for sorting out the best solutions to proceed with. Innovation groups are assembled across disciplines. Innovation prizes are awarded once a month. It has proven difficult to sell this service to customers however.

The engineering goal in the office building project case has been to create the “best possible solutions in all disciplines”. They perceive the goals related to environmental and low energy solutions as being the most important for the oil company and after that functionality.

The engineering consultants did not have direct contact with the oil company, but the company has influenced the design of the support construction in the office lamellas. The engineers had designed 3 trusses in each lamella and 4 in the top lamella plus columns. Columns and mid trusses were removed by the oil company to improve the functionality and usability of the work space

iv. www.a-lab.no

v. *Ibid*

vi. www.norconsult.com/aid=9033572

areas. The engineers' warned about risk for uncomfortable vibrations. Also the HVAC system solutions have been a challenge for the engineering consultants because of the lamella construction and no room for central conduits.

THE PROJECT GOVERNANCE MODEL

The oil company's only contract in the project is with the real estate developer. Consequently the company formally only relates to the developer throughout the process. The real estate developer contracted the project management firm, the designers and other consultants, and the contractors.

During the pre-design phase, so-called professional meetings were held every second week, where the developer, the project manager and the managers of the architectural and engineering teams reported their work progress, and decisions needed to the oil company's project group. However, the internal decision making procedures in the oil company were such that at a later stage they might contradict the "signals" given at the meetings, or the decisions taken by the developer on behalf of the oil company. This malfunction of the decision procedures as seen from the design group's point of view resulted in substantial redesign during the pre-design process.

While the oil company embraces all the elements in the governance framework presented in figure 3, the project governance function is not safeguarded by the developer's project organization, but by the oil company's project organization. This creates of course a double decker in the communication process, and a less fluid information flow. The construction contracts are turnkey contracts. The architects' design contracts are transported as part of the turnkey contracts in the detail design and construction phase. The civil engineers are kept as advisors in the developer's project organization, but are also advising and doing design work for the turnkey contractor. In this phase the oil company cannot and will not rule works, which relieves the architects. A problem concerning communication and decision making may occur in the construction phase as well according to the developer's project manager, due to great time pressure. He anticipates issues which have to be discussed and decided upon by the oil company in this phase too.

SUMMARY CASE FBO

VALUE AND BUSINESS MODELS

The oil company's value and business model regarding the new office building is of course aimed at strategic business related visions and goals. For the oil company the building is a tool to help secure their business competitiveness and success. Their functional demands for the use value of the building reflect their strategic business goals. The company also wants the building to brand their corporate responsibility identity by asking for environmentally friendly and energy saving solutions. Because of time pressures the oil company put an advertisement in the papers saying that the oil company looked for a new office building to let or to buy, when it should be delivered, total m2, and a brief list of overall qualitative objectives for the building. They got 40 proposals, chose 5 for parallel development and negotiations and after four months picked the winner.

The real estate developer's value and business model regarding this project was at first geared at winning the competition. They safeguarded in the first round delivering two very different concepts. Being pre-qualified for the second round with one of the concepts, they used extensive resources on further development of the concept and on a spectacular video presentation, to convince the oil company that they were delivering the highest value among the competitors.

Having won the competition and starting the pre-design and specification phase for a turn key tender, the developer's value and business model turned into a classic project management model, geared at controlling that the design and construction deliveries were in accordance with the tight time schedule and the project budget. They also had to control that the oil company's quality and functional demands during the pre-design phase were in accordance with the contract or additional requirements.

The architects' value and business model for the office building is first and foremost about creating an architectural landmark which can win them praise in architectural journals and architectural prizes – of which the building already got one^{vii}. Of course they wish for the oil company to praise their architectural solutions too. They find the oil company too focused on functionality and operational issues, i.e. use value, and more interested in branding the company by interior design than architecture, as the architects see it.

The engineering consultant firm's value and business model is in general geared at understanding and solving clients' problems.

vii. WAF awards 2009

However, in the office-building project they were overrun by the oil company's project organization regarding their proposed construction solution. The issue was what they as engineering consultants considered important, i.e. use comfort (fear of swinging due to construction solution) versus use value as seen by the client, i.e. office space use quality and flexibility, which were one of the important business related goals of the oil company.

Analysing the real estate developer and their project organization's business models in this case, they seem to be far from supporting the oil company's value and business model related to their new office building. What could have hampered value creation for the oil company in this case is the Inside – out disciplinary value focus of the designers, the architects and engineering consultants alike, and the classic operational project management focus of the real estate developer's project organization. What helped enhance value creation in this case was the client's, i.e. the oil company's corporate governance function.

GOVERNANCE

The oil company is a multiple client of large projects, both on-shore and off-shore. Their experience is that regardless of delivery organization and project, they have to complement with own or hired competence as part of their corporate governance function. They believe in strong corporate governance in projects and a clear division of roles between delivery organization and client. They are not in favour of partnering models. An important part of their governance is the up front contract work which regulates the work of the delivery organization and the absolute rights of the oil company regarding project specifications and qualities.

The oil company embraces the governance framework or model presented in this paper. Their project governance organization includes the project management part in the model, overlapping or shadowing the real estate developer's project management function. The oil company's project organization exercise continuous quality and risk management throughout the project process. The case analysis shows that without the corporate governance function in this project most probably use value related to effectiveness in use and operation would have been lost on behalf of the oil company.

The question is why a complementation of the developer's project management organization in order to safeguard use value creation on behalf of the client, i.e. the oil company, is necessary. The answer in this case rests with the delivery organizations and their Inside – Out perspective on value creation for the client.

CONCLUSIONS

The assertion in this paper is that in order to make sure that value for the project owner, user and society are fulfilled in building projects:

- A project framework ensuring corporate governance must be in place
- The project owner's business model must be reflected in the delivery organization's business models – i.e. the delivery organizations must have an Outside – In perspective on value creation.

A comprehensive governance framework or model that mirrors our assertion has been developed and tested in two project cases, one private and one public. Our conclusions so far are based on the case study presented in this paper. The empirical findings in the other case study however confirm our conclusions in the paper. Analysing the real estate developer and their project organization's business models in this case, their models are geared at classic commercial real estate and operational project management success criteria. The business models of the architects and engineering consultants on the other hand are geared at disciplinary and professional success criteria. None of the companies involved on the delivery side seems to have delved into and really understood how important use and operations effectiveness is as an element of value creation for the oil company.

The results suggest that project delivery agents, i.e. the real estate developer and their project manager's focus are on the scope of work needed to fulfill time, cost and quality requirements, i.e. goals on the operative level. Despite paying lip service to customer satisfaction as a major project goal, architects' and engineers' business and value models in this case did not embed goals related to user effectiveness. Disciplinary and not customer related usability and operability needs dominated the designers' agenda. Therefore we conclude that corporate project governance is vital for value creation on behalf of project owners and users in building projects.

The aim of the R&D project reported in this paper is to identify barriers and drivers influencing value creation in building projects, focusing on the early phases of projects. The case study shows that even if strategic goals aimed at creating long term effect and use value for the client and user organization are clearly defined in procurement documents, the project delivery organizations' business models are focused at project efficiency goals and project qualities as defined by their own discipline.

Of course a single case study does not provide enough evidence to conclude that an important barrier for value creation aimed at clients and users, i.e. project success, is the project delivery organization's business and value models. However, the second case in this study also confirms this finding. The findings will be tested in workshops with representatives from the delivery industry in November 2011. Stories from practice and literature on effectiveness and efficiency in the building and construction sector also confirm that the delivery organizations in buildings and real estate in general^{viii} still have some way to go before they are able to create value as defined in this paper.

The case study shows that corporate project governance is a necessary driver in order to create value for the client and user organization in projects. In the case study reported here corporate project governance was exercised. This case study's client argued that in order for an end user organization to make sure the end product will deliver value in use, he must exert governance throughout the project, based on strategic business goals and concrete success criteria. That was their practice regardless of being an owner-occupier or renting the building. The case analysis confirms this argument.

Our main thesis therefore is that understanding building projects as critical enablers for realizing operational goals in the short run and creating corporate success and sustainable values in the long run is essential to consolidate strategic value creation related project goals. Establishing a business and value model for a building project means establishing a project context where corporate strategies and long term value creation are emphasized.

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viii. There are of course exceptions!

TOWARDS TESTING A NEW FIRST-ORDER DECISION- MAKING MODEL FOR THE PROCUREMENT OF PUBLIC SECTOR MAJOR INFRASTRUCTURE

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Given global demand for new infrastructure, governments face substantial challenges in funding new infrastructure and simultaneously delivering Value for Money (VfM). As part of the background to this challenge, a brief review is given of current practice in the selection of major public sector infrastructure in Australia, along with a review of the related literature concerning the Multi-Attribute Utility Approach (MAUA) and the effect of MAUA on the role of risk management in procurement selection. To contribute towards addressing the key weaknesses of MAUA, a new first-order procurement decision-making model is mentioned. A brief summary is also given of the research method and hypothesis used to test and develop the new procurement model and which uses competition as the dependent variable and as a proxy for VfM. The hypothesis is given as follows: When the actual procurement mode matches the theoretical/predicted procurement mode (informed by the new procurement model), then actual competition is expected to match optimum competition (based on actual prevailing capacity vis-à-vis the theoretical/predicted procurement mode) and subject to efficient tendering. The aim of this paper is to report on progress towards testing this hypothesis in terms of an analysis of two of the four data components in the hypothesis. That is, actual procurement and actual competition across 87 road and health major public sector projects in Australia. In conclusion, it is noted that the Global Financial Crisis (GFC) has seen a significant increase in competition in public sector major road and health infrastructure and if any imperfections in procurement and/or tendering are discernible, then this would create the opportunity, through the deployment of economic principles embedded in the new procurement model and/or adjustments in tendering, to maintain some of this higher level, post-GFC, competition and throughout the next business cycle/upturn in demand including private sector demand. Finally, the paper previews the next steps in the research with regard to the collection and analysis of data concerning theoretical/predicted procurement and optimum competition.

Keywords: decision-making model, infrastructure, procurement, value for money

INTRODUCTION

BACKGROUND AND CURRENT PRACTICE IN THE SELECTION OF MAJOR PUBLIC SECTOR INFRASTRUCTURE

Reflecting population growth, migration and demographic changes, the OECD (2006) estimates global demand for new infrastructure at USD 53 trillion between 2007-2030 and in Australia, Infrastructure Partnerships Australia (2010) has summarised estimates of required new infrastructure over the next 10 years from AUD 455 billion to more than AUD 770 billion (in 2007 terms). This high demand for new infrastructure in many countries is presenting governments with severe challenges – not only in terms of funding in the wake of the Global Financial Crisis (GFC) but at the same time, challenges in the delivery of new infrastructure whilst achieving Value for Money (VfM). One response to this challenge has been to leverage private finance as part of Public-Private Partnerships (PPP). Such that now, PPPs are considered to be a key mode of delivering new infrastructure in many countries, including in the UK and in Australia (KPMG and Infrastructure Australia 2010). However, despite having led the Private Finance Initiative (PFI) and having undertaken more PFI/PPPs than any other developed country, the latest report from the National Audit Office in the UK notes amongst its key findings that “There is no clear data to conclude whether the use of PFI has led to demonstrably better or worse value for money than other forms of procurement” (2011: 6). This uncertainty surrounding the relative merits of PPPs versus other/non-PPP procurement modes is being exacerbated, for example, and again in the UK, by the lack of transparency and accountability in non-PPPs (Thomas 2011).

In addition to a lack of comparative data (including a lack of data in operations), there also exists in the UK, uncertainty in terms of early identification of projects that are suitable for a PPP. Early identification of projects suitable for a PPP and as part of a preliminary evaluation is critical to avoid unnecessary expense of travelling too far down the PPP path including developing the Public Sector Comparator (PSC) as part of developing a PPP business case. Amongst the most authoritative observations, with regard to the early

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stages of project development and concerning the circumstances in which to select a PPP over other non-PPP modes, is given by the House of Lords Select Committee on Economics Affairs (2010: 31), albeit at a very broad level. That is, “the projects most suitable for private finance are those where the requirements can be clearly specified at the outset and which are of a size that consortia of private sector companies can take on their balance sheets”. In other words, flexibility and competition are being identified as key determinants, or indicators, of the circumstances in which PPP maybe suitable and deliver VfM.

In Australia, the National PPP Policy Framework seeks to enable public and private sectors to work together to improve public service delivery through private provision of public infrastructure and related services and requires jurisdictions to apply the framework to the procurement of PPP projects. The framework recognises that no one delivery method is presumed to be more efficient than another and in its Volume 1 Procurement Options Analysis (POA) provides an approach for assessing the viability of PPP delivery against other procurement methods.

The approach in the POA comprises five steps:

- Step 1: Data gathering (objectives; risks; unique project characteristics; agency and market capability);
- Step 2: Shortlist delivery models (consider suitability of: PPP; Alliance; Managing Contractor; other);
- Step 3: Validation (what precedent exists for the project? What does the market think?);
- Step 4: Delivery model options analysis (which model best achieves requirements and objectives and reduces risk?); and
- Step 5: Preferred delivery model (structure preferred model; consider risk; approval; gateway review).

Step 2 uses four criteria, namely, scale, scope, whole-of-life opportunities and risk to begin to direct the procurement in one of three main directions. That is, PPP; or Project Alliance/Managing Contractor; or other. Step 4 envisages evaluating shortlisted procurement modes against project objectives and using data gathered in Step 1. The POA does not prescribe an evaluative method to be used in Step 4 but recognises that some departments in Australia have developed approaches (assessment matching, weighted tables and other tools) that reflect their particular project requirements and some of which are summarised in Table 1.

Table 1: Australian state procurement guidelines

State	Guidelines
NSW	Working with Government: Guidelines for Privately Financed Projects (December 2006)/Value for Money drivers (Section 1.2)
QLD	Project Assurance Framework (July 2010) /PPP Policy and Value for Money Framework/ Business Case Development/Qualitative Assessment (Section 3.1.2.3)/ Value Drivers (Section 3.1.2.1)
SA	Procurement Policy Framework (May 2011)/Procurement Management Planning Guidelines (under development)
VIC	Investment Lifecycle Guidelines (July 2008)/Options Analysis/Procurement Options/Procurement Methods – comparison of strengths (Section 3.2)
WA	Infrastructure Procurement Options Guide (2010)

On the one hand, evaluative methods in Step 4 of the National PPP Policy Framework’s POA and related state procurement guidelines in Table 1, do tend toward semi-quantitative (use of rankings/perceptual scales and non-monetary) measures of costs/benefits of alternative procurement modes and are supported by a large body of work generated by practitioners and academics in recent decades. In plain terms, these evaluative methods seek to systematically match client requirements (project outcomes) with the relative merits of alternative procurement modes, in order to select the preferred procurement mode and this approach is otherwise referred to as the Multi-Attribute Utility Approach (MAUA). MAUA has been regarded as the “the foremost technique and approach for examining the criteria of clients and the preferences of experts’ weights for each method in the most objective way” (Love, Skitmore and Earl 1998). Indeed, Chang and Ive (2002) highlight the significance of MAUA, given that since the 1970s they note there to have been around 900 studies relating to procurement systems. On the other hand, Sweeney (2009: 61) reviewed MAUA and identified some issues with implementing the approach and which includes the following:

- A lack of generally agreed and accepted set of criteria among the experts;
- Difficulty in identifying enough skilled experts to reliably contribute to the scoring process;
- Difficulty in reaching consensus in the set of utility scores for each procurement method;
- The range of procurement methods in the research was not comprehensive;
- The scores produced differ by narrow margins which results in limited differentiation and selection less reliable; and
- The analyses were carried out on limited range of trial projects.

These issues arise from a fundamental weakness in MAUA concerning its tautological nature and which is associated with the notion of matching client requirements (project outcomes) with the relative merits of alternative procurement modes in order to select the preferred procurement mode (Chang and Ive 2002; Teo, Bridge and Jefferies 2010). And most importantly, this weakness in MAUA creates a disconnect between the risk management plan and procurement selection that renders the approach susceptible to a non-economic influences and which makes the achievement of superior VfM in relative terms, an unlikely outcome. That is, in MAUA, the preferred procurement mode is being defined as a subset, or effectively in the same terms, as the desired outcomes from the project and is, therefore, tautological. A tautology is a statement of a relationship that is true by logic – as in Popper's (1959) p-q example. That is, if cause (read procurement mode) and effect (read outcomes from the project) are defined in the same terms, or if cause or effect are defined as a subset of each other, then the relationship is circular and considered a truism that is not falsifiable. In other words, MAUA lacks scientific maturity and amounts to a largely prescriptive approach that can be decoupled from the risk management plan – if deemed justifiable and for reasons other than an economic rationale.

In one sense, however, there is nothing wrong with the role that MAUA can play, as indeed there is nothing inherently negative about tautologies. In fact, the acceptance of a tautology can be useful and the MAUA can be argued as a useful tool in justifying a particular procurement mode and in delivering VfM – albeit in terms of a more narrow definition of VfM. For example, take an extreme case in which a government agency is faced with satisfying a dominant or key project outcome visible at the opening day of the asset, say earliest time to complete construction and to the start of operations. Here, the government agency may proceed from this outcome (effect) upstream to the procurement mode (cause) that is selected on the basis of the suitability of this procurement mode's relative merits – for illustrative purposes then, say Managing Contractor. The selected procurement mode may then proceed to deliver the desired key outcome but at the same time may deliver lower outcomes/benefits across the whole-of-life of the asset, than is achievable by other procurement modes – given the outcome/benefits trade-off that exists amongst different procurement modes. The selected procurement mode may well also represent an inferior approach to economising on the sum of production costs and transaction costs – given a lack of attention to production improvements resulting from incentive alignment across design; construction; and operations and maintenance, as well as costs arising from incomplete contracting (Chang and Ive, 2002). Despite this, as the procurement mode selected may succeed in terms of the required key performance outcome, then this should render the selected procurement a success – as all other benefits beyond the key performance outcome should be set at/near zero. Hence, accepting a tautology is useful in this case, as the government agency responsible for delivery may be judged substantially on whether or not the procurement mode was successful in delivering the key outcome. That is, VfM in nominal terms instead of VfM in relative terms. Therefore, based on the above critique of MAUA and at least in the UK and Australia, there appears scope for improvements to be made concerning understanding the circumstances and projects that are best suited to a PPP or other non-PPP modes.

NEW FIRST-ORDER PROCUREMENT DECISION-MAKING MODEL

Against this background and weaknesses of MAUA, a new first-order procurement decision-making model has been developed. This new procurement model is illustrated in Figure 1 and described elsewhere (Teo, Bridge and Jefferies 2010; Teo et al. 2011). In order to facilitate procurement selection in pursuance of VfM in relative terms, the new procurement decision making model is based on falsifiable and a priori theory and which provides a clear connection between data gathering (including risks associated with project characteristics and in conjunction with the relative capability and competence of government versus private sector relative to the project) and the approach to procuring the project. More specifically, this new procurement decision making model deploys production cost and benefit theory from the field of strategic management and Nobel prize winning theory concerning transaction costs from the New Institutional Economics, in order to identify a procurement approach that represents an efficient configuration of risk allocation; bundle(s) of externalised activities; and the nature of the external exchange relationship with each externalised contract(s) for the project concerned. As such, the procurement mode informed by the new procurement model is more likely to deliver superior VfM, or a better ratio of production benefits to production costs and transaction costs across the whole-of-life of the asset, than procurement modes associated with the outcome of deploying MAUA.

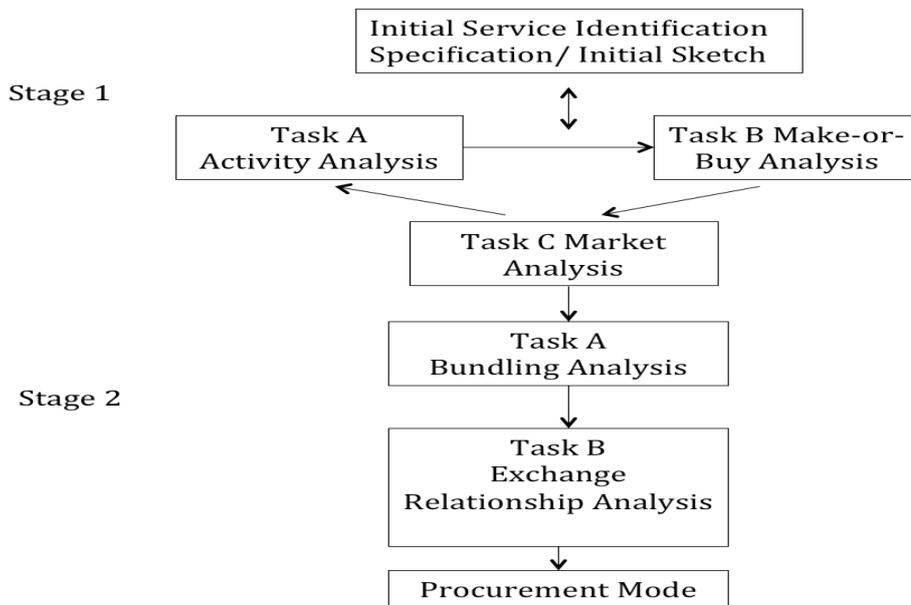


Figure 1: Schematic of new first-order procurement decision-making model (Source: Teo, Bridge and Jefferies 2010; Teo et al. 2011)

TESTING AND DEVELOPING THE NEW FIRST-ORDER PROCUREMENT DECISION-MAKING MODEL

As previously indicated, the House of Lords Select Committee on Economics Affairs (2010) consider competition to be a fundamental driver of value, in terms of recognising size as key determinant of the viability of a PPP. That is, size affects the number of willing suppliers or bidders and this effect is being greatly exaggerated in the current economic climate with constraints on credit. The absolute level of competitive tension will not only create downward pressure on prices but also facilitate the crystallisation of innovations that impinge on the time, cost and quality of the project and which will influence the overall performance of the project across its life cycle. More fundamentally, the extent to which actual observed competition in respect of a project matches the optimum competition for that project is an external indication and check of the likelihood that the actual procurement mode can deliver superior VfM in relative terms and in contrast to other competing procurement modes.

As illustrated in Figure 2 and described elsewhere (Teo et al. 2011) competition is developed as a dependent variable/proxy for VfM and the corresponding hypothesis is given as: When the actual procurement mode matches the theoretical/predicted procurement mode (informed by the new procurement model), then actual competition is expected to match optimum competition (based on actual prevailing capacity vis-à-vis the theoretical/predicted procurement mode) and subject to efficient tendering.

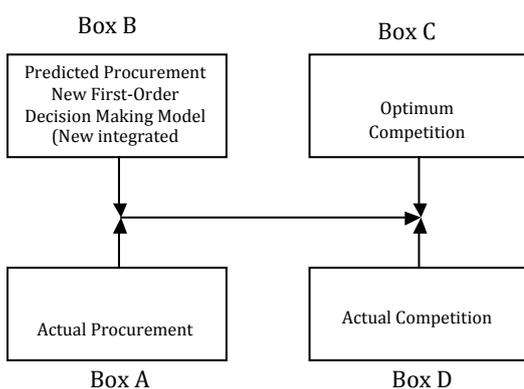


Figure 2: Procurement-tendering-competition hypothesis (Source: Teo et al. 2011)

Also described elsewhere (Teo et al. 2011) the research method uses a combination of survey and case study methods designed to generate data to test the hypothesis illustrated in Figure 2 and, in doing so, develop and test the new procurement model. The aim of this paper is to report on progress towards testing this hypothesis, in terms of an analysis of two of the four data components in the hypothesis. That is, actual procurement (Box A) and actual competition (Box D) in road and health major public sector projects in Australia and which have been collected using a project information schedule – as a research instrument in a survey of government road and health departments and agencies in Australia.

ANALYSIS OF DATA CONCERNING ACTUAL PROCUREMENT AND ACTUAL COMPETITION

RESPONSE AND REPRESENTATIVE NATURE OF DATA

In total, 87 project information schedules were submitted, comprising 61 road and 26 health-related projects across the five mainland states in Australia and with each project falling within the study's parameters. That is, road and health projects with a capital value approximately in excess of AUD 50 million and in which expressions of interest had been established in the period July 2005 and June 2010. This response represented more than 50 percent of budgeted projects in both sectors (146 budgeted projects). On the basis of location, timing and size, and with the exception of health projects in Victoria, the sample is representative of budgeted projects and sufficient to generate reliable and distinct patterns relating to key aspects of the procurement decision and competition.

KEY PROCUREMENT AND COMPETITION PATTERNS

Project size/value

The total value of the 87 projects is AUD 32.297 billion (comprising AUD 22.143 billion road projects and AUD 10.154 billion health projects) and across these projects a low number of higher value projects account for an appreciably higher proportion of the value. That is, in roads 40 of the submitted road projects (66 percent) comprise the two lower value/most frequently occurring categories (between AUD 50 to 100 million and AUD 100 to 250 million) and which account for AUD 4.164 billion (19 percent) of the total value of the submitted road projects. At the same time, 10 of the submitted road projects (16 percent) fall in the two higher value categories (between AUD 500 million to AUD 1 billion, and more than AUD 1 billion) and which accounts for AUD 13.847 billion (63 percent) of the total value of the submitted road projects.

In terms of health projects, 17 of submitted the health projects (65 percent) comprise the two lower value/most frequently occurring categories (between AUD 50 to 100 million and AUD 100 to 250 million) and which accounts for AUD 2.024 billion (20 percent) of the total value of the submitted health projects. At the same time, five of the health projects (19 percent) fall in the two higher value categories (between AUD 500 million to \$1 billion, and more than \$1 billion) and which accounts for AUD 6.593 billion (65 percent) of the total value of the submitted health projects.

Actual procurement

With regard to higher value road projects (greater than AUD 250 million), Alliance Contracting (in 7 projects) represented the most popular procurement approach. Whilst in terms of lower value road projects (approximately AUD 50 to 250 million), construct only and the design and construct approach (in 29 projects) was the most popular procurement mode. On the other hand, Managing Contractor in 13 projects (and of these projects most were greater than AUD 250 million) dominated the health projects submitted.

Furthermore, there is an appreciable difference between road and health projects in terms of health projects with a much greater reliance on the contractor taking the contractual risk for the upper limit in the price (in 21, or 81 percent, of health projects representing AUD 9.407 billion, or 93 percent of the value of submitted health projects). In contrast, 33 or 54 percent of road projects (representing AUD 13.369 billion, or 60 percent of the value of submitted road projects) rely on the contractor taking the contractual risk for the upper limit in the price.

However in common and across both road and health projects, only five projects include either the operation and/or maintenance (O&M) component(s) and which account for the minority of the value of the projects.

Finally, the majority of road and health projects (62 projects, or 71 percent of the submitted projects representing AUD 19.406 billion, or 60 percent of the value of submitted projects) are delivered as a single contract and in terms of projects delivered as multiple contracts, these tend to comprise the two lower value categories and below AUD 250 million. As such, the procurement patterns noted in this section are not appreciably affected by the practice of multiple contracts.

Actual competition

For the purposes of this research, the attractiveness of the project as the measure of competition and in turn a proxy for VfM is measured using the number of firms demonstrating their willingness to bid either through open tendering or Expressions of Interest (EoI) by eligible contractors. Given the very small incidence of open tendering in the sample, the subsequent analysis in this section refers to EoI only but includes the number of firms submitting a bid via an open tendering process. Figure 3 (that combines road and health projects) shows the number of EoI in each year, in terms of the line of best fit and which begins to slope upwards from 2009.

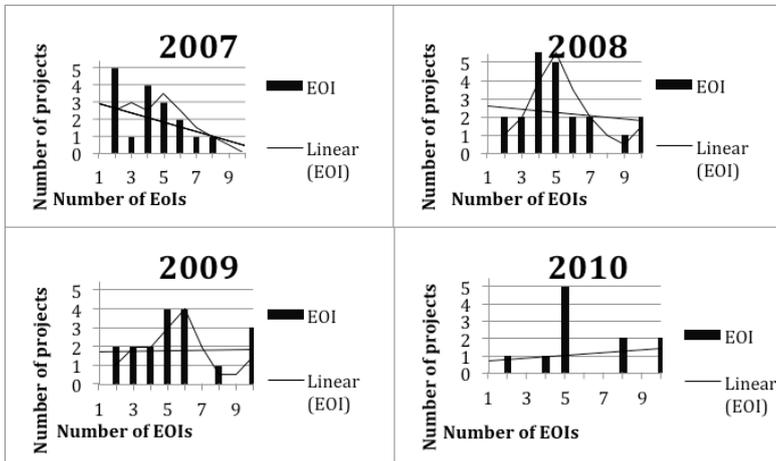


Figure 3: Road and health EoI

Figure 4 illustrates the aggregate EoI in both roads and health projects against the commencing date.

In summary, combined EoI are statistically significant at a 99 percent confidence level both in terms of the commencement date and including when this date is treated in two pre and post GFC categories. There also exists a significant relationship between EoI and procurement mode; between EoI and project value; and between EoI and payment terms. That is, greater EoI with construct only and design and construct procurement modes (statistically significant at the 99 percent confident level); greater EoI with lower project value (statistically significant at the 95 percent confident level); and greater EoI for fixed price lump sum payment terms (statistically significant at the 99 percent confident level). Finally, there is a stark fall in EoI at around AUD 800 million. That is, there is a range of EoI between 2 to 15 contractors with a mean of 5.16 at project values less than AUD 800 million. For project values in excess of AUD 800 million the range of EoI is between 2 and 5 contractors with a mean of 3.86.

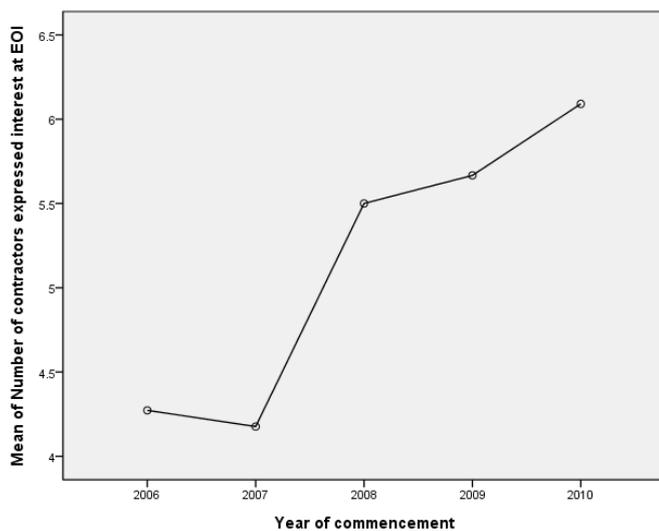


Figure 4: Road and health EoI and commencing date

CONCLUSIONS

The key patterns in the sample and which are common to both road and health projects comprise:

- A low number of higher value projects accounting for an appreciably higher proportion of the value. This pattern continues to exist when excluding PPPs from the sample, although this pattern becomes less pronounced;
- A very low incidence of operations and/or maintenance being bundled-up with construction; and
- A statistically significant increase in EoI post-GFC, along with a statistically significant relationship between EoI and procurement mode; capital value and payment terms.

On the other hand, the key pattern in the sample representing a point of difference between the road and health projects concern a very strong tendency for the contractor to take the contractual risk for the upper limit in the price (and which corresponds with the dominance of the Managing Contractor approach) in the health projects. Whilst in the road projects, there is more of a balance in terms of government and the contractor taking the contractual risk for the upper limit in the price and this corresponds with construct only/design and construct and Alliance Contracting as the two most popular procurement modes in this sector.

The GFC has seen a significant increase in competition in the public major infrastructure sectors in the paper and if any imperfections in procurement and/or tendering are discernible (to be investigated in subsequent steps in the research) then this would create the opportunity, through the deployment of economic principles embedded in the new procurement model and/or through adjustments in tendering, to maintain some of this higher level, post-GFC, competition throughout the next business cycle/upturn in demand including private sector demand and therefore, advance construction capacity and competition and, in doing so, enhance VfM. Having surfaced the key patterns, the attention in this research project now turns towards the case studies in which to deploy the new first-order procurement decision making model and to generate the theoretical/predicted procurement in respect of each case (shown in Box B in Figure 2) and a nationwide survey of contractors to surface data concerning optimum EoI (shown in Box C in Figure 2). The approach being developed to select cases involves identifying cases that fall inside and outside the key patterns. This approach is designed to generate data to test and develop the new procurement model as fully as possible. The identification of the cases will remain confidential.

The questions in nationwide survey of contractors are largely designed to map contractors' capability and actual prevailing capacity surrounding each selected case study project and vis-à-vis the theoretical/predicted procurement mode that emerges from deploying the new procurement model in each selected case study project. The theoretical/predicted procurement mode represents a particular and efficient configuration of risk allocation; bundle(s) of externalised activities; and the nature of the external exchange relationship with each externalised contract(s) for the case study project concerned. In doing so, it will also show the nature and extent of the most efficient construction package in the case study project. This can be used, in conjunction with data from the nationwide survey of contractors, to help estimate the optimum level of expected EoI that can then be compared with actual EoI in each of the selected case study projects – in pursuance of testing the hypothesis depicted in Figure 2.

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LEAN PROCUREMENT: THE USE OF LEAN CONSTRUCTION TECHNIQUES IN PROJECT VALUE ENHANCEMENT

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Lean construction is characterised by a set of clear objectives in project delivery involving the concurrent design of products and processes, and the application of production control throughout the project life cycle to maximise value for money to customers. The successful delivery of construction projects requires the effective use of project management techniques such as risk and value management to achieve the optimum performance of a constructed facility over time. However, it has been argued that lean construction came about as a result of the failure of traditional project management to provide an integrated project delivery process in which design, construction, operation, and maintenance are considered as a whole with an understanding of how to enhance value delivery to clients, stakeholders (including occupants), and society in general. This paper explores in depth the lean construction techniques that support environmentally sustainable benefits and value enhancement in the design and construction processes (including supply chain management). It also explains how the implementation of lean techniques in construction project delivery and procurement strategy (including partnering relationships between contractors, consultants and manufacturers) delivers a high level of benefits and value.

Keywords: construction project, lean construction, procurement, value, value management

INTRODUCTION

Lean construction is a production management-based approach to project delivery; a new way to design and build capital facilities which is based on the principles of lean thinking and production (LCI 2011). The implementation of lean within construction is a value seeking process that maximises value and continually redefines perfection. Lean construction came about as a result of the failure of traditional project management to provide an integrated project delivery process in which design, construction, operation, and maintenance are considered as a whole with an understanding of how to enhance the delivery of value to clients, stakeholders (including occupants), and society in general. This has brought a significant reform to construction process in terms of waste minimisation, value maximisation/enhancement, performance optimisation, environmental management etc. through the use of lean construction techniques that support environmentally sustainable benefits and value enhancement in the design and construction processes (including supply chain management).

This paper explores in depth the lean construction techniques that support environmentally sustainable benefits and value enhancement in the design and construction process (including supply chain management). It also explains how the implementation of lean techniques in construction project delivery and procurement strategy (including partnering relationships between contractors, consultants and manufacturers) delivers a high level of benefits and value.

A key component of lean thinking is to identify all the value adding time and reduce the non-value added activities as there is a glaring and indisputable need to improve the delivery of value to clients, stakeholders, and society in general while at the same time driving down cost and the time to deliver operational constructed facilities (Bicheno 2007).

RESEARCH METHODOLOGY

The research is a theoretical one which is based on a systematic literature review. The literature sources were accessed through web of knowledge which provides access to leading citation databases covering numerous journals and conference proceedings. Also, some textbooks were found useful in the research process. This method was chosen along side with documentary evidence (case study) as appropriate because of the issues to be explored and explained by the research study.

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LEAN PRODUCTION AND CURRENT PRACTICES

Current project management views a project as the combination of activities while lean thinking forces attention on how value is generated rather than how any one activity is managed. Production in lean construction is managed so that actions are aligned to produce unique value for the customer. Lean production is defined by Todd (2000) as “initiative, whose goal is to reduce the waste in human effort, inventory, time to market, and manufacturing space to become highly responsive to customer demand while producing world class quality products in the most efficient and economical manner”. Value to the customer and throughput, the movement of information or materials to completion are the primary objectives. According to Womack and Jones (2003), lean thinking can be summarized as to correctly specify and enhance value, identify the value stream, make the product flow, let the customer pull value, and pursue perfection. Lean thinking has been considered to be one potential approach for improving organisational performance in terms of value generation (Womack et al. 2003). The research of Hines et al. (2004) which was based on the framework suggested by McGrill and Slocum (1993) reflect the relationship of value and cost and reaching the cost-value equilibrium created awareness in the managers’ vision of evolving towards lean thinking.

SUPPLY CHAIN MANAGEMENT

Supply Chain Management (SCM) has been defined by Tommelein et al. (2003) as “the practice of a group of companies and individuals working collaboratively in a network of interrelated processes structured to best satisfy end customer needs while rewarding all members of the chain” SCM is characterised with achieving increased competitive advantage in the construction market. Supply chain participants such as owners, contractors, suppliers etc are still in search of a better understanding of supply chain, its dynamics and how they can increase their competitive advantage by applying it (Arbulu and Ballad 2004). SCM is closely related to lean supply (Lamming, 1996). The basic concept of SCM includes tools like Just-In-Time delivery (JIT) and logistics management. The current concept of SCM is very broad but still largely dominated by logistics.

Arbulu and Ballard (2004) proposed a strategy to improve the management of supply systems in construction using lean principles and techniques with the objective of assuring on-time delivery of information and materials to project sites at least cost and maximum value for the final customer. This strategy includes the use of lean techniques like Kanban to pull selected materials on a just-in-time basis from suppliers or logistics centres to site. Moreso, an extensive literature search has been carried out by Mollenkopf et al. (2010). It revealed the barriers, drivers, converging, and contradictory points across the three supply chain strategies namely green, lean, and global supply chain. Sharing of information among partners of a supply chain will not only reduce the operation costs of each of the partners, but the efficiency of this ‘trust’ based business transaction will give rise to a sense of ‘customer satisfaction’ along the value chain.

LEAN CONSTRUCTION TECHNIQUES FOR ENVIRONMENTALLY SUSTAINABLE BENEFITS

Vinodh et al. (2010) carried out a study on tools and techniques for enabling sustainability through lean initiatives by exploring various issues of sustainability as well as the strategies/ techniques that would enable the achievement of sustainability objectives using lean initiatives. It has been revealed through literature that lean principles are aimed at waste reduction and therefore results in capital gain, achievement of sustainable benefits as well as improving sustainability of an industry. Some of the sustainable benefits from lean principles include: reduction in material usage, energy consumption, hazardous waste, water usage etc. these benefits are presented in Table 1. According to The Environment Protection Agency (EPA) (2011), many organisations have found that implementing lean concepts and tools results in improvements in environmental performance, even when lean activities were not initiated for environmental reasons. However, since environmental savings are often not part of the “business case” for lean improvement activities, organisations implementing lean do not necessarily quantify the environmental performance gains associated with their lean initiatives case studies and best practice.

Some of the case studies and best practice examples of environmental benefits that resulted from lean initiatives are presented in Table 2. In addition to these case studies, a study was carried out on US construction companies investigating whether lean thinking principles were been adopted and if so, what results were being achieved and what were the perceived barriers in the approach.

Four company case studies were completed and results show that office construction times reduced by 25% within 18 months, schematic design reduced from 11 weeks to 2 weeks, turnover increases of 15-20%, productivity increased, satisfied clients looking to place repeat orders increased, and project costs reduced. The study showed that although there was different application of lean principles which showed some interesting initial result, all companies were partnering and a number of the suppliers were very keen to undertake lean work and were fully co-operating (Garnett et al., 1998).

LEAN CONSTRUCTION TECHNIQUES/STRATEGIES FOR VALUE ENHANCEMENT

The suitability of lean construction techniques to promote value in construction has been raised for discussion since the issue of value in construction is a complex one requiring the combination of several different value strategies within one project (Ogunbiyi et al., 2011). The main strategies for implementing a value management approach to improve on lean construction methodologies in order to contribute to sustainability implementation and performance improvement has also been explored. Egbu et al. (2004) stated that Value Management and Value Engineering are techniques for enhancing value within a project by defining what will deliver value in a specific project, engineering a best value solution to meet those defined value parameters, and then delivering a cost effective solution. Green (1999) has put forward the concept of value generation during the early stage design phase as a learning process between the client and the design professionals such that there was a joint understanding of client's value parameters and their realisation in the design.

Table 1: Environmental benefits of lean principles (Source: Vinodh et al., 2010)

LEAN PRINCIPLES/TOOLS	SUSTAINABLE BENEFITS
Pull approach	Reduction of work-in-process, elimination of potential waste from damaged products, lesser floor space utilisation
Cellular manufacturing	Reduction in set-up times and change over time hence low energy and resource usage, reduction in defects
Value Stream Mapping	Reduction in waste through fewer defects, less scraps, low energy usage, etc.
5s	Reduction in lighting requirements due to clean windows, leaks attended to immediately, reduced consumption of materials and chemicals
Total preventive maintenance	Less hazardous waste due to decreased spills and leaks, increased longevity of equipment
Six sigma	Fewer defects hence less waste, improvement in product durability and reliability hence increase in product lifespan
Pre-Production Planning	Reduction of waste at design stage, usage of right sized equipments, reducing the complexities of production processes and product design
Kaizen	Elimination of hidden wastes and unwanted activities
Visual controls	Identification and elimination of unwanted entities hence less material usage and wastes
Lean supplier networks	Introduction of lean to existing suppliers would lead to better realization of environmental benefits
Poka Yoke	Reduction in defects hence less waste, low energy usage, less scrap

Value management is one of the performance improvement tools and techniques. It is a structured method of eliminating waste from the brief and from the design before binding commitments are made. Value management is now used by up to a quarter of the construction industry to deliver more effective and better quality buildings, for example through taking unnecessary costs out of designs, and ensuring clearer understanding of the brief by all project participants and improving team working (DETR 1998) .

Table 2: Case studies of environmental benefits of lean principles (Source: <http://www.epa.gov/lean/environment/studies/>)

CASE COMPANY	SUSTAINABLE BENEFITS
DuBios- Johnson Diversey and Steel case	Lean practices resulted in: Energy savings of a 60 percent reduction in the BTUS required Reduction in water usage by 80 percent Waste stream was cut by 85 to 95 percent
Canyon Creek Cabinet Company	Expect savings of almost \$1.5million annually from process changes Process improvements included reduction in lead time, work-in-progress, defect, overproduction, downtime, operator travel time, and material loss and damage Decreased VOCs which will reduce permitting requirements
Columbia Paint &Coating	Reduction of 15,000 lbs of paint solids from wash water saved 18,000 lbs of shrink wrap Removed 2,820 lbs of hazardous materials from the waste stream
Lockheed Martin	Reduced hazardous waste resulting in cost savings due to the elimination of RCRA permit requirements Reduced facility size by 1/3 (a reduction 550,000 square feet) Reduced chemical storage capacity to 2% of its original size

Lean Project Delivery System

A new system of delivering building projects on the basis of the principles of lean production has been proposed. This new system is termed Lean Project Delivery System (LPDS), which is seen as a project delivery method that conceptualizes design and construction projects as lean production systems (Ballard 2000). Figure 1 illustrates the Lean Project Delivery System. The five interconnecting phases of the LPDS model include: Project Definition, Lean Design, Lean Supply, Lean Assembly, and Use. Each of the phases contains three modules and is represented as a triad. Each triad overlaps the succeeding triad to include at least one common module. For example the Project Definition phase includes purposes, design criteria and design concepts and overlaps with the Lean Design phase which includes design concepts, process design and product design. Also, two modules of Production Control and Work Structuring extend throughout the lifecycle of the project. Some important features of LPDS include downstream players in the planning process, conceptualising the project delivery as a value generating process, and creating a reliable workflow amongst the project participants.

The domain of Lean Project Delivery is defined by the intersection of projects and production systems and is therefore fully applicable to the delivery of capital projects which include the formation of a temporary production system in the form of a project team that consists of owner, architects, engineers, general contractor and sub-contractors. The lean philosophy minimising waste and maximising value should be applied as early as possible in the design and construction process, i.e. at the briefing and early planning phases. In lean approaches, the desire to maximise value and reduce waste starts at the beginning (initial team composition).

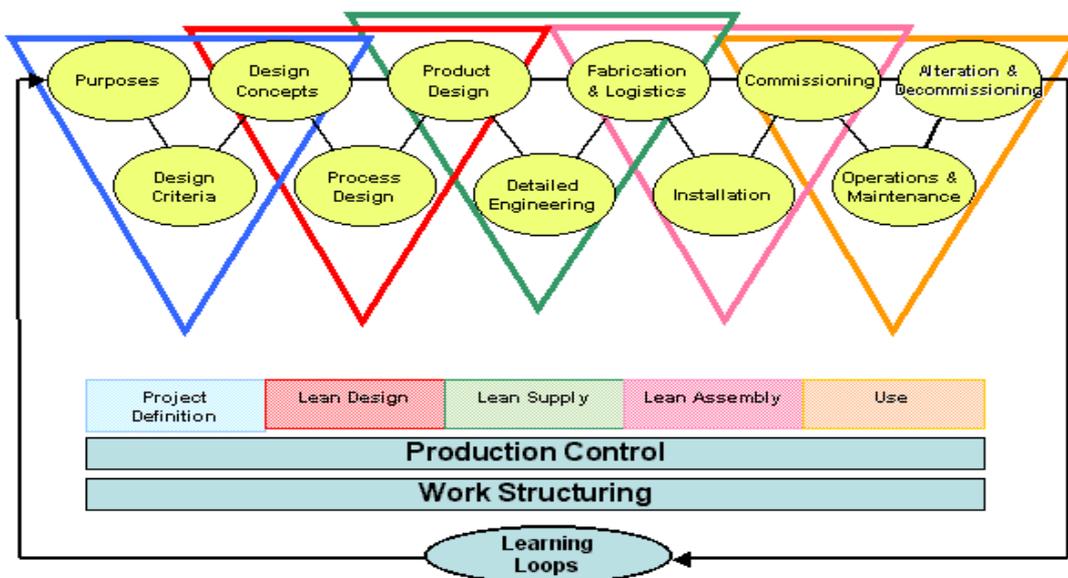


Figure 1: LPDS system (Source: Ballard 2000)

According to Garnett (1998), there are five lean principles which were described by Womack and Jones (1996) within which lean construction techniques can be successfully applied. This is represented in Figure 2 below.

In construction, specifying value comes before design and value is defined by the ultimate customer's needs through tools such as value management, quality function deployment and simulation (Ballard and Howell 1998). The key technique behind value stream is process mapping for a very specific reason: i.e. that of understanding how value is built into the building product from client's point of view. Flow is concerned with achieving a holistic route by which a product is developed. The basic units of analysis in lean construction are information and resources flow. Improvement is possible by reducing uncertainties in workflow. Redesigning the planning system at the assignment level is the key to assuring reliable workflow and this step has to be implemented early. The principle of pull makes use of just in time applications to meet the client needs and subsequently customising and delivering them more predictably when the client requires them.

Lean Construction Methodologies/Tools

Salem et al. (2005) carried out an evaluation on the Lean Construction tools such as: Last Planner, increased visualisation, daily huddle meetings, first run studies, 5s process, and fail safe for quality and safety. The effectiveness of the lean construction tools was evaluated through the lean implementation measurement standard and performance criteria. It was found that last planner, increased visualisation, daily huddle meetings, and first run studies achieved more effective outcomes than expected.

Last Planner System

The Last Planner system of production control, introduced in 1992, which emphasises the relationship between scheduling and production control, is the most completely developed lean construction tool (Ballard 2000). The Last Planner System has been described by Ballard and Howell (2000) as one method for applying lean techniques to construction.

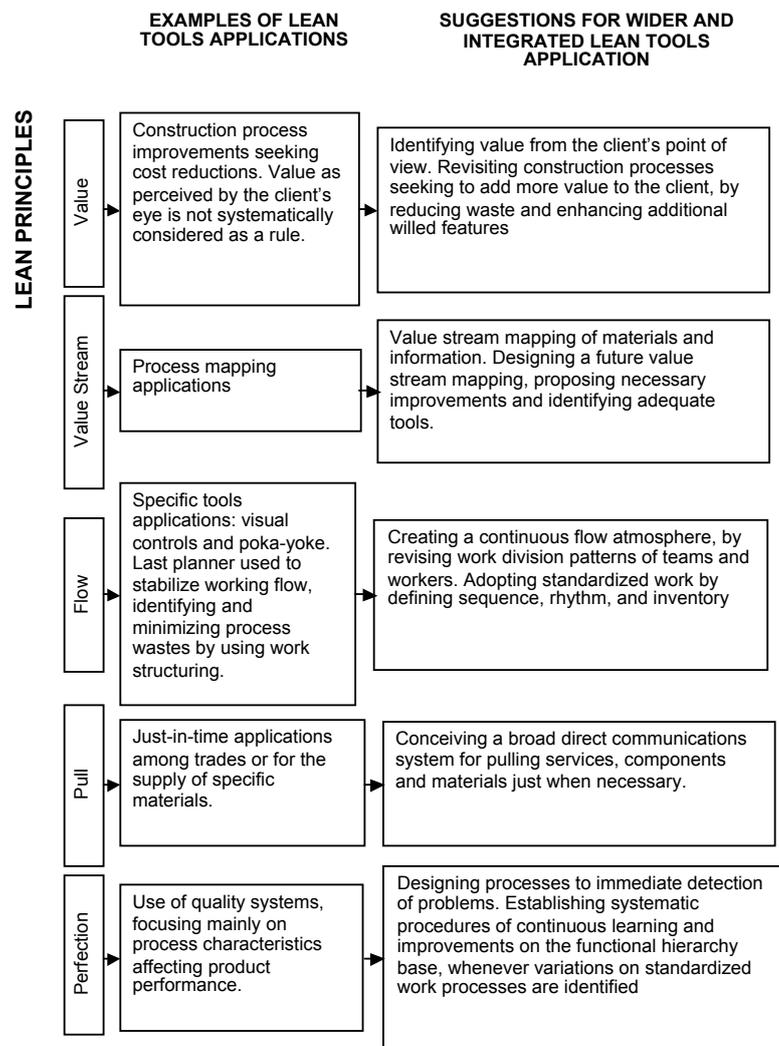


Figure 2: Examples of lean tools already reported in construction implementation and suggestion for wider and integrated application for the sector (Source: Picchi and Granja 2004)

It provides productive unit and workflow controls and facilitates quick response to correct for deviations from expected outcomes by using root cause analysis. According to them, the Last Planner is based on three levels of schedules and planning tools:

- The master pull schedule serves as the overall project schedule, as contrasted with the detailed critical path schedule that is the more traditional management tool.
- The look-ahead schedule reflects major work items that need to be completed for the milestone dates in the master pull schedule to be met. This schedule is usually based on a six to eight week time frame, and uses items “pulled” from the master pull schedule; they are carefully reviewed to ensure that they are free of constraints that cannot be removed within a given time.
- The weekly planner schedule delineates the work activities or assignments “pulled” from the look-ahead schedule that must be initiated to meet the completion dates in that schedule. Eligible activities or assignments are those that have no current constraints, and that have resources available and assigned.

Several examples of the application of lean construction techniques were presented by Forbes et al. (2002). These include a Brazilian company which collaborated on a research program with the University of Sao Paulo to improve the integration of design and production processes, Verticon Construcao e Empreendimentos Ltda who used last planner on a 90 days construction project and the application of the Last Planner Control System on a housing project in Quito, Ecuador. Some of the benefits achieved are presented respectively: Communication and motivation among the design team influenced the integration of design features with process considerations directly, the implementation of lean construction and control procedures significantly improved production efficiency, in terms of buildability and production cost control and elimination of not only material waste, but non-value adding tasks as well with a reduction in project duration from 90 days to 83 days and reduced rework etc. The last planner facilitated improved quality control and the application of lean methods, The Percent Plan Complete (PPC) and Performance Factor (PF) improved. It was proven at the construction site that look ahead planning enables one to keep current activities linked with the master pull schedule.

The main idea of the lean construction process is that the same team of suppliers, contractors and consultants work on a series of projects, continually developing the product, applying quality improvement and waste reduction techniques, and incorporating arrangements for learning and continuous improvement. The early stages of partnering are a necessary pre-requisite for improving construction but without the concept of flow production applied at a strategic level, partnering remains only a partial solution. Organising to achieve seamless flow delivery of a product gives purpose to a partnering relationship.

PARTNERING

Partnering is a long term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant’s resources. The relationship is based on trust, dedication to common goals and an understanding of each other’s individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and service (Packham et al., 2003). Partnering has been described by Bubshait (2001) as an innovative and effective project organisation concept and the key elements that contribute to the success of partnering to reduce cost and minimise conflict in the construction industry were discussed. The relationship between main contractors and subcontractors is mainly a transactional one where all parties try to obtain additional value at lowest cost.

This view has been supported by Miller et al. (2002) who argued that most subcontractors are small and are fundamentally different to larger main contractors but that the traditional nature of the relationship has seen main contractors attempt to take advantage. Miller et al. (2002) reflect on two case studies based on transactional and relational approaches and contrast the levels of trust and willingness to engage between the two. Suggestion was thereafter made that there is need for some form of harmonisation (such as partnering) for lean construction innovations to succeed. Partnering has been presented as a potentially important way of improving construction project performance through the benefits it brings to clients and contractors (Bresnen and Marshall 2000). Partnering the supply chain is a mechanism process by which the alliance is managed and by which it provides value to its customers. Partnering establishes a base level of trust which allows people within a system to shift their attention to improving at the system level instead of simply defending their interests. But trust is hard to maintain in the absence of reliable work flow. Complex, uncertain and quick projects are likely to fail when only traditional approaches are used with lack of a comprehensive underlying theory, efforts such as partnering are little more than patches (Howell and Ballard 1998).

CONCLUSION

The lean construction techniques that support environmentally sustainable benefits and value enhancement in the design and construction processes have been extensively explored. It has been established that supply chain management leads to improved understanding of the characteristics of construction supply chain problems and that lean principles and techniques are capable of assuring on-time delivery of information and materials to project sites and value maximisation for the final customer. The implementation of lean principles and techniques at the early stage of construction process will lead to improvement in environmental performance, waste reduction resulting to capital gain, achievement of sustainable benefit as well as improving sustainability of an industry. Also, partnering has been suggested as a potential way of improving construction project performance because of its benefits to the clients and contractors as well as being important for the success of lean construction innovations.

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BENCHMARKING AND KEY PERFORMANCE INDICATORS FOR THE CONSTRUCTION INDUSTRY IN SAUDI ARABIA

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Saudi Arabia has been experiencing a construction boom over the past four decades. This boom is continuing, due to rapid growth in the oil industry and increasing revenues. The construction industry is one of the major contributors to the Saudi Arabian economy. It is expected to have contributed up to £10.5 billion to GDP in 2010. The construction industry plays a crucial role in social and environmental development in Saudi Arabia. Currently, the industry is lacking performance measurement systems. These systems are critical in order to identify necessary areas for improvement. The aims of this paper are to identify how the construction industry in Saudi Arabia is currently measured and the critical success factors (CSFs) on performance. Further, it briefly investigates the barriers that impact Saudi construction performance measurements. The first step towards achieving performance improvement is to understand current performance, by looking at structured methods of performance measurement. Thus, a credible method of construction performance measurement is required for achieving any sustainable performance improvement. Benchmarking and key performance indicators (KPIs) are widely seen as such credible methods. The literature on performance measurement, both in general and in the construction industry in particular, is reviewed. Interviews were conducted to investigate aspects of Saudi construction performance measurement. The outcomes showed that construction industry performance in Saudi Arabia is currently measured through both financial and non-financial measures. However, a more structured approach to performance measurement, through model creation, is required.

Keywords: benchmarking, construction, critical success factors (CSFs), key performance indicators (KPIs), Saudi Arabia

INTRODUCTION

Saudi Arabia has the largest construction market in the Middle East, with multi-billion dollar projects in both the public and private sectors. The key dynamics stimulating both public and private sector investment in construction projects are population growth and the strong increase in oil revenues. Currently, the Saudi construction industry is lacking performance measurement systems. These systems are critical in order to identify necessary areas for improvement. Kaplan and Norton (1996) stated that the first step towards achieving performance improvement is to understand current performance, by looking at structured methods of performance measurement. Thus, a credible method of performance measurement for construction is required in order to achieve that. One of the most debated and controversial topics about Performance Measurement Systems (PMS) is the impact that PMS implementation and usage have upon business performance, in terms of clear, tangible results. There is not much related work in the Saudi context, although KPIs have been well established in certain contexts. Martinez et al. (2004) stated that there is only a small amount of research on this topic, as reported mainly by consultancies and commercial research companies. They have two limitations: a lack of a strong methodological basis and a quantitative approach that lacks explanations regarding results. The aims of this paper are to investigate the application of benchmarking and KPIs, as used in the UK, and to measure the performance of the construction industry in Saudi Arabia. Moreover, it will explore how Saudi construction performance is currently measured, and the influence of factors and barriers that impact on the achievement of improvements in business results.

THE CONSTRUCTION INDUSTRY

The Chartered Institute of Building (CIOB) defined construction management (CM) as one of a family of disciplines concerned with the complex phenomenon known as the 'Built Environment' (BE). The planning, design, production, adaptation, maintenance, restoration, conservation, management, evaluation and recycling of the built environment requires interaction between disciplines, just as healthy living requires multi-professional support. CM is exercised at a variety of levels, from sites and projects, through corporate organisations, clients and whole communities (Bale and Shirong, 2009).

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Egan (1998) stated that the UK construction industry, at its best, displays excellence, but he also thought that substantial improvements in quality and efficiency are possible. Beatham et al. (2004) were critical of the construction industry for being inefficient. Egan (1998) and Latham (1994) stated that the construction industry had long been recognised as having problems in its structure, which inhibited its performance. Moreover, poor performance in construction has been identified with regularity (Puddicombe 1997). However, every industry faces obstacles and constraints, which are unique to its operational environment. Construction projects are organised by different parties such as clients/owners, architects, engineers, general contractors, subcontractors and suppliers. Because of this diversity, each party tends to have its own goals and objectives, which can lead to conflicting relations (Love et al., 2004). The argument within the construction industry has shifted from tendering prices, and is now centred on what should be included as performance measurement criteria (Cheung et al., 2001). In the construction industry, cost and time over-runs are the main reasons for the industry's inefficiency. In the public sector, the average costs of over-runs on projects are within the range of 30%. Two-thirds of private sector projects go over budget, and are delayed by around the same amount (Audit Commission, 1997). There are several other factors that contribute to inefficiency in the construction industry. Egan (1998) found that "30% of construction is rework", labour working at 40-60% potential efficiency; "accidents can account for 3-6% of total project costs, and at least 10% of materials are wasted" (Egan, 1998:15).

THE CONSTRUCTION INDUSTRY IN SAUDI ARABIA

Scanning the terrain in Saudi Arabia, the construction situation is no different from that in the UK. Assaf et al. (1995) identified nine factors that cause delays to large building projects in Saudi Arabia, by conducting a survey of contractors, owners and architectural and engineering firms. These factors are materials, manpower, financing, equipment, changes, government relations, scheduling and control, the environment and contractual relationships. The three fraternities involved in the survey had different responses (agree/disagree) to each factor. However, these factors have a profound effect on the performance of the construction industry in one way or another. 76% of the contractors and 56% of the consultants indicated that average time over-run was between 10% and 30% of the original estimate. The most common cause of delay identified by all three parties was changes to orders (Assaf and Al-Hejji, 2006).

BENCHMARKING AND KEY PERFORMANCE INDICATORS

Performance measurement is the process whereby an organization establishes the parameters in which programs, investments and acquisitions reach the desired results (Office of the Chief Information Officer (OCIO) Enterprise Architecture Program 2007). Neely et al. (2002) defined performance measurement as the process of quantifying the efficiency and effectiveness of past actions. Such performance measurements are typically identified by KPIs, or benchmarking.

BENCHMARKING

Camp defined benchmarking as "the search for industry best practices that will lead to superior performance" (Camp, 1989). The definition emphasises the value of the learning of best practices (internally or externally) for the purpose of achieving superiority or competitive edge over competitors. McCabe (2003) argued that genuine benchmarking means comparing the performance of one company against others, and then using lessons from the best organisations to make improvements. The best performance achieved in practice is called the benchmark. Benchmarking is one of the most powerful tools for initiating and sustaining continuous improvement. In today's highly competitive marketplace, there is a critical need for managers to continuously improve their firm's efficiency and effectiveness. In order to determine overall success, managers need to be familiar with the necessary critical performance measures. El-Mashaleh et al. (2007) stated that benchmarking can accurately identify successful companies and the underlying reasons for their success, if carried out properly. It can also be used as a goal-setting process (Voss et al., 1997). Moreover, it is seen as an aid in setting performance objectives to achieve performance improvements (Venetucci 1992). In order to stay competitive, leading organisations compare their own products, services and business processes against the best from the same or outside their industry on a regular basis, to seek best practice implementation from whatever source. Kyrö (2003) stated that benchmarking has established its position as a tool to improve organisational performance and competitiveness in business life. It involves a comparative analysis between at least two parties. The comparison between one company and another may depend on different types of benchmarking, which are performance, process and strategic benchmarking (Luu et al., 2007). Watson (2007) defined benchmarking according to two criteria: categories of practice and sources of data.

Benchmarking Categories

Watson (2007) stated that all benchmarking is process benchmarking. He states that the starting point of benchmarking is measurement. The act of measuring performance and the process of benchmarking must be distinguished. Generally, the process uses a common measurement standard for comparison across organisations, in order to determine the best practices based on results.

After several investigations and performance measures, the practices that lead to best observed performance and their root causes are documented as best practice. Kyrö (2003) stated that different authors have classified benchmarking according to different criteria, such as aims, focus, bases and target of comparison. Bhutta and Huq (2009) classified benchmarking into process, performance and strategic benchmarking.

Benchmarking Sources of Data

Benchmarking sources of data was identified as another criterion. Watson (2007) divided the sources of data into four different types, namely competitive, functional, internal and generic. Competitive benchmarking targets the specific product designs and process capabilities used by direct competitors. Functional benchmarking seeks information from a functional area in a particular application or industry. In internal benchmarking, the approach is to learn from sister companies, divisions, or operating units that are part of the same operating group or company. Finally, generic benchmarking seeks process improvement from a different industry.

Need for Benchmarking in Construction

The European Commission has been a strong advocate of the benchmarking process. Since the mid 1990's, it has led a number of benchmarking initiatives in response to requests for guidance from the construction industry (Commission of the European Communities, 2003). Benchmarking programmes for the construction industry have been initiated recently in several countries. Costa et al. (2006) investigated the KPIs launched in the UK, the National Benchmarking System (NBS) in Chile and the Performance Measurement System for Benchmarking in the Brazilian Construction Industry (SISIND-NET Project). Each initiative was analysed by taking into consideration three main issues: type of benchmarking, scope of the performance measurement system and the implementation of initiatives. The data were analysed in two stages: independently for each initiative to determine the results and compare them to identify similarities and differences. Costa et al. (2006) stated that it is important to understand the differences between the approaches adopted in different countries in order to identify the generic measures that can form the basis for international benchmarking. Based on the analysis of the initiatives adopted in the UK, Chile and Brazil, the findings showed difficulties in data collection and lack of resources for implementation in all countries. Despite these difficulties, transferring the knowledge and data that can be used for comparing performances of the participating companies can potentially improve benchmarking initiatives for comparing companies from different countries and industries (Costa et al., 2006).

Benchmarking is used in the construction industry for many purposes. Hamilton and Gibson (1996) identified benchmarking as a sufficient tool for pre-project planning in the construction industry. On the other hand, Abdel-Razek et al. (2007) identified benchmarking as a reliable indicator for project labour performance. Moreover, Lema and Price (1995) considered benchmarking as an accelerator towards achieving Total Quality Management (TQM).

KEY PERFORMANCE INDICATORS

Key performance indicators (KPI) are quantifiable measurements that reflect the critical success factors of an organization. According to the KPI Working Group (2000), the purpose of KPIs is to enable the measurement of project and organisational performance throughout the construction industry. Chan and Chan (2004) stated that KPIs are general indicators of performance that allow focus on important aspects of outputs. They found that only a limited number of KPIs are maintainable for regular use. A list of objective measures, such as construction time, time variation and unit cost, and subjective measures, such as quality, functionality and client satisfaction, were introduced and discussed by the authors. Alarcon et al. (1998) indicated that most KPIs measured are results-based; talks had been held with governmental and private organisations to conduct an international benchmarking initiative with the companies involved in KPI measurement.

The Department of Trade and Industry's KPIs

The Department of Trade and Industry's (DTI, 2000) KPIs are among the most widely used systems for performance measurement in the UK construction industry. They are specific to construction rather than production-line industries, and they are sensitive to project requirements. The DTI KPIs were created by The Construction Best Practice Programme (CBPP), funded by the DTI and operating in conjunction with Constructing Excellence (Burgess, 2000; Department of the Environment: Transport and the Regions, 2000). The origins of the DTI KPIs lie in the findings of Egan (1998), who firmly stated the need for year-on-year improvements in construction performance. The DTI KPIs have seven topic areas, within which all other indicators fall. They are time, cost, quality, client satisfaction, changes to orders, business performance and health and safety (Department of the Environment Transport and the Regions, 2000). The performance data were gathered and translated into a performance benchmark percentage score, using benchmarking conversion curves and plotted on a radar chart. The shape of the graphs was defined by the data collected from previous years. This allowed refinement of the curves and for performance requirements to continually rise, and, as a result, an effort towards the year-on-year improvements advocated by Egan (1998).

The Use of KPIs in the Construction Industry

Grillo (1997) proposed a model that shows how different processes and variables influence the result of a project. He selected KPIs that seek to measure the final level of success that a project has achieved. Performance in the most important of the construction processes and other variables, decisions and strategies that affect projects were highlighted. The KPIs related to results include cost variation, schedule variation, the cost of client claims, changes to the contract of sale, the accident index, risk rate and labour efficiency. Those related to process are productivity over output, urgent orders, planning effectiveness and administration productivity. Workforce training and subcontractor ratios are included in the types of variable that the KPIs measure (Grillo 1997). On the other hand, Yeung et al. (2008) developed a Partnering Performance Index (PPI) for construction projects in Hong Kong. The PPI can assist in developing a benchmark for measuring the performance of partnering projects. The authors established a set of Quantitative Indicators (QI) in order to measure the most important KPIs. Face-to-face interviews, a Delphi questionnaire survey and an empirical questionnaire survey were employed. The QI with the highest mean ratings for each of the seven KPIs was selected. "By incorporating these indicators into the evaluation process, assessors could perform their evaluation based on quantitative evidence" (Yeung et al., 2008: 298). The KPIs used were performance in the areas of time, cost, top management commitment, quality, trust and respect, effective communications, innovation and improvement.

RESEARCH METHODS

The selection of which method to use is the most important choice in research design. The researcher should look for the most beneficial method available. In theory, the choice of methods depends on the nature of the research problem and the researcher's philosophical orientation. However, there are certain practical limitations, such as time and funding, which might influence researchers' choices (Boyd et al., 1985). The research aims to explore how the performance of the Saudi construction industry is measured, and how the use of KPIs and benchmarking develops a model to measure Saudi construction projects, with a view to obtaining new insights. Therefore, the exploratory method best suits the aims of the research. The research focuses on the qualitative methods that examine subjects' words, behaviours and actions in descriptive ways, and more closely represents the situation as experienced by participants (Maykut and Morehouse, 1994). The holistic nature of qualitative methods is thought to be useful for the purpose of understanding the performance of the Saudi construction industry. The researcher will take part in the construction of data to better understand the phenomena under study and to provide detailed description.

Data Collection

A semi-structured interview approach was chosen for data collection, because it helps to better understand how individuals construct meaning and significance from their personal framework. It is a flexible and an adaptable approach to exploring the Saudi construction industry by means of conversation. Moreover, it provides the opportunity for further discussion and further exploration of thoughts and ideas as the interviews proceed.

Respondents

Respondents were carefully selected from among those with knowledge, experience in the field and understanding of the subject under research (Easterby-Smith, 2008). In order to ensure that they have relevant experience to address the questions, decision makers involved in performance measurements were chosen. They were all Saudi nationals working directly in organisations involved in both public and private construction projects. Moreover, they were selected to represent different parties in the industry with different qualifications and expertise. The first one is a policy maker working for the government. The second is an owner of a private consultancy company and the third is a concrete supplier. The findings can be further enriched by interviewing clients, contractors, academics and other parties involved in the industry.

Table 1: Interviewee Information

CONSTRUCTION PARTY	CODE	QUALIFICATION	EXPERTISE	EXPERIENCE / YEARS
Supervisor general of projects	KSA1	PhD	All Engineering projects	25
Consultant	KSA2	MSc	Architectural and CM	17
Supplier	KSA3	MSc	Concrete	10

Semi Structured Interview Questions

The interviews were carried around the main research questions. They focused on understanding the current performance measurement in Saudi construction, exploring the factors influencing the projects and the barriers that impact performance measurement. Although these themes guided the interviews, the researcher did not ask exactly the same questions each time. In so doing, each successive interview was used to expand understanding of the subject under research.

RESULTS AND DISCUSSION

CURRENT PERFORMANCE MEASUREMENT OF THE CONSTRUCTION INDUSTRY IN SAUDI ARABIA

The supervisor general of projects (KSA1) stated that there is no proper system in place to measure the performance of the construction industry in Saudi Arabia. Each organisation has its own way of measuring performance, depending on its targets, which, in most cases, are basic measures only applicable to the organisation. The basic measures include schedule over-run and cost over-run, which are used at the project level. Only few well-known organisations in the kingdom use KPIs. The consultant (KSA2) confirmed that the performance of the industry is currently measured through financial and non-financial measures. These measures include budget, time, return on investment, customer satisfaction and quality of products/services. On the other hand, the supplier (KSA3) stated that the Saudi construction industry is currently measured based on the following factors:

Demand

There is a sustainable demand for construction projects in the kingdom, due to the growth of the native population, the infrastructure, electricity, utilities and commercial sector projects.

Government

Government expenditure plans, strong capital and funding plans set by the government are key measures for Saudi industry performance.

Opportunities

Opportunities to investors reflect strong growth for the construction industry and are considered a key performance measure for the construction industry.

MAIN INFLUENCING FACTORS ON THE PERFORMANCE OF SAUDI CONSTRUCTION PROJECTS

According to KSA1, the continuous delay to projects is the main factor influencing the performance of construction projects in the Kingdom. The average time over-run versus target delivery date is 20%. In some cases, projects can be delivered up to double the target date (100% over-run). This is mainly due to the lack of project planning and scheduling by the contractors, which leads to over-commitment to deliver projects within stretched targets. On the other hand, KSA3 emphasised that there are external and internal factors influencing the performance of construction projects in Saudi Arabia.

External factors

- The environment: the world financial crisis, financial recession and political instability in the region.
- Client: payment delay from clients and their under-the-table expenses.
- Suppliers & sub-contractors: increase in construction costs and schedule delays.
- Financial sources: non-ability to access sources of funds.
- Government: unclear regulations & rules and under-the-table expenses.

Internal factors

- Engineering department: delay in design face & consultancy.
- HR Department: non-availability of skilled manpower.

ALTERNATIVE METHODS OF CONSTRUCTION PERFORMANCE MEASUREMENT

KSA1 stated that KPIs are the only recognised tool for some big organisations and the only method used for performance measurement. These KPIs are mainly actual cost and time compliance to the agreed target. Project planning and scheduling software (i.e. MS Project and Primavera) are used for formalities. However, KSA2 thinks that one of the most effective methods for construction performance measurement is the Earned Value Analysis & Management System (EVMS). On the other hand, KSA3 identified three methods for measuring the Saudi construction industry: the Performance Measurement System (PMS), KPIs and the Benchmarking System (BS). PMS is a general method of which the criteria are set by the project sponsor. On the other hand, KPIs and BS are structured methods using pre-set criteria for performance measurements.

BARRIERS THAT IMPACT SAUDI CONSTRUCTION PERFORMANCE MEASUREMENT

According to KSA1, the lack of qualified personnel who can work with the performance measurement tools is a main barrier impacting construction performance measurement. Moreover, there is no enforcement from decision makers to put a system in place. KSA2 agrees with KSA1, and added that the lack of established metrics, lack of a measurement baseline, as well as the non-

implementation of benchmarking and TQM are barriers impacting Saudi construction performance measurement. KSA3 stated more barriers such as:

1. Lack of valid data and real-time control.
2. Commitment of companies to standardisation measures (i.e. no standardisation measures across the construction industry).
3. Commitment of companies to implementation of improvement based on findings (i.e. commitment for taking action based on findings).

USE OF THE KPIS OF OTHER DEVELOPED AND DEVELOPING COUNTRIES TO MEASURE CONSTRUCTION PERFORMANCE IN SAUDI ARABIA

In order to use the KPIs adopted in other countries, such as the UK, to measure Saudi construction performance, the following steps are required according to KSA1:

1. Understanding the differences between measures and KPIs systems adopted in different countries.
2. Developing collaborative working processes and convincing all the parties directly involved in construction projects to use the tools, by explaining their benefits.
3. Devising new KPI measures.
4. Developing frameworks that support the migration of other countries' KPIs to Saudi performance management measures and systems.
5. Developing a theoretical framework for Saudi performance management outside of the above.
6. Providing training to personnel on how to use KPIs.
7. Tracking and monitoring progress.

CONCLUSIONS

The construction industry is one of the major contributors to the Saudi Arabian economy. It is critical to have a performance measurement method in place, in order to identify the gaps and work on actions for improvements. Currently, there is no proper system to measure the performance of the construction industry in Saudi Arabia. However, some organisations have their own measures, such as cost and time. Saudi construction performance is influenced by internal and external factors. Availability of data, commitment to company measures of standardisation and implementation, as well as the lack of opportunities for real-time control, are the barriers that impact construction performance measurement in Saudi Arabia. In order to implement the KPIs used in the UK for the Saudi construction industry, a seven-step model can be used to enable a structured approach to performance improvement. In order to obtain accurate results, all parties influencing factors performance have to be measured (i.e. client, contractor, management team, end user...etc). The next step is to apply the model in a Saudi construction organisation in order to capture learning and establish recommendations.

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SESSION 4

INTER- ORGANISATIONAL RELATIONS & SUPPLY CHAIN

PRELIMINARY REVIEW OF THE SOFT-SKILLS ESSENTIAL FOR BUILT ENVIRONMENT GRADUATE EMPLOYEES IN THE SUPPLY-CHAIN: A CASE FOR SME CONTRACTORS

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This paper examines the demand for soft-skills for built environment graduate-employees with the intent of highlighting the nature of the demand for this skillset within the firms' operating in the construction supply chain – SMMEs. The overall intent is to understand the link between the demands for soft-skills in the graduate labor market in relation to the employability of construction graduates by SMEs contractors. The research approach involves a detailed literature review and critical examination of the soft-skills demanded by SME employers and the changes that are taking place in the construction graduate labor market looking at the global trends and how these are being reflected into the South African graduate labour market. As large enterprise contractors are downsizing, de-layering and increasingly outsourcing/subcontracting activities to SME contractors, the paper identifies a growing trend towards investing in education and training of graduates that enhances 'employability' rather than 'employment'. The consequences of this trend in the graduate labour market are increasing the demand of soft-skills in graduate employees that might be employed within the supply chain. As large enterprise contractors are increasingly adopting a management contracting arrangement, which increase the outsourcing/subcontracting activities to SME contractors, the study will increase knowledge and understanding of the concept of 'employability' and how to respond to the changes taking place in the graduate labour market. Potentially, this will inform academics about the importance of soft-skills in the education of built environment graduates.

Keywords: employability, graduates, soft-skills, SMEs

BACKGROUND

SUPPLY AND DEMAND: THE LINK BETWEEN HIGHER EDUCATION AND THE LABOUR MARKET

In 2008, Chandrasiri asserted that a circular interdependence exists between the higher education sector, which is responsible for the supply-side of the workforce and economic growth that reflects the demand-side for the workforce, in the labour market. The necessity of the interdependence or responsiveness of the higher education to the demands of economic growth is linked with the idea to increase graduate 'employability', rather than 'employment'. Within the higher education sector internationally (Saunders & Machell, 2000) and in South Africa (Department of Education, 1997; 2002a, South African Technology Network, 2008), the interest in increasing graduate employability is growing. Brown and Lauder (1996) differentiate between the goal of employment and employability in the focus of the education system. They contend that the state should prioritise investment in education and training that enhance employability; where the focus is on skills formation to develop a highly educated workforce for greater occupational mobility and flexible work patterns, rather than, employment; where skills are linked to specific occupations and economic routes.

Kruss (2004) observed that the traditional undergraduate BA or BSc degree programs are structured as one for 'employability' with an 'indirect' link to the labour market, teaching people to think and explore the unknown, and that acquisition of academic marks the end point of formal education, whereby employers then focus on providing necessary skills, knowledge, and experience to produce skilled employees. Contrary to this, the BTech degree programs are known to be structured for 'employment' with skills linked 'direct' to specific occupations and economic routes (Du' Pre, 2010; Garraway, 2006). Nevertheless, Kruss (2004) considered that for BA/BSc and BTech degree graduates, professional specialized knowledge is predominantly provided through mentored work experience, regulated and accredited by professional associations in co-operation with employers in the workplace.

Abroad, the general study on employability reported that employers were complaining about the low levels of skills of graduate-employees entering the labour market (Stewart & Knowles, 2000b; Cox & King, 2006). In South Africa, employers were also found to complain about graduate-employees skills level (Griesel & Parker, 2009; Kruss, 2004). Cox and King (2006:264) underline two aspects of employability skills for a graduate-employee to offer a prospective employer:

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- Transferable skills – those applicable throughout a working life; and
- Subject skills – those more relevant to each career.

As for transferable skills, an additional range of soft skills such as *problem-solving, communication, self-confidence, adaptability*, etc. in a specific academic discipline programme proved to be beneficial to graduate-employees' working-life (Harvey, Moon, Geall, & Bower, 1997). Employers reported that newly recruited employees with effective *problem-solving skills* would *identify and solve problems* by developing *creative solutions* (McLeish, 2002). As a subject skill, employability necessitates that graduates still need subject specific skills (Cox & King, 2006) to offer an employer (Nabi, 2003). Employers employing graduates in SMEs revealed that subject specific degree courses, resulted in both immediate and long-term advantages for their firms (Hart & Barratt, 2009). Although there are many definitions of employability, this study adopts the definition derived by McLeish (2002:2), in a study of employability in SMEs, which states employability as:

Skills required not only to gain employment, but also to progress within an enterprise so as to achieve one's potential and contribute successfully to [the] enterprise strategic directions.

For this study, soft skills are considered as non-technical skills such as:

Communication, team-work, problem-solving, leadership, networking, self-confidence, adaptability (Cassidy, 2006; Duoc & Metzger, 2007).

In relation to the BSc construction degree programmes (offered at Traditional Universities (TU) in South Africa), Smallwood (2010) states that beyond the acquisition of the traditional construction education, graduates will have to modify *attitudes*, add *skills*, which add to the individuals' potential and the organizations competence. There remains a desire for typical TU degrees to have a '*direct*' link to the labour market. This was noted by senior South African government officials. These government officials opine that it may be possible to find sufficient number of graduates, but they lack vocational skills in so much that employer(s) have to devote time training graduates:

So it means that when you left the higher education system, you were not prepared for what you ultimately do. The product that walks out does not meet the needs of industry, so higher education is not responding to the needs of industry, be it in numbers, be it in knowledge or skills (Interview with Senior Official, Government Department, 18 April, 2002).

In relation to the BTech construction degree programmes (offered at Universities of Technology (UoT) in South Africa), research findings indicated that while respondents from UoT rated '*planning, scheduling and controlling construction operations and activities*', which can be termed technical skills, industrial respondents rated '*acceptance of responsibility*' and '*problem-solving skills*', which might be termed soft skills, as the second most important skills (Chileshe & Haupt, 2007). "Trust and honesty", which might be termed soft skills, was reported by both academia and industry respondents as the first most important skill and attribute (ibid).

From these two analyses above, it can be seen that the TU are structured towards delivering 'employability' with an 'indirect' link to the labour market whereas the UoT have structured themselves towards 'employment' with a 'direct' link to the labour market. However, in both cases employers are either not satisfied with graduate-employees skills or rather rank soft skill as one the most important skills to possess. These studies confirmed that there existed a structured mismatch between the kinds of skills that industry employers appear to demand, and what the built environment education provides. In a recent study entitled..... '*Practitioners' perceptions of soft skills possessed by quantity surveying graduates*', Styan and Crafford (2010) concluded that quantity surveying graduates lack adequate possession of the soft skills. Although a large number of graduates are traditionally employed by big companies (McLarty, 1998; Harvey et al., 1997; Mason, 1996), or by professional SME firms, as oppose to SMEs contractors (FBS, 2004). The increase in downsizing, de-layering and outsourcing/subcontracting activities adopted by large contractors, both abroad (Edum-Fotwe, 2002; Edum-Fotwe, McCaffer, Thorpe, & Majid, 1999; Thorpe et al., 1998) and in South Africa (Bamu & Godfrey, 2009), might lead to a large number of the newly qualified graduates from universities to start looking for employment opportunities from SMEs contractors. Investigations and research findings in graduates' skills surveys have been mainly dominated by large companies, and, it would be dangerous to assume that these findings will be true for SMEs (Holden & Jameson, 2002). This also holds true for the construction industry. Research projects in development of soft skills in construction sector have been largely dominated by large companies as compared to SME contractors (Hager, Crowley & Garrick, 2000). Also, while there are reference studies of soft skills on professional construction firms or individuals, studies on SME contractors are minimal in this area. Broadly, there is a lack of data regarding the human resource issues in SMEs contractors (Wager, 1998), and research studies has failed to offer any valid investigation (Stewart, Miller, Mohamed & Packham, 2003). The objective of this study therefore, is to contribute to the development of the minimal investigation of essential soft skills required by built environment graduates within SME contractors'. Although few specific soft skills are mentioned in this preliminary study, narrow task-based approach to specific soft skills is not the focus here.

This study rather focus on understand the link between the demand for soft-skills in the graduate labor market in relation to the employability of construction graduates by SMEs.

SOFT-SKILLS AND CONSTRUCTION INDUSTRY

Yorke and Knight (2006) list four broad and inter-related factors that influence employability:

- Skillful practices (communication, management of time, self and resources, problem-solving and lifelong learning);
- Deep understandings grounded in a disciplinary base (specialised expertise in a field of knowledge);
- Efficacious beliefs about personal identity and self-worth; and,
- Metacognition (self-awareness and the capability to reflect on, in and for action).

These employability factors have little to do with specialized or technical expertise of a particular career-orientated program or profession, but more to do with what is termed 'soft' skills. Although Bennette (2002) states that soft skills are generally necessary skills which enable employees to contribute and participant meaningfully in an organisation, Hager et al. (2000) opine that the demand of these skills on employees vary according to different work and practices carried out by different organisations in construction industry. For example, Stasz, Ramsey, Eden, Melamid and Kaganoff, (1996:102) state that:

.....whereas generic skills and dispositions are identifiable in all jobs, their specific characteristics and importance vary among jobs..... The characteristics of problem solving, teamwork, communication, and disposition are related to job demands, which in turn depend on the purpose of the work, the tasks that constitute the job, the organisation of the work, and other aspects of the work context.

In other words, different functions or tasks in a given organization will demand different competencies (Gonczi et al. 1995; Mo, 2009). This implies that each different participating organization (i.e. large contractor, SME subcontractors, professional firms etc.) in construction sector needs to be treated differently, taking into consideration its functions, jobs, and the environment in which it participate, when investigating the subject of the soft skills.

Construction professional consultants: implication of the soft skills

Although the acquisition of the technical professional skills are essential for practicing professional consultant activities (Styan & Crafford, 2010) these researchers also highlighted the importance of soft skills for the overall success of the professional consultants' career. According to Styan and Crafford (2010) a balance needs to be equal regarding the possession of the technical and soft skills. Further, Edum-Fotwe and McCaffer (2000) mentioned *communication, problem-solving, leadership* etc., which can be termed soft skills, as prerequisite skills necessary for practicing project management practices. Although the importance of the soft skills on the overall career success and industrial competence of construction professionals has become increasingly recognised (Dainty, Cheng, & Moore, 2004; Songer & Walker 2004; Butler & Chinowsky, 2006), there has not been a study investigating the significance of the soft skills in SMEs contractor and its related importance to construction graduate-employees. As such, this study investigates the set of soft skills required by graduates in SME contractors.

SMEs contractors: implication of the soft skills

SMEs in general are competing in a dynamic and increasingly competitive environment (McLary & Dousios, 2006; Edum-Fotwe, 2002) than large enterprise contractors. Construction sector ultimately form a pyramid-shaped industrial structure, with a few number of large enterprise contractors at the top of the pyramid while an overwhelming majority of SMMEs located at the middle and bottom (Ofori, 2009). The pyramid-shaped structure creates a competitive environment particularly in the middle and bottom of the pyramid (Edum-Fotwe, 2002; Jia-ming & Jing-juan, 2004; Cidb, 2009). Further, large enterprise contractors enters into two separate contracts – *one with client and one with SME subcontractors* – in order to undertake the clients project needs (Miller Packham & Thomas, 2002). And the difference in profit margin between the price quoted to the client and the actual cost to execute project works, represents the large contractors reward for efficient management skills to coordinate the operational site work carried out by various SME subcontractors (i.e. trades & specialists) (Edum-Fotwe, 2002). This enables large contractors to be in an advantageous position of selecting subcontracting firms with strategic knowledge to reduce operational costs at the expense of these SME subcontractors (Miller et al., 2002). As a result SME subcontractors' turn to adopt flexibility, with absence of bureaucracy, less rigid and decentralized-approach to decision-making, with the ability to respond quickly to market opportunities, than large enterprise contractors (Edum-Fotwe et al., 1999; Miller et al., 2002). Arguably, because of this, SMEs and their employees may be required to demonstrate a strong competency of soft skills than large contractors and professional companies. Because of this nature, SMEs employers in general, beyond the academic acquisition, when they recruit graduates, according to Hunt and O'Brien (2006), Bennett (2002) they often look for specific soft skills such as flexibility, adaptability, confidence, ability to work in a team,

interpersonal and communication skills. These *specific soft skills* are required because SMEs employers are seeking for employees who are flexible and can adapt quickly (Clarke, 1997; Bennett, 2002) as they transform their organisations into being more flexible and adaptable in response to changing market needs.

The SMEs contractors' marketplace is extremely competitive (Miller et al., 2002; Edum-Fotwe, 2002). And, a general knowledge suggests that a competitive market-place demands firms to be flexible, to adapt in changing markets if they are to survive and grow. Thus the key factor for survival and growth for SMEs contractors is to be flexible enough to adapt to the market demands (Ai-Lin, 2004). Employees in nowadays are called to contribute to the survival and the growth of these SMEs contractors. Bruce (2010) states that in order for SMEs contractor to achieve sustainable-growth, it will need employees who are ready to innovate and prepared to seek out new business methodologies.

The general lack of the soft skills in construction graduate-employees

Those hiring construction graduates began to voice their disappointment with the skills level of their new employees during the late 90s (Bakos 1997; Jagger & Connor; 1998; Davies, 1998) complaining less about technical expertise than the lack of soft skills such as teamwork, creative problems-solving, interpersonal and communication skills, and flexibility. Further, in 2001, Love Haynes and Iran in Australia reported that construction management employers revealed that graduate-employees lack time management and interpersonal skills. Employers of quantity surveying graduates in Malaysia also complain about the low levels of competence of soft skills (Zakaria, Munaaim & Khan, 2006). In recent study in South Africa (SA), quantity surveying graduates' were perceived to possess inadequate soft skills by registered quantity surveyors (Styan & Crafford, 2010). Both in the UK and in SA, the recognition of the call for soft skills and the lack of possession of such skills by construction graduate-employees have led some researchers (Mo, 2009; Dickens, 2006; Chileshe & Haupt, 2007; Smallwood, 2010) to highlight limited, but clear, evidence exists of the mismatch between the types of employees that construction employers' require and what the built environment education provides. While Mo (2009) in UK contends that built environment education has traditionally devoted time on preparing students with strong technical and analytical construction management expertise, Dickens (2006) is of the view that the degree programmes in the UK built environment need also to equip students with soft skills that are deemed attractive to construction employers. Equally, this was reported to be the case in the South African construction studies (see above: Chileshe & Haupt, 2007; Smallwood, 2010).

The nature of construction sector and the increase demand of soft skills

What would be the reasons behind the less complaisance about the technical expertise than the lack of soft skills from those employing construction graduates? And why is there an increasing recognition, recently, of such skills on the overall career success and industrial competence of construction professionals?

Construction sector is a project-based industry, which creates a challenging environment to manage different groups of people effectively to ensure project and organizational success (Loosemore, Dainty & Lingard, 2003). The temporary involvement of diverse project groups, reflected by different firms, who are expected to work together for a short period of time, demands a great deal of soft skills from construction participants to interact effectively. The successful construction project delivery demands personality mix from different project participants (Miller et al., 2002). For example, in construction project, different individuals and groups are force to communicate (Dave & Koskela, 2009) to work with each other during the construction process. Also, different projects pose unique problems and challenges (Ofori & Loh, 2000), that demand soft skills such as teamwork and creative problems-solving, and flexibility. Hence, as early as in the 90s, among 56 key skills and knowledge required for practicing building construction management – *identified and ranked by directors and managers of three small, six medium and two large contractors* – communication, motivation, supervision and leadership were identified as the top four (Young & Duff, 1990).

It is clear from above that the traditional nature of construction business (project-based nature) demands employees to possess soft skills, but what has perpetuated an increase demand of these soft skills. The paragraph below gives a brief overview.

Although the construction markets are known to be volatile (Edum-Fotwe, 2002), in so much that the enterprise contractors current workload does not guarantee future workload due to fluctuating demands (Ai-Lin, 2004), it is recognized that the high levels of competition will continue to force SMEs contractors to be efficient at all times in order to remain competitive in the marketplace (Miller et al., 2002). And, according to Wolosky (2008) an increase in demand for soft skills is being perpetuated by competition and the changes that are taking place in the marketplace, among other things.

LABOUR MARKET AND ORGANISATIONAL PATTERNS

The purpose of this preliminary study is to examine the demand for soft-skills for built environment graduate-employees with the intent of highlighting the nature of the demand for this skillset by construction employers. The overall intent is to understand the link between the calls for soft-skills in the graduate labor market in relation to the employability of construction graduates by SMEs contractors.

ORGANISATIONAL CHANGING OPERATIONAL FUNCTIONS: LARGE AND SMES CONTRACTORS

While the basic business function of large enterprise contractors was known to convert material into a finished building product, this scenario has changed to a situation whereby they only provide managerial services (Edum-Fotwe, 2002) to those who convert materials into a finished product. Those who convert materials into finished product – *smaller-medium contractors* – have grown to establish themselves as specialists, general and labour-only subcontracting firms (Bamu & Godfrey, 2009; Edum-Fotwe, 2002). Although subcontracting is historically common to construction industry (Bamu & Godfrey, 2009), whereby, a main-contractor will employ services from the SMEs sub-contractors, surprisingly; the subcontracting activities are now reported to occur in traditional functions which were normally carried out by the main-contractors. Within the construction sector internationally (Edum-Fotwe, 2002; Ofori & Debrah, 1998) and in South Africa (Bamu & Godfrey, 2009), large contractors were not only reducing their past traditional general work/functions, but also they are increasingly subcontracting work they used to carry out to SMEs contractors. Large contractors used to carry out most of the trades needed for construction work, but now they have taken a stance that allows them to operate mainly as co-coordinators (ILO, 2001) and managers (Godfrey & Bamu, 2009) of many small contractors and sub-specialist contractors on construction projects (Edum-Fotwe, 2002).

This has permitted large contractors to divorce themselves from carry out any of the operational trade-works needed to complete the construction work, and turn to outsource most of this work to SMEs sub-contractors. Notably, large building contractors are increasingly using outsourcing, externalisation and subcontracting management approaches as a means of surviving the volatility of the construction business cycle (Edum-Fotwe, 2002; Bamu & Godfrey, 2009). These management approaches allows the large contractors to transfer some of the risks and financial burdens of the project onto SMEs contractors' (Pietroforte & Costantino, 2003). As operational construction work is increasingly carried out by SMEs subcontractors (Ofori & Debrah, 1998; Bamu & Godfrey, 2009), Edum-Fotwe (2002) asserts that large contractors' are now depending on the performance of the SMEs sub-contractors, to complete a project on time, on budget and at required quality standards. While large enterprise contractors need project management and in some instance, design management skills, the operative skills and specialist functions are increasingly outsourced to small-medium contractors (ibid).

LABOUR CHANGING MARKET: IMPLICATION TO GRADUATES

Although many SMEs contractors have been less likely to employ graduates (FBS, 2004), activities such as downsizing of employees (Bamu & Godfrey, 2009), de-layering and outsourcing adopted by large enterprise contractors (Thorpe et al., 1998; Edum-Fotwe et al., 1999), will lead graduates to start looking for employment opportunities to SMEs contractors. A huge number of graduates will not find placement in 'traditional-graduate-jobs' such as large companies (Hawkins & Winter, 1996). Graduates will find themselves in 'non-traditional roles and jobs' (ibid.). In the construction sector, these 'non-traditional roles and jobs' may involve networks of specialized people and full-time employment to SMEs contractors that have been less likely to employ graduates (FBS, 2004), in contrast to the professional SME consultants or large enterprises contractor that have always employed graduates. Broadly, large organisations' are becoming smaller and therefore recruiting fewer people (Hill, 2003). The construction industry in developed and developing countries has not escaped this phenomenal change. While, Thorpe, et al. (1998) and Edum-Fotwe, et al. (1999) asserted that the modern change activities such as downsizing, de-layering and outsourcing have frequently being found to take place in the UK construction industry. The general trend of many large South African contractors has been to downsize many of their employees and keep only a few workers such as quantity surveyors, construction managers, project and contract mangers and health & safety officers (Bamu & Godfrey, 2009). Arguably, this trend will lead to a large number of these newly qualified core workers – *from universities* – to start looking for employment opportunities from SMEs contractors.

The shift in the graduate labour market will demand graduate exit-skills-level (at South African built environment departments) to priorities investments on education that will train and educate graduates about soft-skills such as flexibility, adaptability, confidence, ability to work in a team, interpersonal and communication skills, *among others*.

UNIVERSITY AND LARGE COMPANIES

Belfield (1999) states that universities engage with large firms and graduates prefer employment in large firms' rather than small-medium firms. Holden and Jameson (2002) note that research and research findings in graduates' *skills* surveys have been dominated by large companies, and, it would be dangerous to assume that these findings will be true for small or medium sized firms. In 2007, Holden et al. concluded by saying that whilst there is now a better picture of graduate employment in SMEs than was the case in 2002, there are still significant gaps that need filling in order to inform policy interventions. From this perspective, it is understandable that there exist a gap of knowledge, particular in view of construction SME sector, of what *skills* graduates might bring to SMEs and what opportunities are available for graduate employed in these firms. Thus, Martin and Chapman (2006) asserted that universities are not doing enough to equip students with SME employment skills. Whilst SME employers believe that they can offer graduates more involvement in decision making, graduates are not aware of the benefits of working for these firms (Moy & Lee, 2002).

UNIVERSITY, GRADUATES AND SMEs

According to Hawkins and Winter (1996) traditionally, SMEs have had little engagement with universities and are unaware of what graduates have to offer. However in 2000 Freeman asserted that a trend is developing for universities to align degree qualifications more with employers' needs and demands, and this development is marched by an increasing demand from graduates for flexibility of employment. This trend is likely to be influenced also by the research that not only involve employers' demands, but also, research findings from studies that will take note of the changes taking place in organizations and their implications for future careers.

SMEs have the potential to “*create employment opportunities; strengthening of industrial linkages; the promotion of flexibility and innovation; the crucial role in supporting balanced growth across the economy*” (Bannock & Albach, 1991). Because of these and other benefits, a well-established interest to nurture and develop sustainable small businesses as SMEs is an increasingly important part of local and national economies (Freeman, 2000). This can be witnessed by many government initiatives aimed at supporting sustainability in SMEs (i.e. South African Cidb), involving economists, academics and industry bodies who strive to develop practices that will help to ensure, that the sector flourishes (Hawkins & Winter, 1996; Freeman, 2000). Freeman (2000) believes that graduates can fill the knowledge gap of management skills and capability for long-term strategic thinking deemed to be essential for the growth and development of the SMEs. Some researchers believe that expanded curricular focusing on SMEs, exposing undergraduates to the success and failures of SMEs, and how these firms develop and grow, will help develop close working partnership that can add-value to SMEs (ECLC, 1998; Johnson & Tilley, 1999).

SUMMARY AND CONCLUSIONS

Why is there a need to study employability of graduate-employees in SMEs? What has happened to the traditional recruitment of large number graduates in large firms? Why SME employers require graduate-employees involvement in their firms? What stimulate this type of research in the first place? How is this related in ways which higher education educates and trains future graduates-employees? While looking at a set of required or essential soft *skills* in construction SMEs sector in general, the main aim of this research going forward is to inform academics about employability and the changes taking place in graduate labor market. In attempt to answer the question posed above, consider the paragraph below by Stewart and Knowles (2000):

One driver for universities to do more on employability is that a key parameter in university performance is employment after graduation. The pressure to do more in preparing graduates for jobs in SMEs is also evident as competition for employment in large firms could become more acute as more graduates chase what they perceive as better jobs in larger firms. This can be seen as a pragmatic response to the needs of SMEs in terms of graduate employment. From the graduate perspective, they will need to be prepared for working in smaller businesses as opposed to the more traditional “blue chip” ones. There is already evidence that graduates are having difficulty in finding graduate jobs that may force those who would not have considered working in a SME to do so.

As stated above, beyond the academic acquisition, SMEs employers when they recruit graduates according to Hunt and O'Brien (2006) they often look for soft skills such as flexibility, adaptability, confidence, ability to work in a team, interpersonal and communication skills. Arguably, this might also be relevant to construction SME sector. This is because SMEs contractors turn to adopt flexibility,

with absence of bureaucracy, less rigid and decentralized-approach to decision-making, with the ability to respond quickly to market opportunities than large enterprise contractors (Edum-Fotwe et al., 1999; Kuratko, Goodale & Hornsloy, 2001; Miller et al., 2002). Having mentioned this, in construction, there has never been an extended study investigating specifically the employability skills, and thus the soft skills required by construction-graduates for the SME contractors. As such, this preliminary study has drawn attention to investigation of the set of soft skills required by graduates for SME contractors. Ideally, the study will generate specific knowledge and understanding of the concept of 'employability' and how to respond to the changes taking place in graduate labour market. Further, Holden, Jameson and Walmsley (2007) argue that 'graduates are important resources that can add-value to SMEs'. This research study going forward contributes to the development of Holden's et al. (2007) argument, by looking at what set of *soft-skills* matters the most for graduates to qualify for *employability* to specialist construction SMEs that are likely to employ them, in the near future.

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DESIGNING AND MANAGING THE STRATEGIC FACILITIES MANAGEMENT SUPPLY CHAIN: RISK AND THE CRITICAL NODE OPERATIONAL MODEL

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Services management is core to FM operations. Supply chain management should be used strategically to provide quality working environments. This paper examines the optimum technique which can be applied by clients and FM service providers where FM functions are outsourced. The paper defines the network structure of the FM supply chain. The paper argues for both supply chain design and for critical node micro management in a transparent supply chain environment with the FM acting as the strategic lens through which the focus of the supply chain is achieved.

Keywords: chain, design, facility, management, supply

INTRODUCTION

There are many definitions of supply chains and these are too numerous to list extensively within this paper. One fairly generic definition is given by Christopher (1992) describing a supply chain as a network of organisations involved in upstream and downstream links in the different processes that add value to products and services. Lambert (2004) simply defines the supply chain as the integration of key business processes across the supply chain for the purpose of creating value for customers and stakeholders. With the inclusion of informational, financial and relational aspects supply chains become a multi-disciplinary and multi-functional set of activities dealing not only with the more physical activities but also with behavioural and intangible dimensions such as relationship building and management (Ritchie & Brindley, 2007). Traditional manufacturing supply chain management (SCM) theory focuses primarily on logistics. Within FM much of the supply chain is service led and as such the issues of supply chain assembly and management are fundamentally different. Strategic purchasing (Then, 1999) focused on the needs of the client (Nelson, 2004) through careful management of the supply chain supports issues such as the nature of buyer-supplier relationship, the management of that relationship and FM purchasing contributing towards core organisational success (Chen and Paulraj, 2004). Additionally Chen & Paulraj (2004) argue that SCM must be composed through a chain of inter-reliant strategic collaborative relationships among the supply chain members with the objective of deriving mutual benefits. In essence a strategic partnering arrangement is required. The framework developed in figure 1 also draws on the innovative relational view of inter-organisational competitive advantage with an integrated approach to the planning and control of materials, services and information flows that add value for customers through collaborative relationships among supply chain members. The productivity nexus within the FM supply chain hides the latent added value (Sarshar & Pitt, 2009) whilst managers themselves require demonstrable deliverables to the core business in order to justify the provision of the service and future re-investment in it either by the service provider directly or indirectly by the client. The core facilities management operation is therefore the development of a fully risk assessed approach to strategic support of the core business through the FM supply chain.

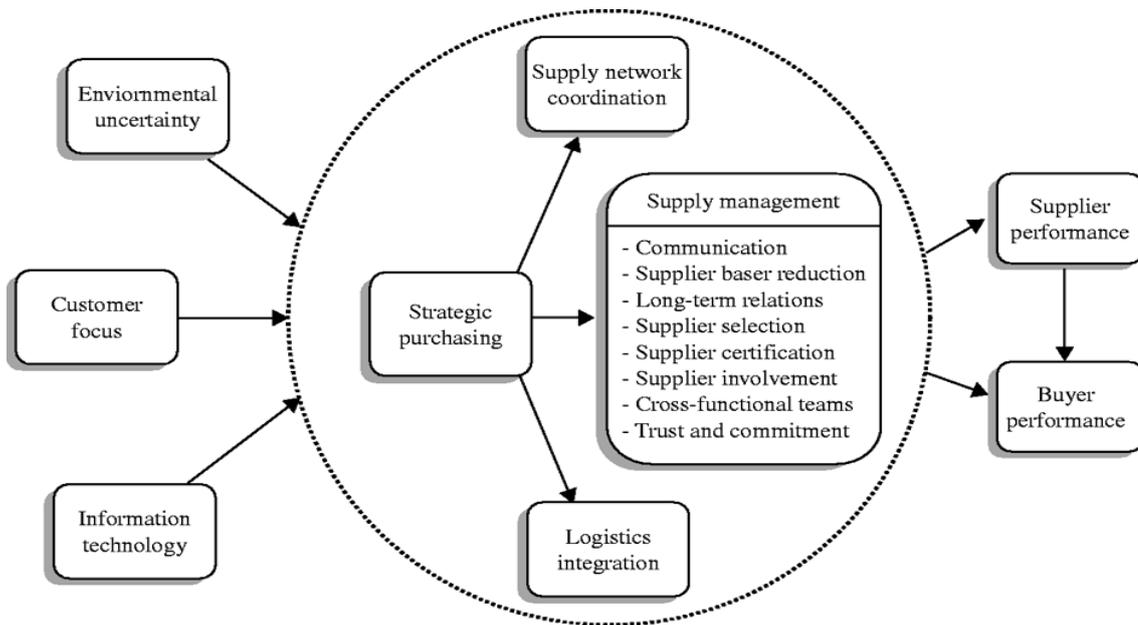
ANALYTICAL METHODOLOGY

The conceptual framing of the FM supply depends upon the existence of a strategic thread not found in the industry by Salonen (2004). However, the perceived strategic importance of FM to companies has grown significantly in the last twenty years and whereas services may not be viewed by all as critical they are now rarely seen as purely operational. Figure 1 shows the Chen & Paulraj (2004) model which provides a conceptual framework for the understanding and interpretation of the workings of the FM supply chain.

A customer focused approach to SCM necessitates strategic purchasing but it can also support the purchasing function should it fall below expectations. The focus of this paper is mainly the supply management section and it is here that the strategic focus is

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most easily understood. With a focus on strong strategic supply chain development a failure in the purchasing function itself can be treated as no more than a parenthesis in an otherwise workable supply chain. Without strategic SCM a single purchasing error can potentially bring down the whole supply chain.



Source: Chen and Paulraj (2004)

Figure 1 Supply Chain Management Research Framework

SUPPLY CHAIN STRATEGY LEVELS

Supply chains can operate at different strategic levels and they must be interpreted strictly according to that level being tactically managed and adapted to deliver the overall organisational objectives.

Organisations formulate strategies at three major levels: corporate, business and functional.

Corporate strategy determines the business or businesses in which the firm will or should compete and how it will fundamentally conduct the business or businesses. Corporate strategy addresses the following matters:

- Does the organisation have a strategic advantage?
- Does the company want to compete or find a niche?
- Does the company seek to concentrate on one product or product line, or on multiple products or products line?
- Will the corporation be innovative?
- Does the company want or need to grow, stabilise, reduce its investment, turn company fortunes around, or defend itself against a takeover?

The Business strategy level deals with competition within the specific area of operations.

Functional level strategies: Supports other strategies and answers the question, how do we obtain the most effective and efficient use of our resources? Whilst functional strategy may well be subservient to business and corporate strategies it must nonetheless support them. This is where the FM strategy is positioned:

- Economic Functional strategies
- Marketing
- Operations-production or service generation
- Finance
- Human Resource management
- Information Systems/Research and Development/Other significant areas

Organisations can optimise their strategic advantage obtained through effective supply chain management by taking tactical approaches to service delivery problems. The strategy adopted may be to deliver drinking water to employees throughout a building but there may, for example, be tactical advantage in delivering this in a form that is consumed giving rise to maximised productivity in either the short or long-term. In business terms this may mean over-consumption of a commodity or service to gain short-term business advantage creating a less significant shortage in the medium term. The understanding of this dynamic separates the ordinary from the extra-ordinary FM organisation.

SUPPLY CHAIN COMPONENTS

For Ayers (2006) there are a number of considerations that must be accounted for in the assessment of the supply chain performance. These viewpoints are shown in Table 1.

Type of SCM viewpoint	Description
Functional	Company's SCM is formed based on a separate functional paradigm of individual departments. No interdepartmental link is established within each functional section
Procurement	Focuses on the context of supply in a supply chain. Initiative on relationship with supplier is critical as part of company's sourcing initiatives
Logistics	In this context, SCM deals with the movement of physical products from production to end-users, which involves transportation and warehousing management
Information system	Focuses on sourcing a better interfacing of SCM mechanisms between internal and external links via the application of information technology
"Business process reengineering" (BPR) and operations innovation	Focuses on waste elimination and quality improvement process. This viewpoint of SCM underpins BPR to be adopted across multiple companies within the SCM as an effort to maintain competitive advantage
Strategic	This viewpoint pursues SCM as a holistic approach and a vital strategy for organisation sustainability

Table 1.
SCM viewpoints

Source: Ayers (2006)

SUPPLY CHAIN RISK AND STRUCTURE

The consideration of risk forms an important part of the supply chain management process. In Figure 2 Richie & Brindley (2007) identify the five major elements of risk that need to be addressed.

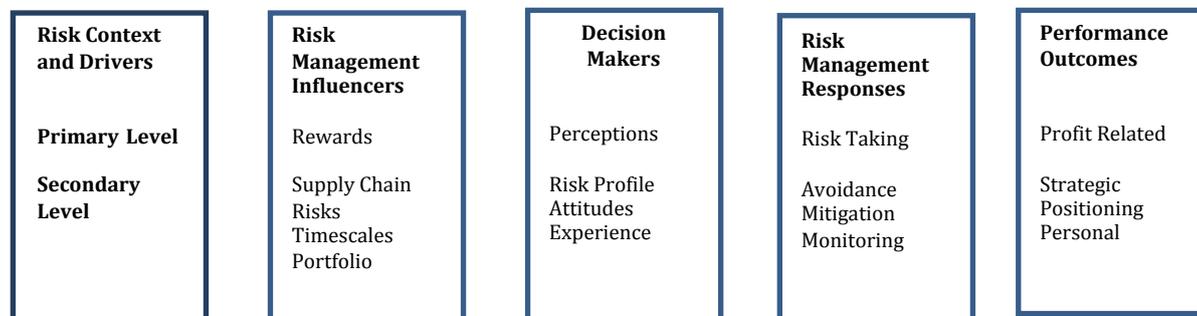


Figure 2: Supply Chain Risk Management Framework (Source: Richie & Brindley, 2007)

The complexity of the risk management framework depends upon the nature of the supply chain itself. Viswanadham & Raghelementavan (2000) identify four distinctly different types of structure within supply chains as follows:

- Serial structure: where one element of the chain feeds into another and the whole chain resembles a single pipe line.

- Divergent structure: structure resembles a cone. At the vertex is the facility that produces a base product.
- Convergent structure: a series of sub assembly stages leading to a finished product.
- Network structure: a tandem combination of both convergent and divergent structures which is both sourcing and distribution intensive.

The network structure typifies the advanced FM supply chain as it represents a complex, almost infinite, number of inter-relationships and variables. The nature of the FM supply chain presents the manager with a very high level of risk management complexity. In common with other aspects of FM supply chain management it therefore requires a very high level of skills across a wide range of disciplines. The complexity does not only lie in the involvement and integration of numerous services and parties in the delivery process of FM functions, but also in the determination of a common platform for strategic partners that share a common vision, goals and objectives towards organisational sustainability (Noor & Pitt, 2009).

THE KEY FM ROLES IN SCM

In the multiple contract management environment the key roles of the facility manager may be summarised as follows:

SUPPLY CHAIN ASSEMBLY & DESIGN

The overall procurement process must enable the assembly of a supply chain that has the strategic capability to deliver the individual services in an effective manner that compliments the delivery of all other services. Each individual service impacts upon the other throughout the supply chain but the impact of each service upon the other will vary dependant on a number of variables.

- The nature of the core business
- The nature of the subject and second service
- The management of the subject and second service
- The criticality or perceived criticality of the two services
- The client investment in the two services
- The client relationship with the service provider
- Staff profile in the two services

However, in the network structure each service impacts upon other services in an almost infinite number of ways making the concept of decision nodes less useful than critical or key decision nodes. The level of micro-management that would be required to take into account all of the meeting points between the services would be prohibitively complex and prohibitively time intensive. It would also be cost ineffective. Therefore the FM must identify key and critical areas of concern where two or more services interface in order to apply an active management role. Other less critical areas of interface will require a passive or delegated management role to be applied. In this way the FM can keep control over the business impact in a complex multi-services delivery model but can also manage the risk inherent in using several business models to deliver services to the same principal.

The FM supply chain designer must have regard for all of these factors and how the chain will focus on the support of the core business operations. What is needed is a framework for risk and critical node management within the supply chain itself. Clearly identifying and reviewing these nodes at the time of supply chain design and construction will enable a greater level of added value to be maintained.

SUPPLY CHAIN INDIVIDUAL BUSINESS MANAGEMENT

In manufacturing many algorithm based models exist to enable the decision making process in the assembly and management of optimised supply chains. There is by no means complete agreement as to the efficiency of this process however (Zsidisin et al., 2004) with questions being raised over the comprehensiveness of the factors that are included in the decision making process. It would be normal for these models to be based upon cost reduction principles through the chain (Graves & Willems, 2005) where the quality monitoring of physical products is a matter of fact. These models are not as useful in the assessment of service delivery as the diverse nature of the FM business model is such that each set of circumstances are necessarily unique and whilst it can be argued that the greater the flexibility within the supply chain itself the greater the protection from inefficiencies (Graves & Tomlin, 2003) the combination of core and service multiple processes requires a degree of rigidity due primarily to the subservient nature of the FM supply chain to core operations.

Each individual service represents a business in its own right within the overall client contract. As such we find an almost “mirror on mirror” effect as each business finds itself interlinked with another at two distinctly different levels. Firstly and more obviously

the service businesses are linked through their relationship to and provision of services to the core client business. Secondly, in large facilities, there is the need for FM services to be provided to each provider by each provider.

This requires that the facility manager focus on certain aspects of each service as follows:

- The service business viability – the FM must have regard to the circumstances of the service provider in relation to financial viability. This may relate solely to the profitability of the single contract or to the wider business of the service provider. This situation will impact upon the performance of the supply chain member in several ways not least the need for the FM to consider the business continuity implications (Pitt & Goyal, 2004).
- Innovation capability – where a service provider is already demonstrating an ability to manage processes for its own benefit and its customers benefit then the FM can afford to be more distant. In most cases however the provider will require an external catalyst to ensure the development of innovative solutions (Goyal & Pitt, 2007).
- Compliance – ensuring that the service provider adheres to all statutory requirements will always be a critical function.
- Organisational behaviour – staff retention, motivation, capability, interaction and communication are all factors to be taken into consideration when assessing the critical nature of any part of the supply chain.
- Performance measurement – the FM must define the acceptable performance parameters for the service provider and enable the provider to demonstrate performance against this, the industry average and preferably best in class. The service should ideally be linked into the core business through customer satisfaction indices (Tucker & Pitt, 2010).

An example of this would be the critical connection between cleaning and catering contractors at a point of food consumption within a meeting room. The FM knows that if these two services are to work together for the benefit of the core business that co-ordination is required. This co-ordination cannot be left to chance as it presents issues of space, time and order. The two services must take place within the same space in order that the facility may be used for its core purpose. The two services must take place at a clearly specified but different time and in the correct order. It is no good having the wrong room cleaned for a meeting two hours after the food was delivered five hours early to the correct room. A meeting in a dirty room with two potential sources of food poisoning is the very predictable outcome. The FM must determine the importance of this co-ordination to the efficiency of the main business and put appropriate management processes into place. It may be that a centralised booking system will automatically notify both service providers as to the nature of services required, when and where. Even so, contingencies and performance issue remain critical. This necessarily means that the FM must make judgement calls as to the sensitivity of the business to a systems failure and protect those with high or critical importance above others. It suggests multiple levels of service.

CONCLUSION

Hence the critical node operational model requires that the FM has the ability to accurately identify the “critical” locations. In addition the nature and identity of critical and non-critical nodes can change over time. The critical node operation must be read and operated in conjunction with a Modified Innovation Development Funnel model of innovation management and delivery.

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BETWEEN CORE AND SUPPORT: DEFINING INTERMEDIARY FIELDS FOR BETTER UNDERSTANDING OF OUTSOURCING AND FM

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The uncertainties and dynamics are frequently discussed concerning outsourcing in FM domain as well as in activities of core business. The concept of core business has been frequently discussed in the last decades when companies of the service sector have grown in significance. Service management has been accepted as a research discipline where “intangible service” is regarded as an opposite to “tangible goods”. Rented spaces for instance can be regarded as a service if it is exchangeable with other spaces with the aim of optimise the users’ satisfaction. The boundaries are indistinct between (1) core business vs. support activities and (2) between pure service (intangibility) and physical artefacts (tangibility). This article discusses the relevance of conceptualising intermediary fields of the above mentioned factors (1) and (2) and discusses the interdependence of the factors which is conceptualised in a model. It is argued that increased knowledge and attention to the discussed intermediary field would contribute to a larger understanding of outsourcing topics in FM.

Keywords: decision analysis, information technology, partnering, sub-contracting, transaction cost economies

INTRODUCTION

The reality cannot always be described in “Black” or “White” as opposite factors; intermediary “Grey” zones occur in fact in many managerial models. Among facilities managers today it is frequently argued whether an organisation should simply be described in terms of core and support business respectively. Since Prahalad and Hamel (1990) presented the concept of core business it has been of major interest in the analysis of companies. The core business often stands as a dual contrast and some kind of opposite to the activity of supporting a business. The factors of support activities and core activities are also connected to the theories of transaction cost economies where Williamson (1975) and Coase (1937) describe the dynamics of the two factors as an explanation of the existence of firms. The dynamics of choosing an in-house function or to outsource this function to an external provider is a main topic for Facilities Management. However in recent years the strict diversion of activities into core or support business has been criticised (Axelsson, 1998). Outsourcing decisions of companies and organisations tend often to be described in terms of insufficient results. The act of outsourcing implies a risk of irreversibility, especially when a certain time has elapsed. Activities classified as support services sometimes glide into core business and vice versa. Often it has been observed that what is assigned to be support business has played a leading and central role of the itinerary of the company. A common example is that the property and location of the company have contributed to open new doors for generic products and services of the core business. This paper should be regarded as an essay that puts the strict diversion of the two concepts core business and support business into question and argues for relevance of intermediary fields; it tries to give premeditation to the intermediary fields of core vs. support business and service and goods. The everyday activities of facilities managers have their natural realms within intermediary fields. The roles of intermediary fields are not new: Williamson (2008) expresses as follows:

“Governance structures are described as syndromes of attributes that differ in discrete structural ways. Markets and hierarchies are the polar modes to which hybrid (long term) contracting is an intermediate mode.”

The challenge seems to achieve reversibility of outsourcing as a theme for research as well as standards among practitioners’.

GOODS AND SERVICES

The emergence of the service industry in recent decades has motivated managers and scientist to define what is the features of a service. Goods can be interpreted as opposite to service whereby features that define goods and service have been classified and distinguished. Table 1 presents the features of Goods and Services according to Normann (1983).

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Table 1: Comparison Goods and Services (Normann, 1983)

GOODS	SERVICES
Materialistic (Tangible)	Non materialistic (Intangible)
Transferable ownership	Intangible
Displaceable	Non-transferable (ownership)
Storable	Production and consumption occurs on the same place
Distribution	Non transportable
Transportable	Direct contact client and company often necessary
Indirect contact possible between Company and client.	Client participant of the service.

It is evident that the description of the Goods and Services is contradictory; for example why could not Services between Company and client be possible? This, in fact is the main task of doing acquisition for a company. Axelsson (1998) highlights that most products have their intermediary position between pure services and pure goods. For example, cars and mobile phones are even if tangible highly linked to services.

In buildings the activities of the users are matched to various extents with a physical surrounding that includes various services. In leasehold contracts it is a matter of who is the client for new office settings. In long term contracts it is often required that interiors must be removed or replaced to original status. Sometimes new tenants accept the settings of former tenants who have left the premises.

Dettwiler (2008b) put foci on boundaries of the firm that are fluctuating according to the business cycles and accessibility of external resources. All events of the studied variables appear only to a limited extent affect total space use. Similar values during of spatial changes due to acquisition or outsourcing during up turns and down turns of GDP argue for the relevance of equilibrium that is as a definition the boundaries of a firm.

The findings argue for a deepened thought on the dynamic relations that set the boundaries of firms, where the size and the core can exhibit various shapes. We have two apparent situations of low respective high growth of GDP. If growth firms decide to effectuate outsourcing of core business, or, acquire alternatively sale firms; what implication does it then give to office spaces, given the fact that GDP is an independent background factor?

Space change occurs “stepwise” because the physical boundaries a fixed through walls and location; perfect match would thus be impossible to attain between organizational needs and the physical assets. This might as well be translated to the fact that spaces have various owners and user in the course of time. The fluctuations of the boundaries can be associated with decisions of renting or acquiring spaces.

CORE ACTIVITIES AND SUPPORT SERVICES

Tay and Ooi (2001) collected the various definitions of FM where it could be seen that common denominators were “buildings”, “coordination” and “work place”. FM was aimed to support a core business. The current definition of FM in the EU standardisation EN 15221-6 has omitted the term core business for a more politically correct term “primary activities”. Some decades ago FM was more related to real estates which are also omitted in the current definition of FM of EU.

During the recent decades, the emergence and growth of the tertiary sector have resulted specialized firms that support companies and organizations of services that are neither core business nor activity. Efficiency gains are stated if firms and organization have the possibility to concentrate their particular skills on their main tasks (core business or activities) and letting “the rest” (non-core services) be managed by other units that are specialized to provide appropriate services to support the core.

An example of the problem could be that a medical doctor at a hospital should not have main responsibility (as it was some decades ago) of deciding the space design of a hospital but rather be transferred to a specialised FM or CREM unit and thus separating core and support activities.

The notion of FM is often related with decisions to outsource FM-units that have been within the realms of the organisation and acquire it from the market for cost and efficiency reasons. The opposite occurs sometimes; when “insourcing” is considered most favourable, a FM unit is incorporated in the company or organization. The word “Insourcing” has gained a larger acceptance in Germany with the meaning of an opposite action to “outsourcing” (Gondring, 2009) (see Table 2).

Table 2: Pro and Cons in Outsourcing (Gondring, 2009)

PRO OUTSOURCING	CONTRA OUTSOURCING
Concentration to Core Business	Security Risk, leak of sensible data
Enhanced efficiency, Effectiveness, Flexibility	Danger of possible financial instability of the supplier, hidden costs
Improved liquidity	Transaction cost of Control of Contract
Access special Competences	Work legislation and Policies might be violated, less staff care
Access to new technology	Responsibility for not employed staff
Continuity of Supply	Employees Less influence on Staff of Supplying firm
Better adaptability to branch specific changes	Risk when switching employees
Simplified organisation	Loss of Knowledge
Transparency of Costs	Higher performance (above contract) agreement cannot be guaranteed

Prahalad and Hamel (1990) claim that the core competences will be enhanced through a strategic work of knowledge management whereas the physical assets will deteriorate. This is true, however in a FM context when considering spaces as a service delivered it is a wrong conclusion to regard spaces a element that do not support the evolution of core business. As we learn in FM it should enhance the core business, sometimes under the sign of Corporate Real Estate Management, Workplace management and other managerial disciplines. Omitting the criteria of an employment or profession, FM can be regarded as an attitude amongst CEO of growth firms (Dettwiler, 2008a) rather than an established profession because, as the example above of medical doctors at hospitals, one person is involved in both core and support business activities.

Exterior forces like fluctuations due to business cycles or access to market shares influence also decision to locate on single or multiple sites (Dettwiler, 2008b). During favourable times of market the propensity to hire new office spaces tend to be higher than during recessions; which dominate through bounds to old leasehold contracts from previous “boom” period. It was further shown that the fluctuations of business cycles were a background factor for entire or partial relocation.

FM is related to coordination and processes like SCM, Supply Chain Management. Williamson (1989) refers core features to human, technology and process and collects under the concept of Transaction Cost Economy, TCE. In later writings links between SCM and TCE were made; Williamson (2008) defends the research theme and relevance of TCE; the paradigm of make-or-buy decisions is the theorem associated to TCE whereas SCM as a contrast has a larger multidisciplinary area like FM. The dynamics of TCE is related to factors like friction and inertia which can be related to customer loyalty which is an element of avoiding changes of outsourcing contracts.

Outsourcing is an event that occurs both in supporting firms as well a major topic in the core management of firms; as above the relevance of pro and cons of outsourcing exhibit relevance ubiquitous in a firm structure. Alliances are entered in contracts of cooperation and partnering in order to attain stipulated goals. The goals are a product of definition of needs; whereby an approach of studying the real needs is a necessity. Dettwiler (2011) highlights the problem that definition of needs frequently often has a non-rational origin.

Fig. 1.1.B
Broadly drawn
scope of facilities
management

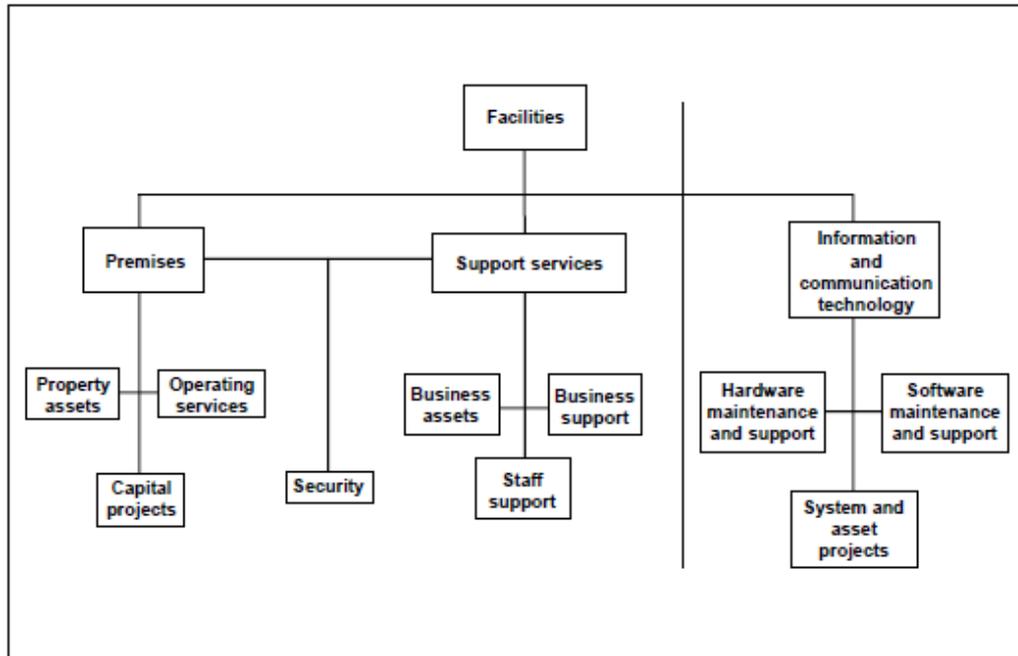


Figure 1. The relationship between Premises, Services and IT according to Williams (2001)

Figure 1 suggests that ICT and thus Knowledge Management (KM) functions as well as a linkage between premises (tangible) and services (intangible). The recent development of the FM industry has put FM into the foreground where the approach of highlighting the contrast core business and support business has been criticised. For example when a company acquires its premises, the role of FM changes to a CREM perspective.

The studies of growth firms has revealed that ownership or leasehold relations are primary decisions at the realms of top management of the core business and not FM subordinates Dettwiler (2008b). Here it can be motivated as well to discuss intermediary stages between core and support services. Penrose (1959) discerns the managerial service (of the leadership) as a quality to enable growth of firms: this quality today occasionally is delivered as support in incubators and thus a market feature.

OUTSOURCING DILEMMAS

“...many companies learned that unexpected complexity, lack of flexibility among outsource providers, and other unforeseen problems added costs as well as friction, ultimately translating into higher total costs than anticipated. One quarter of the outsourced transactions were brought back in-house” (Williamson, 2008). Pro and Cons of outsourcing are often described when dealing with outsourcing dilemmas (Table 2). However other critical points can be highlighted concerning outsourcing. The word insourcing is not always used as logic opposite to outsourcing. In managerial websites insourcing is frequently used when an activity always in fact has been kept in-house.

The rationale of the TCE is in fact to describe the dynamics between markets and hierarchies (in-house) where a strict truth is impossible to find. Williamson (2008) uses the concept of hybrid contracting an establishment of the intermediary field; styles of mediating Hybrid Contracting: (1) Muscular: (the buyer is much larger than the smaller supplier), (2) Benign and (3) Credible. The two latter factors relates to Human Behaviour like trust and distrust.

“The muscular approach to the outsourcing of goods and services for which investments in specific assets are made is myopic and inefficient. Real or imaginary power is nonetheless a myopic trap for those who believe that unused power is a waste — which applies to that subset of large manufacturers who lack the foresight to outsource in a more informed and restrained[...]way” (Williamson, 2008).

The reasoning above (Williamson, 1979, 2008) implies that accurate information has significance in decision making of outsourcing. Knowledge Management and prediction capabilities become a prerequisite for creating a base of creating more appropriate contracts.

Outsourcing and KM has a strong interdependence; also in a historical sense in the public sector where changes of KM affects the performance of FM services and Outsourcing contracts (Bröchner, 2003). Outsourcing features is today varying between countries depending on factors like population density, HR policy and the character of industry (Bröchner et al., 2002) whereby it can be assumed that ICT and knowledge management will play a significant role in the future of establishing contracts. A significant problem with contracts is the difficulty to formulate every detail whereby consensus and oral agreement between involved individuals play the non-formal part of a contractual relation. Kadefors (2004) highlights inefficiencies in contractual relations due to inefficient communication and distrust (or “credibility” above (Williamson, 2008)) with a recommendation of new settings in collaboration that guarantee creative teamwork between parties (e.g. partnering).

Decision makers in outsourcing can easily be related to principal-agent theory which means that they might not take fully responsibility of their decisions, possibly blinded of short-term profit interests. The agent in this case is the outsourced supplying firm that in the course of time might be set into another scenario than that of the time when contractual relations were founded.

Intermediary fields are motivated; individual loyalty to firms does not last forever. Staff can transfer between in-house and supplier organisations by changing employers. The intermediary field is the turbulent environment with rapid changes and unforeseen events. It is the field of the notion of dynamics itself.

INSPIRATION FROM EMPIRICAL DATA

The empirical material of this survey (elaborated at Service Management, Chalmers University of Technology) is assembled from an existing database, the Gaselle list, provided by Soliditet, owned by Bonniers Affärsinformation. The main criterion for a Swedish firm to be listed is that it has reported a minimum rate of turnover growth during the preceding four years. Incidentally, the number of firms that fulfil the criteria of the Gaselle list has decreased over the last five years. The present survey is based on the Gaselle list of 2003 containing 967 listed firms. The database includes annual company turnover, number of employees and changes (measured in % during four-year period) in employee numbers and turnover. 10 variables (representing the period 2001 to 2003) are used for analysis in this paper. After a second reminder, the responses were 387 (40%). 58 firms (10%) of the nonrespondents (580 firms) were randomly selected for additional telephone interviews during February and March 2005. Almost all, 57 (98.3% of the non-respondents sample), answered orally five control questions selected from the original questionnaire. T-test and Wilcoxon signed t-test indicate that generalization of the whole population is reasonable.

It is reasonable to apply data from growth firms in studies on TCE an FM because both issues are related to the problematic of coordination; which since long is regarded as a limitation of firm size (Coase (1937), Williamson (1986) and a major occupation for facilities managers (Tay and Ooi, 2001).

Table 3. Pearson-correlation from Swedish survey.

	1.	2	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Rented office space Boom	1											
2. Rented office space Recession	.882**	1										
3. Business cycle effect Boom	.123*	.099	1									
4. Business cycle effect Recess.	.172**	.131*	.934**	1								
5. Oral agreements Boom	-.035	-.008	.225**	.222**	1							
6. Oral agreements Recession	.002	.005	.240**	.237**	.958**	1						
7. Contracts flexible Boom	.056	.092	.157*	.175**	.424**	.428**	1					
8. Contracts flexible Recession	.106	.122	.173**	.202**	.410**	.422**	.936**	1				
9. Long provider search Boom	.102	.043	.112	.127*	.161**	.154*	.127*	.155*	1			
10 Long provider search Recess.	.090	.043	.100	.153**	.191**	.178**	.105	.153*	.903**	1		
11. Office reloc moves Boom	.176**	.173**	.125*	.121*	-.004	-.001	.012	.028	.115*	.079	1	
12. Office reloc moves Recession	.166**	.111*	.081	.141*	-.011	.009	-.046	-.018	.018	.043	.464*	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

The study illustrates the dynamics of a field in-between two ideal states; a recession and a boom. Since the reality is oscillating between these extremes, the natural stages are in fact the intermediary field. Within the states of boom and recession firms decrease and increment their activities as well as the consumption of space use and FM services.

The correlation matrix reveals that the propensity to rent offices among growth firm is well correlated with the effects of business cycles. A lag effect seems to be apparent because the correlation are higher of the propensity to enter leasehold agreements during booms but are probably enclosed to a contractual situation of the leasehold when recessional time prevail (0.172** compared to 0.123* and 0.131*). This assumption is as well reinforced by the observed propensity to relocate offices and acquiring properties (enter leasehold contracts) in transitions between booms and recessions. The uncertainty of markets provokes as well preference for intermediary solutions with optimisation of reversibility in contractual agreements; oral agreements correlated to flexibility of contracts (0.424**, 0.428**) are apparently significant issues due to the fluctuations of business cycles; lag effects argue possibly for the need of reversibility in contracts. The construction of e.g. Sale-and-Lease-back is a product of reversibility and an intermediary state.

Transaction cost economics, TCE, can be related to the variables of the survey committing (1) oral FM-agreements (instead of written), (2) to close flexible FM-contracts and (3) search long time for an FM-provider. The correlation matrix reveals interdependence between the three variables and a fairly strong correlation to the effect of variation of GDP (Gross Domestic Product) which is in the survey associated to fluctuations of business cycles.

The survey suggests that continuous change and dynamics is the dominating scenario of companies (in this case defined growth firms) and their relation to FM. The stability of static factors becomes less relevant in favour of dynamics.

A MODEL OF INTERMEDIARY FIELDS

The reasoning above concerning the two topics (1) goods and services and (2) core and support argues for intermediary fields. The dynamics due to fluctuations of business cycles (GDP) argues itself for avoidance of static definition of the features. The two factors can be assumed being interdependent. The concept of Williams (2001) supports the idea of a physical and non-tangible classification. Physical artefacts are neither a product of core management nor a product of FM-department. By that reason a model of Table 4 is proposed with interweaved patterns between the two topics.

Table 4 A conceptual model of intermediary fields

	CORE ACTIVITIES	INTERMEDIARY FIELD ACTIVITIES	SUPPORT ACTIVITIES
INTANGIBILITY, SERVICES	Business within tertiary sector	Maintenance of machinery that produces core products	Facilities Services, FM
INTERMEDIARY FIELD SERVICE AND PHYSICAL OBJECTS	Service and goods combined Application: e.g. Transport with packaging of the core product. Marketing material.	ICT-supported Partnering: Hybrid Contracts with Reversibility The role of a facilities manager on Strategic level supported by KM Application: e.g. Sustainable Refurbishment	Service with a direct physical connection: Application: e.g. Interface ICT: Monitoring building information (BIM) Maintenance, construction and repair
TANGIBILITY, PHYSICAL OBJECTS	Manufacturing of goods (with non-apparent follow up service)	The factory as a symbol for the produced goods Reuse of Building Materials, (Walls etc.)	Buildings and Infrastructure

The challenge for actors in the intermediary field is to attain appropriate decision at the appropriate time after having evaluated the constitution of real needs (Dettwiler, 2011). It might be the crucial factor that outsourcing should not (or never) be a reversible event. When a certain time have elapsed after such an event, it is even more difficult to return to insourcing.

An example is to match the artefacts of workplaces to accurate ITC-settings and associable services. Another example of being in an intermediary stage was a CEO of the Swedish survey that adjusted different parts of the core business with partly ownership, leasehold and leaseback agreements.

Possibly should it be motivated that future outsourcing events should be considered in the very early phases of the briefing of projects. Dettwiler (2011) remarks the opportunity of Reversibility in decisions that must be made; The factors (1) Image, (2) Function, (3) Reactiveness and (4) Proactiveness should be considered as an aid to clarify thoughts before and during the very early stages of the briefing process. Enabling the extraction of the “real needs” would improve efficiency, and above all, avoid expensive erroneous decisions in future briefing processes. Due to the interdisciplinary and coordinating skills of Facilities Managers, they will have an opportunity to take on the professional role of identifying the real needs before change occurs, and to play a key role in the pre-briefing and briefing stages of construction project. Such an approach must more efficiently use Knowledge Management where accurateness of information can be supported by ICT. Since the 1980s DSS, Decision Support Systems, has continuously been developed; real time information and complex patterns can be more easily be analysed and detected which could find a role in e.g. partnering situations.

Contracts are categorised as recurrent or occasional, highly depending on information flow (Williamson, 1979). Changes in outsourcing contract would in the future exhibit more recurrent features rather than occasional; which would lower the transaction cost through standardisation measures and transparency approaches within knowledge management and ICT.

CONCLUDING REMARKS

This paper has proposed an inclusion of ICT as a knowledge management tool for creating outsourcing contracts with optimised outcomes for stakeholders and parties. The significance of paying heed to intermediary fields would render a liberty to the stakeholders of markets to establish new creative solutions and new contract philosophy. In a resource-saving and sustainability perspective it is a sense to consider the utility of e.g. re-using building material that satisfy various physical settings of offices.

It is often said the parties in PPPs should attain a win-win situation in an ideal contractual constellation. Asymmetric information flow creates however various strengths between parties (Williamson, 2008). Knowledge management that contribute to more accurateness of the future with transparency would cater for more sustainable contractual solutions of outsourcing. Adjustments of outsourcing contracts in vigour should not be exempt but rather a routine where reversibility should as well be the optimal solution for the stakeholders.

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INTERPERSONAL ASPECTS OF PARTNERING IN HOUSING RENOVATION

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Building processes are under pressure of both internal and external changes. Internally, the process itself is required to be more efficient and transparent and externally, circumstances as climate change urge for process innovations that contribute to quality improvement of the building stock that is created or maintained. A possible two-step approach to cope with both types of changes is adapting the building process to an integrated supply chain enhancing transparency and other process oriented requirements, followed by equipping the supply chain with tools and knowledge to deliver buildings that are adapted to the external circumstances. This study focuses on the way in which Dutch housing associations experience working in an integrated supply chain in housing renovation. During a two year knowledge exchange project seven dyads of housing associations and main contractors execute a renovation project and share their experiences. A semi-structured interview was conducted to take note of their first discoveries. It turns out that the current main goal for the partners is to develop a building process that is more efficient and delivers products with a higher end quality compared to the traditional process. But, it costs a lot of effort to establish the collaboration process itself, where the success factor trust is most present. Partnering in housing renovation is in its infancy, as many parties are not yet fulfilling all aspects of partnering. However, the first steps are made and knowledge projects like the described one count as an added value to the transformation of the building process.

Keywords: contractor selection, housing, partnering, refurbishment, trust

INTRODUCTION

More than a decade ago, several reports have been drawn up requesting the building industry to change its way of working. In the UK, Egan (1998) and in Hong Kong, Tang (1999) concluded that the fragmentation of the construction sector as well as a limited investment in R & D were preventing the building industry to innovate and deliver quality according to the standards of the 21st century. Reports in Australia and Singapore came to a comparable conclusion (Dulaimi et al. 2002). In the Netherlands, a similar report “Van raad naar daad” (From advice to action) was drawn up in 2004 by the “Regieraad Bouw” (Management Council for Construction), with the aim “to stimulate and maintain a momentum of change in the construction sector so that it can again carry the designation of healthy, transparent, and innovative” (Regieraad Bouw 2004). These reports paved the way for an abundant body of literature on process innovations such as partnering (Bygballe et al. 2010). Strikingly, the biggest share of partnering literature focuses on new construction, with some papers being oriented on housing (e.g. Hong-Minh et al., 2001; Barker and Naim 2008). Literature on partnering in housing rehabilitation is scarce (Gruis et al. 2011), although renovation of the existing building stock is an important issue, considering that it is perceived as a crucial player in reaching targets of CO₂ reduction by national governments (Murphy and Meijer 2011). The building process for housing renovation is in many cases more complex than new construction. For example, establishing a continuous production flow is more difficult, due to the fact that every dwelling has its own characteristics. Moreover, the projects are many times located in urban contexts, which can cause logistic constraints. Another issue that can complicate continuity for production is the tenure of the dwellings. The Netherlands has a building stock of 7,2 mln. dwellings, of which 55% is privately owned, 32% is owned and maintained by the social rented sector whereas 12% is owned and maintained by private renters. Tenure is not known of 1% of the building stock (www.cbs.nl). Due to large differences in demands and use of the private sector, creating a continuous production flow is not easy for a contractor. In this view the rented sector is a better starting point for gaining experience with partnering in housing renovation. The sector has good conditions for establishing continuous production flows as many dwellings are owned by few organizations. There are approximately 430 housing associations in the Netherlands, which on average, owned 5,800 dwellings in 2009 (www.cfv.nl). The largest housing association owns approximately 80.000 dwellings. Furthermore, housing associations are not only concerned with the end product of a renovation process, being a renovated dwelling. During the renovation activities, the most important factor that has to be taken into account is the tenants that are living in the dwelling that is being refurbished. Depending on the level of rehabilitation intervention, adequate measures have to be taken to provide the tenants a decent place to live. High level renovations usually consist of (a combination of) toilet, kitchen,

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and bathroom refurbishments together with substitution of window frames, roofs, or both and modifications to the heating system. Low-level renovations are merely singular activities on toilet, bathroom, kitchen, heating system or activities outside the dwelling, such as paintwork. In the case of high level renovations, tenants are 'out placed', which means that they have to leave their homes and move temporarily to another dwelling provided by the housing association. In low level renovations, tenants stay in their dwellings but nuisance has to be reduced to a minimum. The expected benefits of a better end product and a more efficient building process make partnering also a promising approach for the social rented sector. Over the past years, housing associations have found each other in new construction, maintenance and refurbishment (e.g. Straub 2007, 2009; Van der Brug (Ed.) 2009; Vernieuwing Bouw 2010).

The partnering approaches of dyads of Dutch housing associations and main contractors are reflected against the background of international literature on partnering. The housing associations and main contractors are participating in an ongoing knowledge exchange project where they carry out a pilot project in a partnering setting during 2011-2012 and share their experiences in plenary sessions which take place every 4-6 months. They are supported by researchers for theoretical back-up. Research questions were: How did the dyads deal with the success factors for partnering? And: How did they give form to the interpersonal aspects of trust in their processes? The focus points are derived from the overall goal of the knowledge exchange project, being the enhancement of partnering in housing rehabilitation. The success factors were selected as subject of study, because the participants were inexperienced with partnering, so they needed feedback on how to successfully develop a well structured partnership. Although "trust" can be considered one of the many success factors, it has received special attention, because it is emphasized as one of the main success factors in literature (e.g. Akintoye et al. 2000; Wong et al. 2005; Kim et al. 2010). Moreover, a starting inquiry of the project made clear that the participants perceived the creation of trust among the partners as one of the main challenges (Gruis et al. 2011).

METHODOLOGY

A literature review was carried out on the two focus points "success factors" and "trust" in order to establish a well sustained and suitable framework for evaluating the partnerships. Next, the participants of the knowledge exchange project were interviewed. The total population of participants in the project is seven contractors and seven housing associations, but to date, only six contractors and housing associations have formed a dyad. The other contractor and housing association are searching for a partner. The data presented are retrieved from interviews with the six dyads. The interviews took place between May and September 2011. In this interview session the housing associations and the main contractors were interviewed separately, so in total twelve interviews are reported in this paper. In most of the interviews there was a project responsible and a strategic responsible (middle or top management) present. Together, they were able to answer both project and organization oriented questions. The aim of the interviews was to map the first experiences of working in an integrated supply chain. Although the main part of the interview had a semi-structured approach, the first question was an open question; the interviewees were challenged to say whatever they wanted about the notion "Partnering". This question was introduced to take note of the basic position of the interviewees relative to partnering. Their opinions were not biased or influenced by the questions of the interview. The discourses were analyzed in order to picture the mindset of the interviewees. The answers from the semi-structured part of the interview were transcribed and sent to the interviewees for eventual remarks. After approval, the transcriptions were used as input for the synthesis and conclusions.

SUCCESS FACTORS AND TRUST

Throughout literature many factors have been described as being success factors for partnering in construction. However, the success factors have been set up with a certain viewpoint, which not necessarily matches with aims and views of the project that is described in this paper. For example, Lönngren et al. (2010) distinguish and elaborate on success factors that are merely based on a successful production process. In the knowledge exchange project more emphasis is needed on the establishment of a successful collaboration. Wong et al. (2005) sum up collaboration related factors in their literature review: trust relations, equity of benefits sharing, effective communication, and a competent management. However, they do not elaborate them. Chen and Chen (2000) established 19 success factors, collaboration oriented, but only five factors are elaborated. The success factors and their elaborations that are found suitable and form the basis for this study are the factors as distinguished by Kim et al. (2010). In their paper, they provide a clear overview of the success factors and prove that there is consensus in literature on these factors. Moreover, they present how the success factors need to be interpreted and evaluated. The success factors are: Leadership, Commitment, Co-ordination, Trust, Communication, Conflict resolution techniques and Partner capabilities.

A central theme in many definitions of partnering is trust. Some are shown in Table 1. Wong et al. (2005) have given a rather metaphoric description of the importance of trust in partnering: “Trust is regarded not only as the glue that holds partners together, but also the lubricant that aids project completion”. They have drawn up a list with 14 attributes of trust in construction partnering. They concluded that “to cultivate trust among the contracting partners, the critical factors are to perform competently and communicate openly and effectively”. For the conducted research, the tools on creating trust in partnering relationships, as elaborated by Kadefors (2004) and the trust factors as distinguished by Lau and Rowlinson (2009) have been used as examples of good practice. Kadefors’ tools that have been used were: providing transparency (‘open books’); problem solving measures as frequent meetings; and a start up meeting for team building and goal expression purposes. The trust factors by Lau and Rowlinson (2009) that have been used were: keeping commitments; predictability and knowledge of others; and honest negotiations. The dyads were questioned to what extent they had incorporated the ‘trust tools and factors’ in their partnership in order to be able to advise them how to improve the level of trust, as this was one of their main preoccupations at the start of the project.

Table 1: Definitions of partnering containing the success factor ‘trust’.

SOURCE	DEFINITION
Kim et al. 2010 p. 188	A supply chain partnership is a strategic alliance to achieve business advantage and exclusive goals by paying attention to critical success factors such as organizational commitment, co-ordination, leadership, trust, communication, conflict resolution, techniques and resources.
CIIPTF 1991 and NEDC 1991 in Hong-Minh et al. 2001 p. 50	Partnering is a long-term commitment by two or more organizations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organization boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost-effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services.
Lambert et al. 2004 in Kim et al 2010 p. 188	A supply chain partnership is a tailored business relationship based on mutual trust, openness, shared risk, and rewards to create business performance.
NAEC 2004 (Denmark)	Partnering is a type of collaboration in a construction project based on dialogue, trust, openness and with early participation from all actors. The project is carried out under a mutual agreement expressed by mutual activities and based on mutual economic interests.

MINDSET

In the introduction it was stated that several governmental documents have required more transparency and innovation in the construction process. However, although the topics were mentioned by the interviewees, they did not seem to have the highest priority in mindset of the interviewees. According to their reactions (see Table 2), partnering has more to do with either process related topics, coded as ‘Collaboration’ (8x), ‘Partner quality’ (7x) and ‘Effective use of knowledge of partners’ (7x), or with output related topics, coded as ‘Efficiency of building process’ (7x). Being trust as a topic relatively poorly mentioned, subconsciously it has been a central theme in the engineering (Bresnen and Marshall 2002) of the partnerships.

Table 2: Topics mentioned, (HA = Housing Association; MC = Main Contractor)

Topic	#Mentioned		
	Total	HA's(n=6) (n=6)	MC's (n=6)
Collaboration	8	4	4
Efficiency of building process	7	4	3
Partner quality	7	3	4
Effective use of knowledge of partners	7	2	5
Transparency	6	2	4
Positive feeling about partnering	6	4	2
Product quality	5	4	1
Attitudes of team members	4	2	2
Goal setting	4	3	1
Trust	3	3	0

PROJECTS

The pilot projects that are carried out by the dyads are all housing renovation projects. The projects deal with several typologies of dwellings. In three projects apartments are renovated; in two projects row houses and in one project a combined typology of apartments and single room units for students. In the remainder of this paper all types of dwellings are referred to as 'renting units'. The smallest project consists of 60 renting units, while the largest deals with 310. In total 990 renting units are renovated. The total building costs (without additional costs and/or taxes) are over 31 million euro's, which means an average investment of nearly 32K euro's per renting unit, ranging from 20K up to 80K per unit. The main goals of the renovation activities are to extend the lifespan, improve the social quality of the renting units and their surroundings and improve energy efficiency. The activities consist of improving the building envelope technically and energetically, improve the building installations and renewing the kitchen, bathroom and/or toilet. Five projects are carried out with dwellings in an occupied state. In one project the activities are so intrusive, that the renting unit is temporarily unavailable for living. In this case, the tenants were offered other dwellings during the renovation activities.

The interviewees were asked for the reasons behind opting for the building process based on partnering. The reasons they could provide were pre-established by the researchers and were either related to the project specifications (complexity, time constraints etc.) or related to the potential benefits of the building process itself (cost efficiency, quality improvement etc.). The respondents also had the possibility to give their own reason in a category 'other'. Because the interviewees were allowed to provide more than one answer, in total 24 reasons were given. The project related arguments were mentioned six times, while the process related benefits were referenced 18 times. The reasons 'failure cost reduction' and 'quality improvement' were answered most times. Interestingly, one housing association gave as reason to approach the building process through an integrated supply chain to ban the 'fighting culture' from the construction process, herewith following Larson's definition of partnering: "Project partnering is a formal management intervention designed to overcome the tendency to manage projects in adversarial fashion" (Larson 1997).

LEADERSHIP

The success factor 'Leadership' is filled in very well by the project participants. In all housing associations and main contractors the top management supported the partnering activities.

PARTNER CAPABILITIES

Even if many of the participants had in common that they indicated efficiency and cost reduction as important drivers for partnering, the supply chains are brought together in three different manners, named as the '1 on 1 approach', the 'consortium approach' and the traditional 'tendering approach'. The first approach (1 on 1) is used in three projects. This method is based on a high level of trust (Lau and Rowlinson 2009), because a comparative selection between two or more companies has not taken place. In the Netherlands public procurement rules do not apply on housing associations because they are considered as private entities. Trust between partners has evolved during earlier projects. Based on a medium level of trust, in two projects, the work is commissioned to a group of partners, who have collaborated to present a joint solution to the project requirements by the housing associations. These groups are referred to as 'consortia' in line with the definition of Gruneberg and Hughes (2006), "A consortium is defined as an arrangement between several firms, in which each firm contributes an equity stake in the form of risk capital or payment in kind in order to qualify as a member. Remuneration of consortium members may be calculated as a share of the net profits of the consortium". The consortia were selected based on pre-established criteria, such as experience with the type of project, attitude towards supply chain integration and vision on the project. In only one of the projects the selection of the partner was based on price, following a tendering procedure. Trust was very low at the start of this project.

In order to be sure that the construction process would run without relational disturbances in the supply chain, caused by uncertainty about partners (Lau and Rowlinson 2009), the involved sub-contractors were carefully selected in 5 dyads. The sub-contractors were known by at least one of the parties and the housing association had the final decision in accepting the sub-contractor. The dyad from the tendered project stated that it did not pay special attention to the selection of sub-contractors.

COMMITMENT

Commitment of partners is shown in their willingness to continue a partnership (Kim et al. 2010). The 1 on 1 selection by three dyads are a strong example of commitment, because it is precisely the continuation of the relationship which is established earlier. Commitment is also shown by expressing the pretensions to continue the relationship. This was at the moments of interviews still missing, as the maintenance phase was left out of the project boundaries. However, in two projects housing associations have at least expressed their intentions to commission the main contractor with the maintenance of the work at hand, and in one of those projects a maintenance company had an advisory role in the consortium. Furthermore, all partnering arrangements were focusing on only one project and no project-unrelated appointments were made.

CONFLICT RESOLUTION

When asked directly if they had agreed upon conflict resolution techniques, none of the dyads was able to name any. However, all dyads stated to be working with contracts. These were based on a traditional situation, where the housing association has a contractual relationship with the main contractor. The sub-contractors had a contractual relationship with the main contractor and not with the housing association. Moreover, all dyads were working in a hierarchical setting, which is considered a traditional conflict resolution technique (Kim et al. 2010). The housing association – the one who pays – has the last word. In one project, the hierarchy was strengthened by the fact that the housing association would only start paying for activities in the plan development phase if the project received green light for execution by the Executive Board of the housing association, meaning that all development risks were charged on the main contractor. All dyads stated to have established scheme where they had a meeting with all project members every 2-3 weeks. These frequent meetings help detecting and solving problems in an early stage, preventing the relationship to deteriorate (Kadefors 2004).

COORDINATION

In the partnering relationship it is important that both partners know what they are expected to do (Kim et al. 2010). The interviewees were asked whether they had shared their project expectations in the early phases of the design process. As Lau and Rowlinson (2009) pointed out, “expectation is one of the components of trust relations”. Transparency in expectations makes it possible to look for common determinants and by enhancing these, the parties work more efficiently, because they do not lose time leveling differences in expectations with the other partners. Although the enhancement of common expectations can improve the effectiveness of the design process, this topic was not dealt with in the early phases of most projects. In only one project, both housing association and main contractor stated that the expectations had been commonly expressed and agreed upon and were laid down in four goal descriptions. They knew the four descriptions by heart. There were two projects where both partners claimed that expectations were going to be agreed upon in due time and in one other project, the partners mutually stated that no common expectations had been formulated. In the remaining two projects the dyads gave different answers. In order to provide a good starting point for collaboration, most of the partners, both housing associations (4 out of 6) and main contractors (4 out of 6) especially selected the individual team members that were thought to be capable for working in an integrated supply chain approach. The competences that were found important were primarily social skills, being among others: collaborative, open minded, service oriented. The level of project information known prior to the partner selection can be considered as another indicator of trust between partners. The less information known, the more trust partners must have in each other’s capacities before committing themselves. In the three projects with the 1 on 1 partner selection, no information was known at all, even the building project was chosen afterwards. In both situations of the consortium selection, the housing associations have given project information in a program of requirements, which the consortia had to fulfill. The program of requirements contained characteristics of the dwellings (typology, number, location) and the year of execution was prescribed.

All housing associations have given openness in their budget. This has created stability in the partnership, because it determined the project boundaries and expressed trust in the sense that the housing association trusted the partners that they would constructively search for a solution within the budget, instead of claiming extra costs for the changes (Kadefors 2004). The main contractors in turn were, when asked, willing to give openness in the tenders they received from their sub-contractors, against the background to prove the housing associations that the price in the overall tender was the best offer. The way the dyads came to a final project price differs largely. One dyad worked with a ‘price book’ where standard prices were defined for all activities that had to be carried out. It was not

clear how they would deal with unforeseen costs. Another dyad agreed on a final price that had been established in close co-operation between housing association, main contractor and three other major project partners. In order to cover unforeseen costs, a risk pot was set up, where these costs could be paid from. The money in the pot was brought together by all partners, including the housing association. If at the end of the project there was still money in the pot, it would be paid back to the partners. A third dyad was at the moment of interview struggling with the phenomena of such a risk pot. In this case the housing association was more suspicious of the reason to create a risk pot, while in this situation the work was commissioned to a consortium, which had been fully responsible for the development of the project. The housing association had the opinion that the consortium should carry the risk of unforeseen costs as well. Yet another option of setting the final project price was worked out by the dyad that started its partnership through a standard tendering procedure. Once the main contractor was selected, the housing association made very clear that the percentage of profit for the contractor was fixed, whatever would happen. The unforeseen costs were covered by money saving alterations in the project. The last two dyads had not dealt with financial aspects at the moment of the interview, so they could not answer the question based on their experience. However, they stated that they would agree on percentages for profit and general costs, but they did not know how yet.

COMMUNICATION

In three projects a start-up session was planned focusing on the way partners should work together in the best possible way. These sessions were project-independent. Collaboration was further enhanced by means of arrangements on how to communicate within the project team, while communication is one of the elements that sustain a good relationship (Lau and Rowlinson 2009). All dyads stated to have regular meetings every 2 or 3 weeks where the progress of the project is discussed. Four dyads are making use of ICT applications for better communication. One dyad used a common g-mail account where a copy of all correspondence among partners was sent to. The three other dyads made use of a project website where all project-related information and correspondence is stored.

The partnering relationship can also be engineered by using documents that describe the project requirements. In all projects the housing associations showed trust in and made use of the capacities of the main contractors by involving them in drawing up the document with project requirements. These were all performance based, being formulated in a program of requirements or a technical description of the work. In one project both documents were produced. There was no project where a rigid material-based description was used.

CONCLUSIONS

Although partnering was encouraged by the government, at the moment it is still in its infancy in housing renovation in the Netherlands. The six housing associations carrying out the pilot project are frontrunners. Moreover, in such a small numbers, consensus on the most effective approach for partnering cannot be developed yet. However, the variety of approaches has shown valuable insights in the way the success factors for partnering in construction can be filled in. Not all factors however, are dealt with in the most effective way, so there improvement is needed. The factors showing high compatibility with the recommendations from literature are: Leadership, all projects have top management support; Communication, all projects have frequent meetings and in three projects ICT tools are used for good communication; Partner capabilities, five of the six dyads stated to have paid special attention to the quality of partners by selecting known parties or applying selection criteria. A factor that is filled in on a medium level is: Coordination, not every dyad clearly expressed goals, which is important for common understanding. But working together in the plan development phase and giving openness in budget and tenders give a good impression of the intentions and possibilities of the partners. Another medium level success factor is Commitment. This is present in three of the six projects in the sense that the partnerships come forth from an existing relationship. The fact that at the start of the project no agreements have been made about the maintenance phase might need improvement, as well as the participant's focus on the current project and not a project-unrelated approach. On a low level, conflict resolution techniques are filled in. Partners work in hierarchical order, which can lead to negative impacts. Agreements are formalized in contracts, which theoretically symbolize a low level of trust. However, a positive element is that in all projects the project teams meet on a regular basis, which helps to prevent conflicts.

To conclude, although the elaboration of the most crucial aspect of partnering, trust, has shown more effective and less effective engineered solutions, the interviewees were not aware that they were dealing with it all the time. For them, it was just there, as an interpersonal fact.

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REORGANIZATION OF SUB-CONTRACTOR MANAGEMENT PRACTICES IN ALLIANCE CONTRACTS

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Project alliancing involves the collaboration of owners and non-owner participants (designer, contractors, and suppliers) to deliver projects, with all participants sharing the responsibility for project risks in achieving project objectives. But in real practice, it fails to create a true alliance environment since only part of the value chain (owner, designer, main contractor) is considered for integration. Consequently, sub-contractors are not within the alliance and alliance members are not interested in improvements in sub-contractors' processes. Therefore this research identifies and recommends changes in the alliance process so that critical sub-contracting processes can be integrated into the main alliance project. To achieve this objective the research follows a comparative study approach. Information obtained from the review of literature is used to identify current sub-contractor management practices and best practices for sub-contractor integration in alliances. Case study of an alliance project was used to identify certain failure factors in sub-contractor management practices in an alliance environment. From these findings, the study proposes a framework to improve sub-contractor management practices in alliance by using lean supply principles. It is concluded that sub-contractor management practices in real alliance lies between traditional supply and lean supply systems and integration of sub-contractor to the alliance will change the win-loss behaviour.

Keywords: alliance, sub-contractor management practices, sub- alliance, lean supply

INTRODUCTION

In alliance projects, owners and non-owner participants work as an integrated team to deliver projects under a contractual framework where their commercial interests are aligned with project outcomes (Ross, 2003). Literature on alliance show that most projects focus on owner–designer-main contractor alliances but with few projects extending alliance practices to sub-contractors. The integration of sub-contractor management in alliance has been on a project by project basis, and where sub-contractor management has been integrated into alliances, good project performances were recorded (Miles, 1998).

Kwok and Hampson (1997) showed that strategic alliances between contractors and sub-contractors produce superior client satisfaction through collective improvement of on-site construction. Kwok and Hampson study found that relationship attributes such as trust, commitment, communication, fair profit and joint problem solving are positively and significantly related with on-site construction performance. However it is unlikely that collaborative working methods in themselves will produce promised gains until sub-contractors are fully integrated into the process (Hughes et al., 2006). Francis and Hoban (2002) demonstrated that lack of alliance experience, complexity of legal arrangements and the high cost of implementation are main reasons for non-inclusion of sub-contractors in alliances. Therefore, the main objective of this study is to propose a strategy for integrating sub-contractors, using lean supply principles which should ultimately improve construction project performances.

The study uses a combination of literature analyses and case study findings to develop a conceptual framework for integrating sub-contractors in an alliance environment. The review was used to analyze the significant issues in sub- contractor management and practical solutions that lean principles could provide to alliance environments. The case study on the other hand, provides evidence to support the view that downstream supply chain participants are fragmented compared to upstream supply chain participants in alliance contracts. The study therefore determines how the downstream can be integrated with the upstream participants in an alliance environment.

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LITERATURE REVIEW

CURRENT STATUS OF SUB-CONTRACTORS IN CONSTRUCTION

Sub-contractors are a vital component of construction projects (Yin et al., 2009) because the major aspects of project works are performed by the sub-contractors (Andreas et al., 2009). With increasing complexities of construction projects (Ahuja et al., 1994) and improved procurement systems, the main contractors' roles have become limited to the management of work interfaces while offering physical execution of construction tasks to sub-contractors (Humphreys et al., 2003). Sub-contracting is therefore an extensive tool in project delivery. In different countries and in different circumstances the involvement of sub-contractors in project execution range from about 60-95% as shown in Table 1.

Table 1: Sub-contractors' contribution in construction

Author	Country	Contribution %
CONSTRUCAO magazine as cited in Ohnuma, et al., (2000)	Brazil	95% of the considered companies were using sub-contracted in at least one activity
Anitablian and Cardoso as cited in Ohnuma, et al., (2000)	Not mentioned	In 15 studies, 100% sub-contract at least one service, 33.3% sub-contract all services
Lehtonen (1998)	Finland	90% of project value
Maturana, Alarcón, Gazmuri, & Vrsalovic (2007)	Chile	60 % – 70% of the project value

A survey of the Australian construction industry found that sub-contractors consistently work for the same contractors and 94% of these sub-contractors have worked with not more than three major contractors (Francis and Hoban, 2002). Another survey found that 41% of commercial sub-contractors have maintained steady relationships for an average of 9.2 years, with their main contractors (Costantino and Pietroforte, 2002). These suggest the existence of informal alliances between main contractors and sub-contractors which the construction industry could benefit from, if the industry recognizes it as so.

Obviously there are pros and cons to sub-contracting. Usdiken (1988) argue that increased sub-contracting may reduce the main contractor's control over the construction process and could lead to cost and time overruns. Non-completion of construction projects has been attributed to sub-contractor delays (Alarcón et al., 2005). Ohnuma, et al., (2000) also suggest that the sub-contractors mainly focus on work completion with little concern to material wastages and work quality, because sub-contracted services are paid on the basis of physical production at a fixed price. Therefore the relationship between main contractors and sub-contractors are potentially adversarial and may not augur well for projects (Wood and Ellis, 2005). Conversely, interdependence between main and sub-contractors help to maintain a high degree of control over the activities of sub-contractors. Newer management philosophies promoting relational and collaborative working such as alliances and lean construction (Maturana et al., 2007) could be made to reduce perceived adversaries between contractors and sub-contractors (Gadde and Dubois, 2010).

SUB-CONTRACTORS' POSITION IN ALLIANCE

Alliances and partnership contract types emerged to reduce adversarial contractual relationships and other effects of fragmentation in the construction industry (Davies, 2008). The alliance team selection strategy is based on both objective (skills, experience, track record) and subjective (behavior, attitude) criteria (Morwood et al., 2008) and are not based on price competition (Hensley, 2009). Morwood, et al. (2008) suggests that this selection strategy promotes self-awareness, awareness of other participants, team development and communication which are critical success factors in construction projects.

There is a significant component of price competition in alliance contracts, for example sub-contract works in alliances are awarded through some form of competitive bidding (Victorian Government, 2006). On the other hand alliances provide transparent legal and commercial framework and incentives for its participants through an open book concept (Ross, 2003). However such transparency does not extend to sub-contracts (Ross, 2003). Transparency may induce high bargain power to sub-contractors in negotiating further price increase and/or prevent the main contractor from any price reduction. Huang, Huang, Lin, and Ku (2008) suggest that some interface problems could arise due to the lack of trust and ineffective communication among project participants when sub-contractors are not integrated into the main alliance.

Payment disputes mainly due to severe competition and fixed price payments could be eliminated through the gain: pain share mechanism in alliances (Tang et al., 2006). This gain: pain share mechanism maximizes all key results areas. However this mechanism does not flow on to sub-contractors, thus the motivation for continuous improvement to work process is reduced. Sub-contractors are not able to share cost savings with main contractors under alliance agreements. This independence could lead to win-loss situations in alliances. Although there is a well-defined hierarchy of participation and collaboration of owner and non-owner participants

towards the realization of project objectives in alliance contracts, very often these do not develop into long term business relationship because the majority of construction projects are one-offs (Brown et al., 2001).

Latham (1994) makes a number of recommendations for improving relationships between main contractors and sub-contractors, one of which is to involve sub-contractors earlier on any project. Latham believes early involvement of sub-contractors on projects could develop greater team working throughout the project life cycle and beyond. But in alliance projects, sub-contractors and suppliers are introduced to the alliance at the project execution stage, meaning that sub-contractors are not a party to the alliance formation and other design development activities. Ross (2003) asserts that maximum participation and innovation could only be gained when sub-contractors and suppliers contribute to the design phase.

In summary, sub-contractors and suppliers are relegated to the downstream in alliance contracts, and there is no clear cut mechanism to monitor their relationship and performance within alliances. Keeping sub-contractors at arm's-length and operating a transactional relationship which is mainly built on the lowest bid between subcontractors and alliance participants could impact on project performance.

LEAN SUPPLY PRINCIPLES

In recent years, the application of lean principles is being promoted within the construction industry to help minimize waste and maximize value. Hines, Holweg, & Rich (2004) noted that management strategies could easily be integrated into lean without contradicting the strategic objective of lean to provide customer value. Lean is only truly effective when it focuses on the entire supply chain. The authors believe that some identified lean supply principles could be applied to the supply chain in alliance contracts to maximum benefits.

Some of the useful characteristics of lean supply pooled from literature are listed in Table 2. The lean supply principles identified were applied in the development of a sub-alliance model, which is discussed later on. Emphasis in lean supply principles is placed on the role that a supplier (in this case sub-contractor) could play in ensuring a desired value stream in project management. The principles require a high degree of supplier innovation and coordination in both product development and production processes. In fact the principles suggest collaboration in product development through group-based supplier development tools. Some other suggestions include the introduction of production control based techniques such as just-in-time concept, improved flexibility and synchronisation of supplier-customer capacities and improved inter-organizational relationship to achieve a win-win for all stakeholders.

Table 2: Lean supply characteristics (Bozdogan and Horng, 2007)

FACTOR	LEAN SUPPLY CHARACTERISTICS
Nature of competition	Focus on the total competitiveness of a value stream No competition between the members of a supply chain Dependent upon partnerships, trust, openness, and profit sharing Number of suppliers is low and very stable
Supply structure	Long term, often lifetime, relations Buying criteria is based on maximum network benefit Early involvement of established supplier in the design process A tiered and defined supply structure
The role of suppliers	A high degree of supplier innovation in both new products and processes The supplier is a leader of technology in the area A high level of supplier coordination at each level of the supply structure
Supplier development	Suppliers within value streams are seen as group Greater effort made by customer to develop their suppliers Pursue perfection by continually removing waste along value stream True transparency in costs and capacity
Data interchange and interaction	Detailed, some strategic, within network Very frequent interaction at operational level, spreading through network
Production principles	True just-in-time Synchronised capacity Flexibility to operate with fluctuations

METHODOLOGY

The objective of this paper is to demonstrate how sub-contractors management practices can be reorganized in alliance contracts. The research is an exploratory study using a case study project executed under the alliance procurement system. Questions asked from a lean philosophy perspective include but not restricted to the following. How do existing sub-contractor management practices in an alliance contract create wastes? How are wastages created (causes for waste)? How can these wastages be eliminated through a reorganization of sub-contractor management practices? Are lean supply philosophies, when applied, able to improve existing sub-contractor management practices?

The paper begins with a review of relevant literature to support ideas on the current status in sub-contractor management. There is also reference made to lean supply principles to give an indication of its usefulness in supply chain management. The study presents brief information of a construction project being executed under an alliance procurement system, for comparison with the literature reviewed. After an initial pilot investigation, some deficient aspects of key processes on the case study project were identified and recommendations for improvement were made to the participating organization. The discussion section on integrating sub-contractors in alliances presented later on is largely based on these suggested improvements. Finally a framework incorporating sub-alliance processes into the main alliance framework is developed as a suggested improvement to the alliance procurement system.

CASE STUDY FINDINGS

BRIEF DESCRIPTION OF THE CASE STUDY PROJECT

The project studied is the replacement project of an existing motorway in Auckland, New Zealand. Due to concerns of robustness to seismic events and its increasing inability to cater for peak traffic demand, it was proposed to replace the motorway with a stronger and wider structure. The project commenced in 2009 and scheduled to be completed in 2013. The new structure is to be built with minimal effect to traffic flow as this is a crucial motorway link. It is a segmented structure built from 468 precast concrete sections constructed off-site and moved into place with a lifting gantry truss. The project is delivered by seven organizations and the local government body via an alliance approach. Several work packages and processes were identified on the project, by a larger research programme undertaken by the authors to investigate wastes and value creation on the project. However only two of these processes are presented here to support the view that downstream supply chain participants (sub-contractors and suppliers) need to be integrated into alliance contracts for improved benefits.

PROCESS STUDY 1

The process involves the production of precast concrete segments needed for bridge replacements. The entire process (precast concrete segment) consists of fabrication of the rebar, mould set up, concrete pouring and other remedial works. The fabrication of re-bar cage sub-process is awarded on a pre-agreed fixed price to a specialist sub-contractor to provide for labour and materials for this sub-process.

PROCESS STUDY 2

The second process studied is the construction of parapet walls for a section of the motorway. The process consists of the installation of precast concrete elements, installation of parapet formwork, concrete pour and removal of formwork. This entire process is sub-contracted on a labour only basis to another subcontractor.

FINDINGS ON PROCESS STUDY 1

The average cycle time for the re-bar cage fabrication sub-process is 540 minutes which is approximately 20% of the total cycle time of the entire precast segment. The process study conducted found that 45% of the cycle time for the re-bar cage fabrication process was spent on waste activities. These waste activities include rework, unnecessary motion/transport and waiting. Improvement opportunities existed in this sub-process around re-bar steel identification and handling, job-site layouting and process delays due to material and equipment unavailability. Furthermore, there were different constructability issues during the construction phase probably because the sub-contractor was not part of the design team at the design development phase.

The process study found that there were aspects of the sub-process which the main contractor engaged itself in, which were specifically the sub-contractors responsibility and being paid for it. Obviously task responsibilities were not well communicated and performance monitoring was lacking in this sub-process. The subcontractor did not prepare the work schedules and was not participating in the regular '*lesson learned*' workshop, where his ideas could be communicated to other project participants.

The improvement opportunities were discussed with alliance management, but these could not be directly implemented because it concerned a sub-contractors' process which was out of their control. There was also little incentive to influence any change in sub-contractor's activities because the sub-process (re-bar fabrication) was awarded at a fixed price, and was not on the critical path.

It is apparent that the benefits of team-working among upper tier parties are not transmitted down the supply chain. Also sub-contractors are unable to visualize how marginal improvements could benefit the entire project. The study reveals that sub-contracting firms are very often kept at arm's length by other project participants on alliance contracts.

FINDINGS ON PROCESS STUDY 2

The process study revealed that 49% of the total cycle time was contributed by non-value adding activities. The non-value adding activities included poor workmanship, layout, ineffective material handling and ineffective work methods. It was apparent from the study that the sub-contractor handling this work process placed more emphasis on effective rather than efficient work performance. The terms of engagement did not provide any direct benefit for efficient work methods nor for high levels of performance. Incentives provided in the alliance contract for performance improvements do not diffuse down the supply chain to motivate the downstream to reduce process wastes.

It was observed that the main contractor implemented process controls such as a daily monitoring of production and comparison with planned targets, and subsequently monthly forecasting of the entire financial performance of the process. However the process incurred excesses over the original budget and under the original time schedule. The process study determined that rework activities accounted for 17 % of the total non-value adding activities. The main reason for reworks was the poor workmanship of the unskilled worker supplied by the sub-contractor.

OBSERVATIONS DRAWN FROM THE PROCESS STUDIES

The process studies carried out on both work processes provide evidence that wastes are generated within alliance contracts through work processes carried out by sub-contractors. Opportunities for improvement are not being exploited by alliance management because of the poor integration of the lower with upper tier project participants in alliance contracts. Furthermore, the terms of engagement of sub-contractors on this alliance project mean that price and previous working relationships were the major determinants in the contracts. Previous working relationships have the advantage of fostering trusts and interdependence, so that commitment towards waste reduction could come naturally. However it is apparent from the study that the alliance framework does not offer any tangible incentives for sub-contractors to commit to such objectives. Furthermore, the alliance had excluded domestic sub-contractors at the design development phase, thus losing any innovative contribution of these sub-contractors at the design phase. Although effort was made by the main contractor to keep sub-contracting teams informed of alliance decisions, but better integration and coordination could have been realized if they were party to key decisions in the alliance project.

The process study revealed that sub-contractor management practices in alliance are a cross-over between traditional and lean supply systems. Table 3 gives a comparison of sub-contractor management in the observed processes in alliance project and lean supply. We note that by extending alliance principles down the supply chain, observed points of departure could be minimised and the opportunities for process improvements become more realizable.

The next section presents a framework that attempts to integrate sub-contractor management practices into an alliance framework. The suggested framework was developed on the premise that project participants must be able to form symbiotic working relationships (Maturana, Alarcón, Gazmuri and Vrsalovic, 2007) from the early phase of any project.

Table 3 Comparison of sub-contractor's management in real alliance and lean supply

FACTOR	SUB-CONTRACTING IN ALLIANCE	LEAN SUPPLY SYSTEM
Selection criteria	Price and past working experience	Past performance
Transparency	No transparency in cost figures	Information (technical & cost) sharing practice
Contract time	Informally long term	Long term
Involvement of product design	No/very little	Involved
Knowledge of supplier capabilities	Very limited	Greater awareness
Relationship	Arm length, project basis	Closer and long term
Level of trust	Lack of trust	Practices taken to reinforce trust
Behaviour	Win- loss	Win- win
Incentive to cost saving	One party	Both party
Communication	Work independently	Open and frequent
Competition	High	Mutual assistance
Hierarchy	Well defined	Well defined tiered structure

FRAMEWORK DEVELOPMENT

In meeting with the objective of the study, which is to reorganize subcontractor management activities, this section describes the framework that is suggested towards achieving this objective. The status quo on most alliance projects generates a lot of waste because of the lack of integration of key domestic subcontractors into the alliance framework. Figure 1 shows a framework that interconnects sub-contractors with the alliance team. For convenience, we refer to the add-on as a sub-alliance to any existing alliance framework. The sub-alliance enters the alliance environment during the pre-project planning phase and carries on to project execution and to the post project review phase. The following presentation of the implementation steps offers a framework for developing the tools needed to assist in its adoption.

In order to identify potential sub-contractors, the potential main alliance members would be required to nominate sub-contractors (whether specialist or key domestic) who could contribute to the alliance. This is the stage where previous relationships come into play and expectedly nominations will be on the basis of proven performance and a demonstration of their capacity to contribute. Main contractors' would issue request for proposals from their sub-contractors and thence provide manageable list of existing sub-contractors for further investigation.

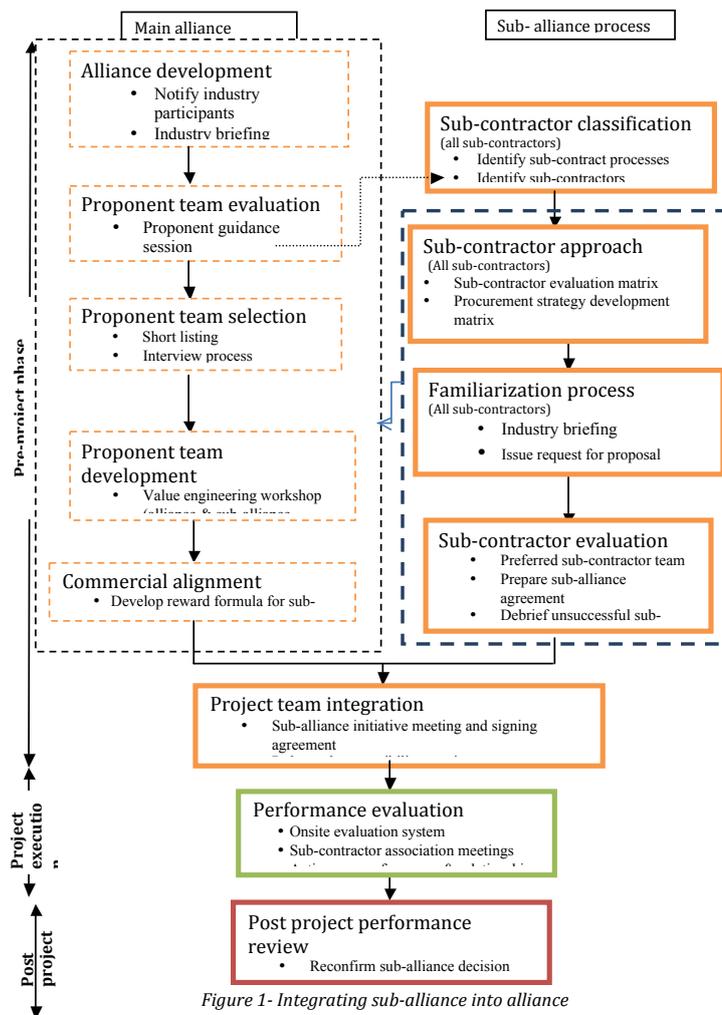


Figure 1- Integrating sub-alliance into alliance

After all proposals have been submitted, potential main alliance and sub-alliance participants are identified based on the capacity analysis of the main alliance participants. Sub-contract processes are identified after a formal evaluation but before the formal selection of the main alliance team by the project owner. When the 'teaming and selection' phase is completed and in parallel to the 'commercial alignment' phases of the main alliance, the sub-alliance team may be brought into the picture of things. The risk and value of each process would have been identified at this stage. High risk and high value processes are selected for consideration by the larger team including the sub-alliance members. The outcome of this activity is a procurement strategy matrix and a sub-contractor competence matrix. The main alliance proponent selection workshop could be used to develop a standard for sub-contractor evaluation and selection. Non-price parameters such as technical and managerial competence, past cognate experiences, innovation, and financial viability of these organizations could be determined and weighted at this stage. This is a sub-contractor evaluation matrix which improves transparency and eliminates the negative effects of price competition. Project-specific factors, sub-contractor evaluation criteria along with the qualifications of sub-contractors are considered and a short list is drawn of potential sub-contractors suited for the project.

At the commercial alignment phase of the main alliance, the alliance members would need to develop a reward formula for sub-contractors which aligns with the main alliances' key performance indicator (KPI) system. This reward formula could be negotiated with the sub-contractors during their selection. The reward formula allows the win-win approach to profit sharing and open book accounting to extend to the sub-alliance team. Short listed sub-contractors would therefore be part of the initial project introduction where the selection criteria and reward mechanisms are explained. Key alliance members will explain project expectations and other opportunities to sub-contractors, who may be required to indicate their strategic objectives for participating in the project. Subsequently all short listed sub-contractors in the newly formed sub-alliance would be involved in all value engineering workshops. The quality of outputs during these workshops would be enriched through innovative contributions by the sub-alliance team. Their early involvement should build trust, strong relationships and commitment throughout the value chain.

Later the alliance proponent members evaluate all proposals. The list of sub-contractors with indication of their quoted prices is considered, while key alliance members comment on their suitability. The core competences of each of the sub-alliance team are

listed and they are assigned roles depending on their relevant skills. Further selection procedure may involve workshops to reconcile the various sub-contractor priorities and feedbacks. Provisional agreements are prepared using the strategic objectives of each participant and distributed among selected sub-alliance members before the project kick-off meeting. A time period may be allowed for the overall alliance to come up with any change so that agreements are finalized before the kick-off meeting. It would be helpful to organize a session with unsuccessful applicants to explain where they went wrong. Alliance board members may conduct this session in the presence of the project owner.

After the selection of sub-contractors, all the alliance members and sub-alliance members are invited to the sub-alliance initiative meeting. At the meeting, alliance members need to reconfirm their commitment to the project by presenting their responsibilities/objectives for the projects and their appropriateness for the work. Final outcome of this activity is to develop roles and responsibility matrix for all project participants. Although individual activities allocated are the key responsibility of each participant, all members must ensure that the project progresses. The final agenda of the sub-alliance initiative is the signing of the sub-alliance agreements by relevant parties. Joint training programmes are to be organized to meet the technical and managerial aspects of the project and to align these with the KPIs. Training programmes should be relevant to problems identified during performance evaluations and would enable participants to see things differently, do things differently and uncover potentials. Intercompany training events should be conducted during project execution to exchange best practices.

Key alliance participants would continuously evaluate the activities of the sub-alliance and the evaluation results could be used as references for future projects. The main contractor who is directly linked with any sub-contractor could assess their performance and could use the “expressions” evaluation system that has three mood states in different colors namely: happy, indifferent and sad (in green, yellow and red respectively). The main advantage of this evaluation system is that everyone is able to monitor their performance throughout the project. These performance feedbacks should aid the training development plan. Immediately after the feedback, the sub-alliance team would be required to share information, discuss the project plans, and generate ideas. Consecutively, relationship status monitoring could be ongoing to assess alliance participants’ as perceived by other participants. An alliance participant’s score questionnaire could be distributed at monthly sub-alliance meetings where they assign performance scores to other members and changes in the score can be openly discussed. Depending on the performance, the training programmes will be developed in a technical or managerial scope to improve the performance. For technical issues, continuous improvement meetings may be conducted among participants to analyze issues. New suggestions may be introduced and the best alternative implemented. This should be a main agenda at the sub-contractor association meeting. Post project performance review meetings will be conducted with all alliance members to review value addition from the sub-alliance team. The performance of each sub-alliance team member is reviewed against set KPIs and strategic objectives agreed at the beginning of the project. At this meeting, the participants should actively discuss the opportunities for future alliances. At project completion stage, alliances should consolidate previous periodic evaluations and lessons learned in a central database for future alliance projects.

CONCLUSION

Alliances projects are established to remove common barriers in traditional procurement methods by encouraging maximum contribution of every project participant to achieve successful outcomes. However it is usual to leave out sub-contractors from the main alliance even though a major portion of physical execution is undertaken by them. It is imperative that the expertise of these key participants (sub-contractors) be integrated into the main alliance to ensure commitment throughout the project value chain. This paper suggests a framework which allows the establishment of a sub-alliance team in tandem with the objectives of core alliances. The authors believe that an extension of alliances to include some selected sub-contractors would augur well for alliance projects. The framework promotes the selection and formation of the sub-alliance teams using similar criteria to those of core alliance teams. Such criteria are usually non-price based, but based on criteria such as innovativeness, ability to collaborate and the alignment of strategic objectives with KPIs identified for the proposed alliance project. An important objective of the suggested framework is the culture shift towards an incentive system that could guarantee a win-win for all project participants. Systematic evaluation of performances and relationships through evaluation indices are suggested in the new framework. It is hoped that the opportunity created by early involvement of key sub-contractors will enhance overall alliance project objectives. Further studies are needed to validate the framework by testing its feasibility in a real alliance contract.

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CLIENTS AND THEIR PROFESSIONAL ADVISERS' ROLES IN CONSTRUCTION MATERIAL PURCHASING FUNCTIONS

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The material purchasing function is the central factor to minimise the overall cost of a building construction project as it contributes to approximately half of the final construction cost. Contractors, subcontractors, clients and consultants are the key personnel involved in the purchasing function in most building construction projects. Clients and their professional advisers could play a significant role in material purchasing functions, but there is evidence to suggest that far too little attention has been paid to their relevance in developing material purchasing strategies. Literature does not provide answers on how the roles of clients can be described in relation to various purchasing activities such as sourcing, selection and procurement of key material inputs; and other routines including feedback and evaluation in relation to price. The paper presents information to show the significance of clients and professional advisers in material management. The paper is an aspect of a wider research that explores how contractors could secure best prices for key materials on construction projects in New Zealand. It describes the methodology for data collection and analyses that will meet the research objectives identified. It is hoped that the result of the research investigations will be beneficial to project participants and the wider construction industry by understanding the complexities involved in procurement decisions and strategies for securing best prices for construction materials.

Keywords: clients, construction materials, purchasing function

INTRODUCTION

A large portion of total construction costs is constituted by construction materials which is usually between 40-50% of the total construction cost for many types of projects (Agapiou et al. 1998). Therefore, maintaining an efficient and effective material purchasing system as well as purchasing materials at the right price, quality and time, are essential for contractors to remain competitive in today's environment. There appears to be opportunities to minimise costs through purchasing strategies particularly with respect to prices. Fellows et al. (2002) confirm that a small percentage reduction in materials costs could bring about a sizable increase in profits for building contractors. However, questions have been raised about how construction materials prices can be better managed considering that it is affected by trade deals between merchants and contractors, and by factors (e.g. political, social, etc.) external to construction (Vidalakis & Tookey 2005). Thus careful materials selection, sourcing and purchasing is essential if it must contribute positively to the realisation of optimum benefits in projects. Key project participants (clients, contractors, architects and designers) should be involved in the material acquisition process so that the best value is realisable on particular projects. Decision making for material acquisition could be associated with economic, technical and aesthetic (comfort and prestige) reasons. However, it is important that the construction materials are suitable to meet functional requirements which satisfy all project participants. Construction management literature show that far too little attention has been paid to cost minimisation strategies in terms of construction materials prices. Sourcing best prices for materials is as much an issue for clients as for contractors and is also an aspect that has rarely received any attention. Eitelberg et al. (2010) conclude that clients' leadership is vital to achieving the best value (Eitelberg et al. 2010) from construction materials. Similarly decisions taken by clients and their professional advisers have a significant impact on the successful construction procurement process (Brisco et al. 2004). The authors believe that it is worthwhile to incorporate clients' decisions into the construction materials purchasing process.

The paper reviews extant literature on the material purchasing and the roles that clients and their professional advisers could play in construction materials purchasing decisions. The paper is an aspect of a larger research programme which explores the opportunities for securing the best prices for key materials used in construction projects in New Zealand. The paper concludes with contextual information on the larger research on which this paper is based. Information provided includes the overarching aim of the research, its objectives and a brief description about the research methods which will be adopted to accomplish the given research objectives.

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MATERIALS CONTRIBUTION TO TOTAL CONSTRUCTION COST

The ultimate price of a constructed building or a structure is an end result of various cost components mostly associated with contractors and clients of that particular project (Statistics Explained 2011). For a client the total cost includes output prices, value added tax (VAT), site cost, architecture fees and other costs. Altogether, these components are called the clients' costs. In addition, there can be profit margins if the client is not the final owner of the building.

Contractors' main cost components consist of construction costs of which material cost is a major component, productivity costs and profit margins. The general cost distribution among these parties can be represented as shown in Figure 1.

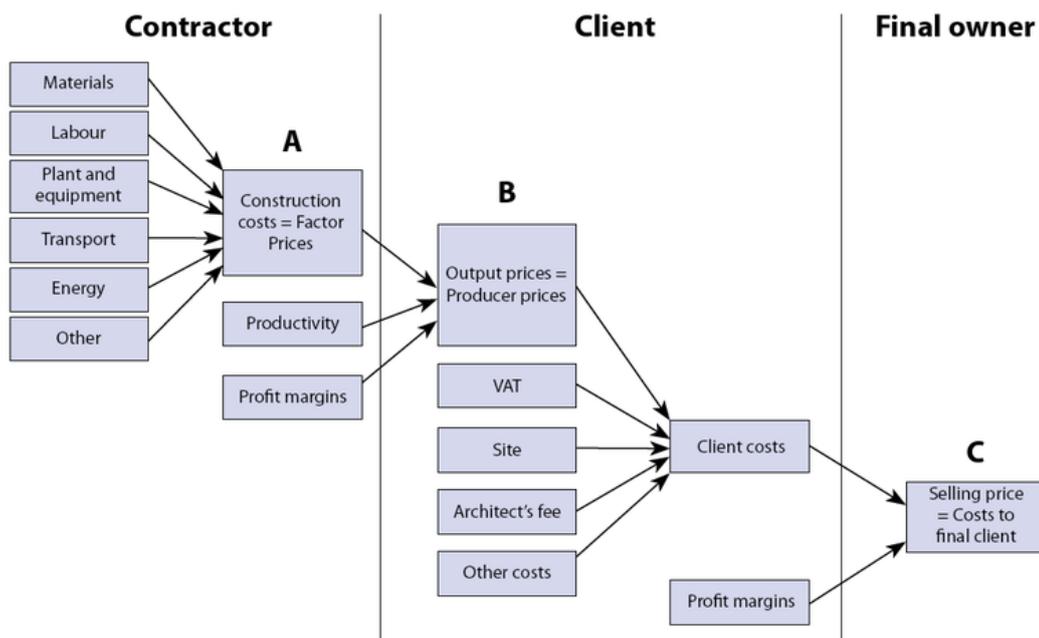


Figure 1: Cost distribution of a construction project (Source: Statistics Explained 2011)

Although the overall building construction cost is distributed over materials, labour, plant and equipment, transport, energy and other components, construction materials comprise a significant part of construction value, approximating 50% of the cost of all construction works (Abdul-Malak et al. 2000; Agapiou et al. 1998; The Business Roundtable 1982; Zavadskas et al. 2005). An examination of cost structures of construction projects reveals that a larger portion of the total construction cost is constituted by construction materials which is usually between 40-50% of the total construction cost for many types of projects (Agapiou et al. 1998). This view is supported by the Construction Industry Institute (1988) which suggests that materials and equipment comprise more than half of a project's cost. Although there is a strong relationship between various project types and their main input contributions (Hillebrandt 1988), as indicated in Table 1, the proportional contribution of material is significant in all circumstances. Bernold and Treseler (1991) commented that the contribution of materials to total construction cost could become even greater in the future due to their increasing cost and increasing usage of materials input in building production. This proportional value further highlights the extent to which construction cost can be influenced through a focus on the proper management of materials.

Table 1: Estimated percentages of various inputs for different project types

Project type	Operative manpower (%)	Materials (%)	Plant (%)	Other (%)
New housing	30	43	2	25
New other building	28	42	4	26
New civil work	15	35	22	28
Repair and maintenance	46	30	2	22
All work	35	37	5	24

(Source: Hillebrandt, 1988 (as cited in Agapiou et al. 1998))

THE MATERIAL PURCHASING PROCESS

According to the definition provided by McConville (as cited in Hadikusumo, Petchpong, & Charoenngam 2005: 737), purchasing is “a fundamental function of material procurement that refers to the acquisition of goods and services and an establishment of mutually acceptable terms and conditions between a seller and a buyer”. Considerable attention has been paid to the purchasing function mainly due to its contribution to profitability, survival of business organisations and firms’ performance (Bayazit et al. 2006; Carr & Pearson 1999). Gadde and Hakansson (2001) found that purchasing is not seen as a separate function and is an integral part of running a company. As far as the construction industry is concerned, purchasing can occur in all phases of a construction project. Anderson and Katz (1998) stated that when a sourcing strategy is developed, particularly to secure the best prices for construction materials, the essential question of ‘how to buy?’ should be answered at the beginning. The sourcing strategy basically depends on whether materials are purchased internally or externally. The next priority should be given to the purchasing function and its associated factors. The purchasing function of a construction firm is a central part of materials management and involves the commitment of project funds for construction materials. The general functions of a purchasing department are defined below (Barrie & Paulson 1992; Dobler & Burt 1996 ; Hadikusumo et al. 2005):

- Identification or recognition of needs via coordination with user departments
- Issuance and processing of internal requisitions
- Discussion with sales representatives
- Identification of potential suppliers
- The conduct of market studies for important materials
- Solicitation of bids and price quotations
- Negotiation with potential suppliers
- Analysis and evaluation of proposals
- Select and award supplies
- Issuance of purchase orders, subcontracts or leases
- Administration of contracts and resolution of related problems
- Tracking and expediting
- Delivery and inspection of goods supplied
- Maintenance of a variety of purchasing records

Depending on the size and scope of the project, these purchasing activities can be achieved by the home office, field, or a combination of both (CII 1988). Few studies have considered any structured research on the purchasing functions and the strategies adopted in the construction industry (Hashim & Ahmad 2006). Therefore, there is a significant requirement for research on the construction purchasing function and especially on the role of the client and their professional advisers in the building construction industry.

THE TRADITIONAL CONSTRUCTION MATERIAL PURCHASING PROCESS

The main concerns of the materials purchasing process are the provision of the right materials at the right time, in the right place and to an agreed budget, such that progress on site is uninterrupted (Kong 2001; Moynihan et al. 2006; Sun et al. 2011), Initiation of construction materials purchasing starts at the tender stage (when the designs are concluded) in a traditional contractual environment. Once the tender document is received, contractors commence project estimation by sending enquiries to their selected suppliers. Afterwards, the contractors evaluate and select the best-received quotes and complete the tender document. Under this traditional contractual environment, material purchasing is limited to the contractors’ three departments namely the purchasing department/purchasing agent, the project management team and the field staff. If the contractor wins the tender at a later stage, the validity of the supplier’s original quote is reconfirmed by the purchasing department. Sometimes there might be a requirement to negotiate a revised price for materials. The next main step after selecting an appropriate supplier is to raise and issue a purchase order to the supplier. In effect, the order becomes a written commitment to accept and pay for goods under an agreed set of terms and conditions and becomes a legal contract. Kong (2001) outlined that there are limitations to traditional construction materials purchasing systems as suppliers may only be selected from a defined geographical location. The system may not allow adequate time for proper supplier selection wherein adequate information about suppliers and their products can be obtained.

In addition, Kong (2001) has reported regularly-encountered trading situations in construction material trading based on the professionals’ ideas in the construction industry. Bargaining, bidding, auction and contract are the main existing trading conditions. Bargaining is a trading condition in which the buyer negotiates with the supplier to accomplish a satisfactory deal. In this case a buyer initiates contact with a supplier, researches the product details including price, and negotiates continuously until a better deal is obtained. Bidding involves a buyer and many potential suppliers. The best deal is selected by the buyer out of the received bids and this follows the typical bidding process. In the case of an auction, a new party called an ‘agent’ who handles the auction, comes in

to the purchasing process compared to the bidding procedure. The buyers bid sequentially to compete for the materials to be sold. During a contractual trading condition, both buyers and suppliers are controlled by a set of mutually agreed rules.

CONSTRUCTION CONTRACTOR AND CLIENT'S RELATIONSHIP

Generally, the building construction industry is project oriented and each project can be considered as unique even though there are common parallel sets of phases. In other words, each construction project is named as a prototype due to its unique site layout and designs. Because of this uniqueness, project team's perspective on the entire construction process could be different. Each project team members such as architects, engineers, contractors and many subcontractors would all have their own opinions on each construction project. Therefore, a construction project is regarded as an order-delivery process and it involves all the parties along the logistic chain. Materials play an important role throughout this order delivery process for the ultimate satisfaction of the customer. When customer's needs are satisfied through the suppliers, contractors, architect and clients, construction materials also transfer among them. In essence, strategies to get best prices for construction materials should be agreeable to all these parties (suppliers, contractors and clients).

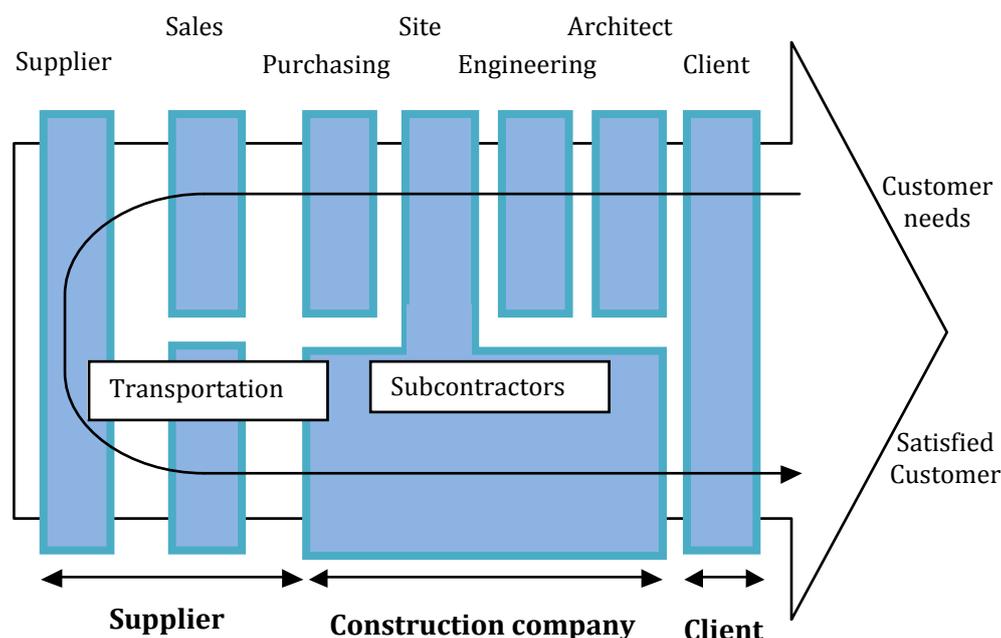


Figure 2: Order-delivery process of the construction project (Source: Wegelius-Lehtonen 2001)

For many industries, one key objective is to achieve the best value for money and the construction industry is no exception. Having realised this, the industry is starting to move away from the limitations of traditional project relationships and lowest-price tenders to other, more collaborative forms of contract procurement. Compared with traditional construction procurement systems, collaboration offers greater opportunities and benefits for the client, contractors, and all other parties to commit to construction project objectives. The inter-relationship between clients and contractors leads to greater client satisfaction, better project quality, shorter construction period and reduced project costs (Boon 2007). In the existing aggressive business mentality of the industry and the non-trusting climate, contractors have greater tendency to pay attention to client/s that provide their workload.

Abdul-Malak et al. (2000) discussed client intentions for managing construction materials purchasing activities. Control of contractor's ordering policies and scheduling contractors payments should be carried out by the client in order to reduce the overall costs of acquiring materials for construction. Due to the clients' responsibility, it is important to ensure that contractors adopt wise procurement plans. However, this depends on the contractual types as well. In order to do that, clients should require the submittal (e.g. shop drawings, material data, samples, and product data, etc.) of a procurement schedule of all major materials against partial payments that apply along with the schedule of work. This can be done through the conditions of the contract. After this schedule is approved by the owner, the contractor is expected to follow it during purchasing of the required construction materials. When the schedule of work is updated, the procurement schedule should also be updated. The contractor's payments for the purchased materials are done in accordance with this schedule to avoid paying for materials that are prematurely delivered to the site. Assume the case that the contractor has already ordered materials according to the approved schedule and work schedule delays were experienced due to reasons outside the control of the contractor. In this case however, the owner will have to issue payments against such delivered materials even if these arrives earlier than it is now required.

DESIGN OF THE RESEARCH STUDY

This paper is an outcome of a larger study (on-going doctoral research project) that is at a relatively early stage in New Zealand. The overarching aim of the doctoral research is to determine how small to medium scale (SME) construction contractors could secure 'best prices' for their key material inputs. The study will be undertaken in conjunction with clients and professional advisers, BMs, manufacturers and building suppliers based in New Zealand. This research study is expected to provide opportunities for the New Zealand construction industry to reduce their construction materials costs. Some research information in this larger study are outlined in the following section.

The following research objectives were formulated to help achieve the overarching aim of the research study.

1. To review and analyse the nature of the construction materials purchasing process and to identify existing problems in this process by conducting a comprehensive literature review.
2. To identify:
 - Buying behaviour of contractors and subcontractors
 - Supply behaviour of BMs, manufacturers, and suppliers
 - Procurement behaviour of clients and their professional advisers
3. To develop a rationalised model/framework to explain construction buying behaviour with a particular focus on prices of building materials
4. To understand the impact of contractor's buying behaviour, suppliers' supply behaviour and clients' procurement behaviour in relation to prices
5. To validate the research findings by subject matter experts in the New Zealand construction industry.

Information will be gathered through surveys and case studies throughout New Zealand. A questionnaire survey will be administered to contracting and client organisations following an extensive literature survey. The case study investigations will involve document analysis of project management procedures and contract documents of selected building construction projects in New Zealand.

In relation to objective 4, it will be necessary to research the types of frameworks developed by other researchers with the form, content, and scope of the synthesised framework depending on the findings of the third objective. There may also be a need to set up mathematical models to explore some of the main findings arising from the third objective. The relationships among sets of many interconnected variables can be represented by identifying a relatively small number of factors using a statistical technique called factor analysis (Norusis 1993). Factor analysis is a collection of methods used to examine how underlying constructs influence the responses on a number of measured variables. Given the likely form and type of data to be obtained from the surveys, it is likely that exploratory factor analysis (EFA) which will attempt to discover the nature of the constructs influencing a set of responses will be used. The impact of various behaviours mentioned above will be evaluated in order to understand their impact on material prices using mathematical models. However, given that, there could be many types of behaviour (and many factors affecting price), it will be necessary to narrow down to a few key types of behaviour for further evaluation using appropriate methodologies.

The following are the key research questions which underpin this exploratory study. This list of questions will be addressed at different stages in the course of the larger research.

1. How do contractors and subcontractors make their materials purchasing decisions in choosing and evaluating supply sources?
2. How can the roles of different project participants be described in relation to various purchasing activities such as quantities needed, quality of materials, potential sources, selection of suppliers and order routines including feedback and evaluation in relation to price?
3. What mix of strategies could/should a contractor or a subcontractor adopt to ensure they secure best possible prices?
4. What are the costs and benefits of these strategies?
5. What project management strategies can be adopted in order to ensure best possible prices are available to clients?

CONCLUSIONS

Sourcing best prices for materials is as much an issue for clients as for contractors and is an aspect that has rarely received any attention. Hardly any study has taken an integrated and holistic approach to material procurement and the achievement of best prices for construction projects. There are a number of issues surrounding the materials purchasing process including the involvement of clients and professional advisers in materials purchasing decisions. It was suggested throughout this paper that clients' role in

the materials purchasing function is critically important. Since their involvement makes more opportunities to secure best prices for construction materials there should be well-defined criteria indicating their roles and that of their professional advisers in the construction materials purchasing function. The fundamental to achieving a better value for construction procurement is effective leadership of the project owners. How collaborative the project team is, is equally important in accomplishing a successful procurement process and deriving best value for procurement decisions. Transparency in the procurement decisions can further enhance the value. However, preliminary and anecdotal findings of the on-going doctoral research on which this paper is based, is indicative that the roles that the clients and consultants play in relation to construction materials purchasing decisions are not clearly defined.

More so there have been no controlled studies related to construction material purchasing issues, especially concerning prices in New Zealand. This reinforces the need for a study into issues around material purchasing in the construction industry. This first time holistic study will help to understand the intricacies involved in construction materials procurement management from an organisational perspective. The study will benefit construction academics and practitioners as it cuts across many bodies of knowledge, from organisational buying behaviour to supply chain management and production management to marketing.

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SESSION 5

WORK, WORKER & WORKPLACE

HUMANS IN THE FACILITIES MANAGEMENT LOOP

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Optimizing comfort for occupants and its related energy use is becoming more important for facility managers. Presently however HVAC installations often do not operate effective and efficient in practice, because the behaviour of occupants is not included. This result in comfort complains as well as unnecessary high energy consumption. As the end-user influence becomes even more important for the resulting energy consumption of sustainable buildings, the focus should be how to integrate the occupants in the buildings performance control loop. This leads to the need for new approaches which enable to include occupant's behaviour in the process control of the building's performance. Such a new development is there in the domain of Bond Graph technology: Archi Bond Graphs. Archi Bond Graphs enable to include user behaviour into people-space systems, which can be combined with other building sub systems, like lighting or hydraulic heating systems. This makes it possible, to include the human in the facility management loop and so to help facilities managers operate and maintain their sustainable buildings more efficiently.

Keywords: facility management, bond graph, archi bond graph, human-in-the-loop

INTRODUCTION

Supplying facility services is the main goal of facility management, therefore practice and theory concentrates on technical work (such as optimising energy sustainability, functionality of workplaces) or managerial work like the forms of relationships such as outsourcing (Heywood 2010). According to the CEN definition facilities management is the integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities (European Committee for Standardisation). There is a shift in focus within facilities management domain. Lately facility management considers the applicability of Environment-Behaviour aspects to its field (Heywood 2010). There is more attention to the importance of people as part of its remit, as can be seen in the definition of facility management by the International Facility Management Association: Facilities management is a profession that encompasses multi disciplines to ensure functionality of the built environment by integrating people, place, process and technology (IFMA 2011). Finch takes even a step further by stating that 'care' of people should be preminent in any definition of facility management. By putting the user first, organisational efficiency will follow (Finch 2010).

Currently the energy management within buildings is far from optimal, improved control could save up to € 600 billion worldwide (Webb 2008). Even in a small country as the Netherlands has a technical saving potential of 170PJ primary energy and an emission reduction of 11Mton (Opstelten et al. 2007). The energy management within buildings can improve by applying the latest developments from ICT technology. The potential savings of energy due to better use of ICT technology is well documented by Røpke et al. (2010), however, in most of the research focusing on improved ICT often overlooks the role of user in reducing the energy conservation. Overall the role of the occupant in relation to the energy consumption has found to be important (de Groot et al. 2008). Occupant presence and user behaviour has a large impact on space heating, cooling and ventilation demand, energy consumption of lighting and room appliances (Page et al. 2007) and thus on the energy performance of a building (Hoes et al 2009). An analysis of occupant behaviour on the energy consumption (Brahme et al. 2009), shows that conservation oriented behaviour of occupants can reduce energy consumption by one-third in normal buildings, while in more efficient buildings, by nearly half (47%). Reduction of or optimizing of energy use is often done without really taking in to account the goal of the energy consumption, human comfort. However, trying to optimize energy efficiency, without addressing occupant comfort, is not going to work (Nicol 2007). Still, as until now user behaviour has not been part of the comfort system control strategy in offices. As there are not many specific research results of the effect of user behaviour in existing office buildings, first a user-actions analysis was performed in cooperation with Royal Haskoning, one of the major Dutch HVAC engineering consulting companies.

ANALYSIS OF HUMAN BEHAVIOR ON ENERGY CONSUMPTION

In the 3th floor of one of their office was chosen as it is a characteristic and representative example of their office working space. Figure 1 shows the floor of the building and Figure 2 illustrates the parameters which might have an influence on the personal actions.

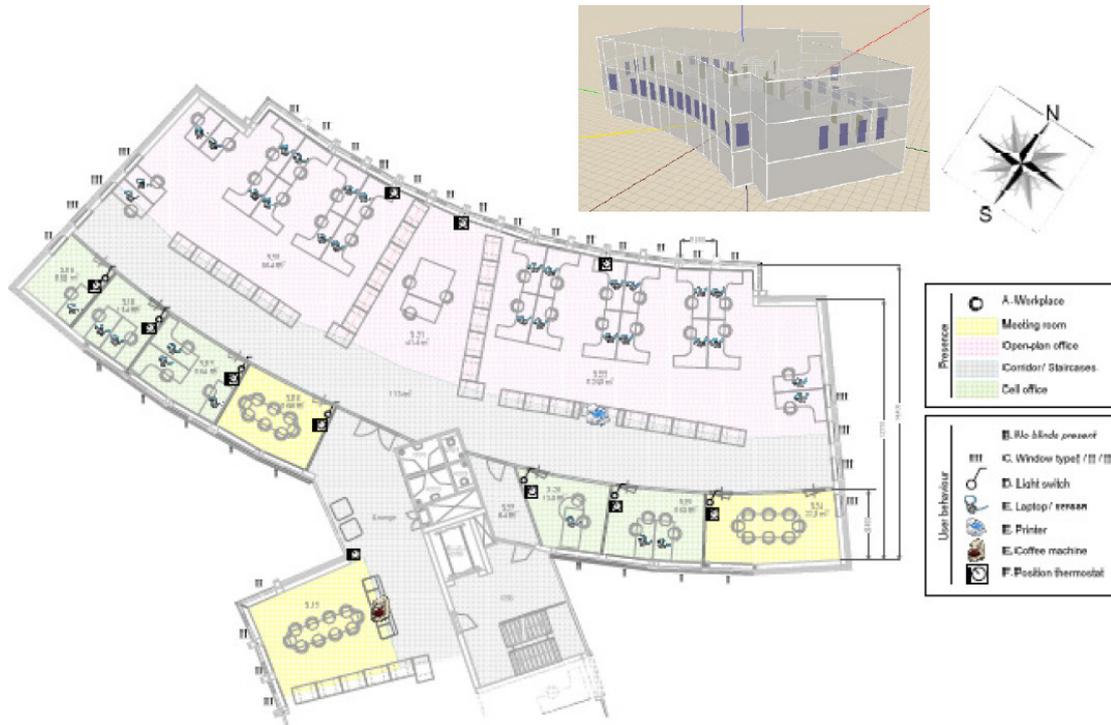


Figure 1. Test case 3th floor of an existing office building

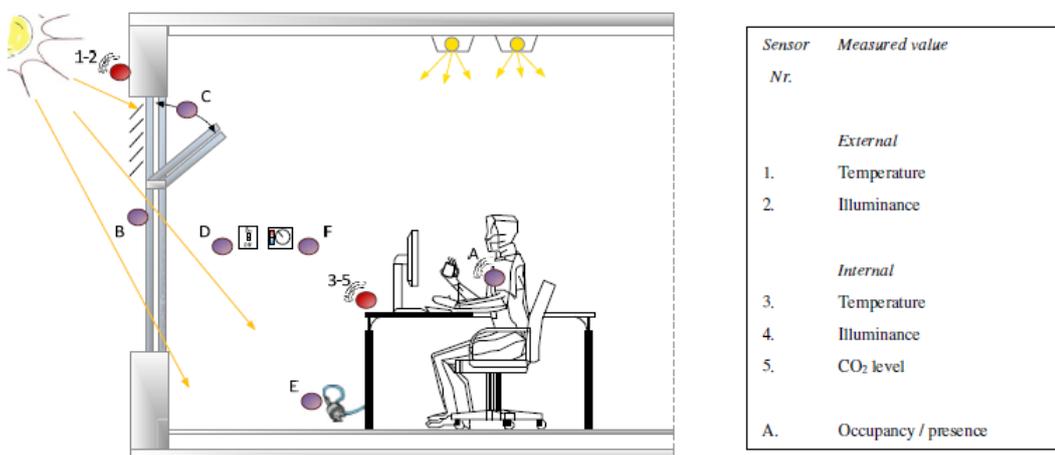


Figure 2. Personal actions and parameters in an example office

For the calculation of the effects of the user behaviour on the energy consumption of the building, the latest version of the VABI Elements heat/cooling load calculation tool was used. VABI is the most important Dutch software developer of tools for building systems, with emphasis on HVAC systems, thermal aspects, electricity and solar energy. The 3th floor of the case study office was modelled in the VABI model, see Figure 1, this made it possible to calculate the effects caused by actions of the occupants. To determine the importance of these behavioural actions on the energetic building performance, the spread in outcomes resulting from the behaviour interactions were determined by basic calculations, see Figures 3 and 4. The input parameters were based on observations of the occupants during a week. To test the sensitivity of the process outcome, in relation to specific user actions, input parameters were changed within an acceptable and realistic bandwidth based on the observations. The output results from the VABI model for room 3.17 and the office space 3.20 – 3.22 are shown in Figures 3 and 4 and represent the total sum of the heating and cooling demand for a year. A high bandwidth means that the parameter is an interesting factor of the occupants' behaviour as it has a major impact on building performance.

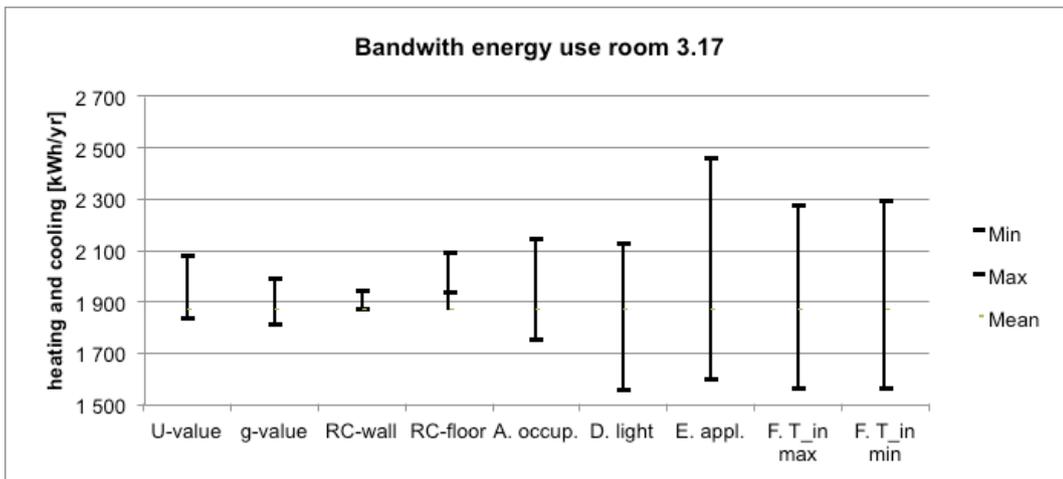


Figure 3. Bandwidth of results from VABI elements for the total energy demand room 3.17 as caused by changing the specific input parameter

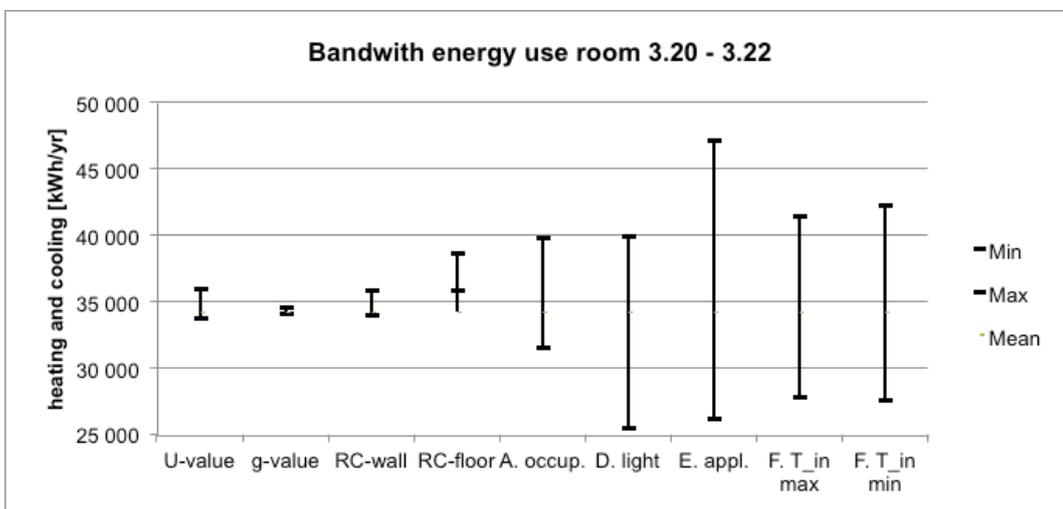


Figure 4. Bandwidth of results from VABI elements for the total energy demand room 3.17 as caused by changing the specific input parameter

Based on the above figures, it is concluded that some of the parameters related to user behaviour (occupancy, lighting, electrical appliances and temperature setting) have a clear and high influence (up to plus or minus 30%) on building performance. This underlines the importance for focusing within facilities management on the inclusion of human behaviour to improve building process control performances.

METHODOLOGY

Several models have been developed to describe human behaviour and to include it in building performance analyses (Nicol 2001; Reinhart 2004; Bourgeois et al 2006; Mahdavi 2006; Rijal et al. 2007; Page et al. 2007; Akhlaghnia et al. 2008; Tabak and de Vries 2010; Kwok et al. 2011). However, only a few studies successfully demonstrate energy reduction from real occupancy behavioural patterns that have been determined (Dong and Andrews 2009). Recent developments indicate, that the application of bond graph technique can serve as a possibility, to both the necessary quantitative and qualitative analysis of the interactions between human, building and building services installations. Therefore the suitability of Bond Graph technology was investigated as recent developments in this domain seem to be promising (Tsaj and Gero 2010).

Bond Graphs (Paynter 1961; Karnopp et al. 1990; Breedveld 1984) combine graphical representations and mathematical equations and are a kind of energy-based systematic representation. They provide a unified approach to the modelling and analysis of the dynamics of hybrid multi-domain systems. Bond Graph possesses a specific characteristic: causality. Causality in Bond Graphs establishes the

cause and effect relationships between the factors of power and this in a sense forms an additional process logic which can be used during modelling the processes. Up to now however, in the domain of the built environment, Bond Graphs were only used to represent the indoor climate installations of buildings for energy simulation (Zeiler 1997) and fault detection and diagnoses (Yu et al. 2002, Yu 2003, Yu and van Paassen 2004). New developments within Bond Graphs technology, now enables to include user's actions and thus to optimize the use of facilities, in relation to the occupants behaviour. Based on Bond Graphs, Gero and Tsai (2004; 2005) developed Bond Graphs for multiple domains (MBGs) that have the capacity to integrate multiple domains using the concepts of energy transformation and transduction. They further specialised MBGs to the domain of architecture to develop Archi Bond Graphs (ABGs). Tsai and Gero developed Archi Bond Graph (ABG's) to be able, to not only include HVAC installations, but also to include the building and its occupants. ABGs are capable of representing and simulating static system structures and dynamic behaviours of different building subsystems. ABG's bicausal bond, extending from the bicausal bond introduced by Gawthrop (Gawthrop and Smith 1996), has two pairs of power variables attached to a bond. It has the capacity to represent energy-flow moving back and forth associated with energy variations (Gero and Tsai 2005). Figure 5 shows the development of a uniform representation for building analysis of Regular Bond Graph's (RBGs) to Multiple domain Bond Graph's (MBGs) and possible association with the ABGs.

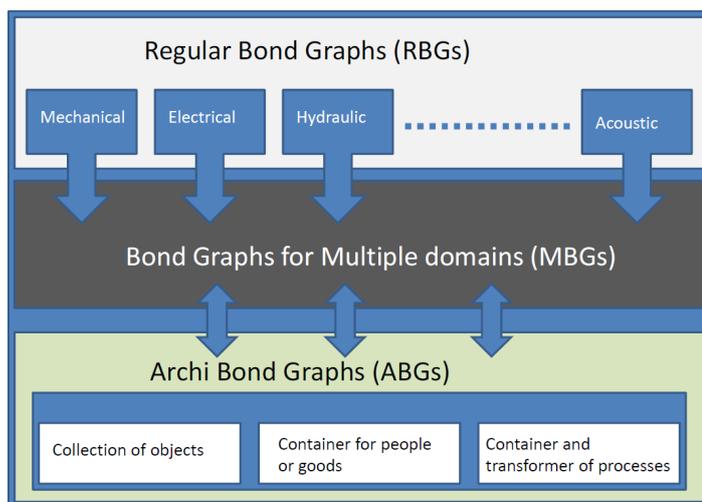


Figure 5. Unified representation for building analysis (Tsai and Gero 2010)

ABGs can be applied to space-people systems and building energy systems. Power variables, effort and flow, are defined in ABGs as the average amount of energy needed for a unit of change and the number of changes in a unit of time respectively. In ABGs for disparate building energy systems, the definitions and units of variables and elements are very similar to those in RBGs for systems of electricity, hydraulics, and HVAC. For space-people systems, in Table 1a, the ABG variables are listed and in Table 1b, the ABG elements are listed (Gero and Tsai 2004, 2005).

Table 1. ABG variables (a) and ABG elements (b) for space-people system (Gero and Tsai 2004 2005)

(a) ABG variables for space-people system		(b) ABG elements for space-people system	
Effort, e	unit people-energy	S-element	people-energy source
Flow, f	people-flow	I-element	space-potential, passage
Momentum, p	people-impulse	C-element	space-capacitor, room
Displacement, q	people-change	R-element	space-resistor
Power, P	people-energy-flow	CR-element	controller, door
Energy, E	people-energy	M-element	meter
		B-element	building construction/component
		TF, TD	energy transformer and transducer
		0-, 1-junction	space junction

ABG elements can be categorized into 1-port and multi-port elements. 1-port elements are source (S), i.e. source of effort (S_e) and source of flow (S_f), inducer (I), capacitor (C), resistor (R), controller (CR), meter (M), and building construction/component (B), i.e. exterior building construction/component (B_e) and interior building construction/component (B_i). Multi-port elements include transformer (TF), transducer (TD), 0-junction, and 1-junction. In ABG 1-port elements, the S-element is an active element, I, C, and R elements are passive elements, and CR, M, and B elements are additive elements. The ABG's are both qualitative and quantitative energy-based uniform representation for buildings (Tsai and Called 2010). A building exist out of different subsystems, Figure 6 shows an example of three building subsystems, a lighting system, space-people system and a hydraulic heating system.

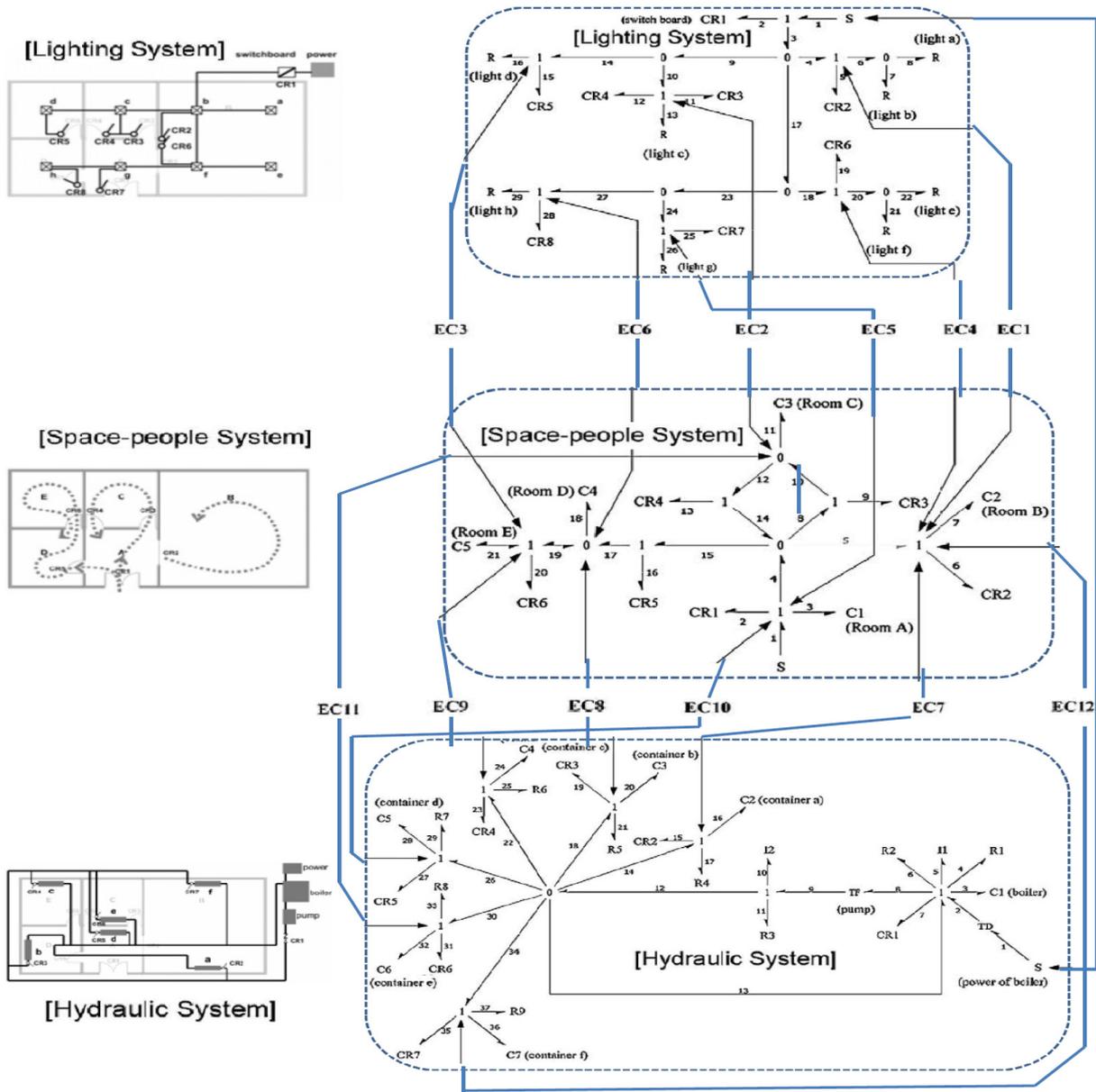


Figure 6. Universal connected representation of space-human, lighting and hydraulic heating system (Tsai and Gero 2006)

As the effort and energy variations in one building subsystem may cause variation of effort and energy in another building subsystem. Qualitative equations can be generated for par example the energy interactions between the space-people system and the lighting system or the hydraulic heating system. There are energy controllers ECx's for the energy interactions between the building subsystems like space-people system of a specific room and its lighting system or hydraulic heating system. These energy controllers (EC's) are placed in between the space-people system and par example the lighting system and the hydraulic heating system. Linked by energy controllers (EC) attached with bonds, the graphical representations of these building sub systems can be integrated into a unified ABG graphical representation, see Figure 6.

FURTHER RESEARCH

Drawing on qualitative physics and using discrete symbols to represent dynamic prIn a next step Tsai and Gero (Tsai and Gero 2006 & 2008) developed Qualitative Archi Bond Graphs (QABGs). Qualitative hereby is related to qualitative reasoning, which means that the reasoning about a system is not in terms of the precise values but rather reasoning at a qualitative level based on different defined categories. As such it can be employed to build a knowledge model to represent the relationship between system structure and behaviour.

Qualitative Archi Bond Graphs (QABGs) (Tsai and Gero 2006) draw on qualitative physics and use discrete symbols to replace numerical constants for representing and simulating dynamic continuous properties of the system, e.g. people behaviours and building energy flows. A qualitative approach based on both physical laws and expert knowledge and rules is more applicable when exact mathematical models are not available (Tsai and Gero 2010). Qualitative reasoning is one of the added values of Bond Graph technology and as such a proven approach (Zeiler 1993). QABGs which consist of graphical representations and qualitative equations with qualitative values provide a more general model, applicable to a wide range of different conditions in building designs. Combining graphical representations and qualitative equations, QABGs provide a more general model, applicable to a wide range of differing conditions in building design. A QABG model for a building combines graphical representations and qualitative equations. QABGs model construction for a building system starts from a building subsystem, to multi-subsystems of a building and then an integrated unified building system. QABGs have been applied to the simulation of building dynamics (Tsai and Gero 2006a) and to energy interactions between building subsystems (Tsai and Gero 2006b). In the next phase of the research, the possibilities of QABGs will be examined and QABGs will be applied to represent the reference building and the observed behaviour of its occupants.

Also a comparison should be made between the different modelling techniques for implementing user behaviour in building performance process control loops. Par example a comparison between artificial neural networks (Kwok et al. 2011) , intelligent agents (Zeiler et al. 2008, Azar and Menassa 2010), probabilistic prediction (Tabak and de Vries 2010), pattern recognition (Dong and Andrews 2009), evolving fuzzy predictor (Akhlaghinia et al. 2008) and QABGs (Tsai and Gero 2010).

DISCUSSION

Reduction of or optimizing energy consumption is often done without taking into account the purpose of energy use: human comfort. However, energy savings can only be achieved, if the individual user comfort is preserved (the Large et al 2008). To try to optimize the energy efficiency without taking into account the user is not going to work (Nicol 2007). To further optimize the performance of these systems, research is needed into the possibilities to integrate the human behaviour in the building management process control strategy.

CONCLUSIONS

Building systems perform inferior by insufficient attention to occupant behaviour influences and with increasing building performance the influence of the user on this building performance becomes even greater. Therefore, further optimizing building performances without taking the user into account is not an optimal way to go. Thus to optimize the facilities management, the challenge for the coming years is to find solutions for supportive tools to help facilities managers operate and maintain their buildings more efficient by including user behaviour in the building process control.

This paper describes the new developments in the area of modelling of people, building and installations, using Archi Bond Graphs and Qualitative Archi Bond Graphs (QABGs) as developed by Tsaj and Gero. To include all kind of building subsystems, goods and most of all people, QABGs offer a qualitative and quantitative energy-based unified representation for building design. They can be applied in the conceptual as well as in the intermediate and final design stages. QABGs can represent both static and dynamic aspects of buildings, as well as people's behaviours and building's energy flows. QABG is a promising technology which enables to include the human in the facility management loop. Further research is needed to implement the technology into practical tools which can be used by facilities managers to improve the operation of their buildings.

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CAN USABILITY EVALUATIONS DRIVE INNOVATION?

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During the last years, methods and tools for evaluation of usability have been developed. The evaluations are means to understand the usability as it is experienced by the building users. In order to improve and develop usability and the user's experience, the evaluations must impact on the actual practice of developing and operating facilities. This paper presents the implementation of tools for usability evaluation in 4 different building owners and facility managers in Norway. The purpose of this paper is to contribute to a better knowledge of user experience-driven approaches to development and management of facilities. By using the USEframe, developed in the Nordic project REBUS, the actual implementation of the usability evaluation is studied. In all the cases, informants that have used different tools and methods for usability evaluations have been interviewed in order to identify if the focus on usability and evaluations have led to new practices, new solutions, and consequently; new "contexts of use". The results show that usability evaluations can only be drivers for innovation in cases where key players have awareness and competence, and where the need for change is seen as urgent enough to justify the amount of resources needed to both analyze the situation and implement the change. To develop new practice, there is a need for sufficient resources, competence and incentives.

Keywords: building evaluation, continuous development, innovation, usability, user experiences

INTRODUCTION

Buildings are built to be used, and in a usability perspective, we focus on how buildings hinder or promote the users' activities. During the buildings' lifetime, demands and use will change. In order to improve existing buildings, and to learn and to develop new improved facilities, we need to know how buildings are used, and know the interaction between organization, facilities, and technology. During the last years, methods and tools for evaluation of usability have been developed. The evaluations are means to understand usability as it is experienced by the building users. In order to improve and develop usability and the user's experience, the evaluations must impact on the actual practice of developing and operating facilities. Do building owners, facilities managers and user organizations use the newly developed tools? Does usability evaluation improve practice and drive innovation; new solutions and new practices? After several years of experience with developing theory and tools for usability evaluation, we set out to investigate if the tools are used, and if they make a difference in practice.

The purpose of this paper is to contribute to better knowledge of user experience-driven approaches to development and management of facilities. The paper presents 3 different building owners and facility managers in Norway who have been parties in developing methods and tools for evaluation of usability. By using the USEframe, developed in the Nordic project REBUS (Blakstad et al 2010b, Lindahl et al 2011), the actual implementation of the usability evaluation by the partners is studied. In addition to the 3 partner cases, an additional case study has been conducted within an organization which has first-hand experience with the tools. In all the cases, informants who have been involved in developing the methods, and later used different tools and methods for usability evaluations, have been interviewed in order to identify if the focus on usability and evaluations has led to new practices, new solutions, and consequently; new "contexts of use".

USABILITY EVALUATIONS AND CHANGES OF PRACTICE

Ideally, buildings are means or tools for the owners and users, which support the activities taking place within them. The physical surroundings contribute to efficiency, effectiveness and satisfaction in the user organization (Alexander et al. 2004, Alexander 2008). This is the usability of buildings. Usability is defined as "the extent to which a system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11). In reality, buildings both support and hinder their users' activities, and it is crucial to understand the underlying mechanisms that influence on the interactive play between different factors and aspects. A building's performance can hence never be seen or understood isolated from an

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organisational or technical perspective. However, owners and occupants seldom perform evaluations of how buildings perform in general, and particularly not when it comes to performance related to usability aspects. According to Granath and Gilliard (2008), “usability cannot be evaluated simply on the product alone but also with respect to how the product is perceived by and interacts with the user”. The complex nature of usability can be described as wicked problems (Blakstad et al. 2008), characterized by no definitive formulation of solutions, and hence open to multiple interpretations (Rittel and Webber 1973).

During the last 10 years, lots of effort has been put into developing the theoretical and methodological framework for evaluation of usability of buildings (Hansen et al. 2011b). Discourses about usability tend to be rather academical and theoretical. Thus, an important objective for the Norwegian research has been to make the concept of usability operational, in order to make it possible to use evaluations for improvements in practice. As a result, a common usability framework or methodology named USEtool was developed (Hansen et al. 2010b, Blakstad et al. 2010a). 3 business partners participated in the project. The partners are all cases in this study. While developing USEtool, the main objective was to create a framework for usability evaluation that was easy to use, and that would be possible for the companies to perform themselves. Our project partners wished to collect experiences from their user organizations, in cooperation with selected user representatives. The main purpose for evaluation was to allow building owners and Facilities Managers to gather user experiences from existing buildings as a basis for improving usability, input when planning new buildings and reference when choosing new premises (Blakstad et al. 2010a).

USEtool and the evaluation process are described in a handbook (Hansen et al. 2011a) which guides evaluators through the following stages: 1) Defining the evaluation, 2) Mapping usability, 3) Walkthrough, 4) Workshop with organization and 5) Action plan/report. Usability can be seen as a relationship between a user organization and a facility within a “context of use” (Fenker 2008, Blakstad et al. 2010b). In the REBUS project, a framework for mapping usability research, USEframe, was developed. USEframe position usability evaluations as knowledge development processes which provide new knowledge, which in turn may produce new guiding principles and governance, instigate action, and in turn lead to a new “contexts of use” (Blakstad et al. 2010b, Lindahl 2011).

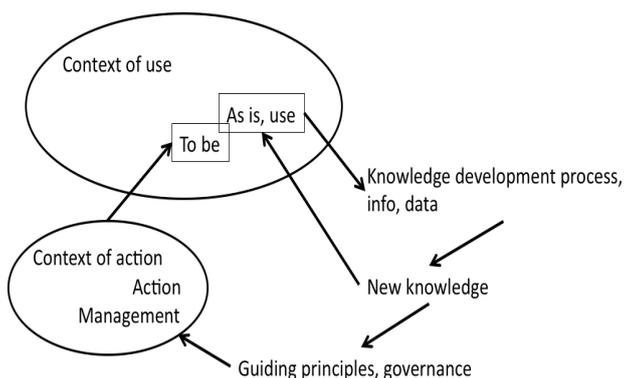


Figure 1. USEframe. Usability evaluation as part of an innovation cycle where evaluations lead to new knowledge and new governance and action (Blakstad et al., 2010b, Lindahl 2011)

However, we believe that USEframe has a wider implication than mapping research. It may also be used to frame innovation and development processes within different contexts of use.

USABILITY OF EVALUATION TOOLS

Parallel to the development of theory, we have carried out several case studies to explore usability, and to test and develop the applicability of the methods. This has been an iterative learning process, where experiences and learning from one case have been discussed, developed and implemented into the following case studies, in order to support continuous improvements.

The USEtool methodology is mainly based on a qualitative approach where different users and stakeholders contribute to the evaluation of usability. As described, usability is a matter of perspective, and different stakeholders and organisational levels will have different opinions regarding the usability of the facilities (Fenker, 2004). The selection of participants will hence be of great importance, as this may influence the findings.

Several studies on usability evaluations (Hansen et al., 2005; Bias 1994) show that the quality of the evaluation will depend on who is participating, reflecting their focus and experiences with the building. Communication between end-users, managers in the user organization, facilities management, and consultants developing briefs and designs, is crucial for improvements in workplace design and management (Duffy 1990, Kernohan et al. 1992, Horgen et al. 1999, Blyth and Worthington 2011, Gjersvik and Blakstad

2004a&b, Våland 2010). In USEtool, this perspective has been essential when developing the methods, by bringing together different actors to discuss and learn from each other. It is more important to obtain the variations in interests, opinions and proposals, rather than focusing on consensus or one “correct” solution.

This co-learning and knowledge exchange has been a new experience and an eye-opener for participants in this research, both from a user perspective and from an owner’s and Facilities Management point of view. One of the partners in the usability project has used the methodology to enable a systematic dialogue between owners, occupants and Facilities Management staff in order to improve briefing for new buildings (Hansen et al. 2011b). Blakstad and Torsvoll (2010) have explored the possible uses and benefits of implementing usability evaluations in different phases of the workplace management processes in another of the partner organisations. They found that the methods generated useful knowledge, and are especially relevant prior to large-scale construction or renovation projects, to discuss new ways of working, new technology and new types of workplaces. They also underline the importance of continuous learning by evaluating innovative concepts for further development and adaptation. Blakstad and Torsvoll also discuss the potential of usability evaluations to assess workplaces with undiagnosed problems.

One of the important discussions related to usability evaluations has been the external validity of the methods used (Hansen et al. 2010a). The methods have been developed to produce or obtain relevant information and experience relating to the defined topics for evaluation. The focus has been on understanding the situation and context and obtaining differences in interests and opinions, rather than focusing on consensus (meaning average, middle way, sufficient). The key advantage of qualitative research is its ability to give insight into local practices, and it is important for the development of a nuanced view of reality (Flyvbjerg, 2006). According to Halvorsen (2008), the main question is not if results may be generalized, but rather if knowledge can be transferred to other settings and contexts. This view is supported by Kroll (2005), who states that even findings can be valid for other projects, it “means not using a cookbook approach to building design”, but more intelligently adopting or adapting the research and applying it to new projects, rather than copy-and-paste. The value of usability evaluations for feeding forward to new projects mainly lies in the ability to understand the user experiences and to translate those into adequate products and solutions.

CHANGES IN PRACTICE – THE INNOVATIVE USER?

This brings us to the issue of transforming knowledge gained from evaluation into changes in practice. In his studies of user innovation, von Hippel (2005) defines users as firms or individual consumers that expect to benefit from using a product or a service. He refers to these as “innovation users”. He contrasts this with manufacturers who expect to benefit from selling a product or a service (“innovation manufacturer”). He claims that users are unique in that they benefit directly from innovations. The innovation manufacturer must make a profit from selling innovation-related products or services to users. Viewing the usability of a building, the direct benefit is mostly related to the users (employees and students, e.g.) occupying the building, and the user organization whose “production” takes place inside the building. The Facility Management staff who are expected to conduct the usability evaluations, are therefore “innovation manufacturers”. Their benefit from innovation is indirect, and if they can profit from their product (facilities) without improving it, there are no incentives to innovate and change. The lack of financial incentives may be substituted with other incentives, and other possible drivers for change might be related to the relationship between FM and the user organization. An FM unit may be linked to the user organization by common interests and objectives, or by a client–supplier business relationship (client–supplier model). This means that the incentives and direct benefits of improving user effectiveness, efficiency and satisfaction will vary, depending on the nature of the relationship between the users and the suppliers (FM), and on the existence of strategic alignment and common rewards. In order to make this a real driver for improvements in usability, some kind of measurement systems and recognition of achievements must be established. Lack of such KPIs and reward systems for improved usability may inhibit realizing benefits from usability evaluations.

Development is the process of creating a significant change, while innovation is a change that creates a new dimension of performance (defined by Peter Drucker for his Drucker Award for Innovation). Schumpeter (2000) distinguished between “invention” (the discovery of new technical knowledge and its practical application to industry) and “innovation” (the introduction of new technical methods, products, sources of supply, and forms of industrial organization).

One of the aims for Action research is to increase the awareness and competence in the company (Greenwood and Levin 1998). But for development and innovation to happen, practice has to change as well. In order to get the FM staff to start using the newly developed usability evaluation toolbox, they need to change their practice. Brown and Duguid (1991) describe how working and learning occurs in communities. They differentiated between actual practice (non-canonical practice) and formal descriptions and procedures (canonical practice). Changes and innovations depend on changes in non-canonical communities of practice, not only in formal procedures. They claim that “canonical accounts of work are not only hard to apply and hard to learn. They are also hard to

change” (p.50). Implementing usability evaluations only through development of formal procedures is demanding. In order to benefit from the evaluations it is the actual practice that needs to change.

CASE STUDIES: IMPLEMENTATION OF USETOOL

The USEtool was developed and tested in close cooperation with the research partners in co-learning processes, and can therefore be labelled action research. Greenwood and Levin (1998) highlights the importance of learning and reflection both for ‘insiders’ and ‘outsiders’ in action research. The actual development process of USEtool is described in the USEtool Handbook (Hansen et al. 2011a). One year after publishing the handbook and giving all partners opportunities for training, we decided to launch an investigation into the actual use of the tools we had developed.

Representatives from all three research partners were interviewed, using a semi-structured approach. Due to geographical distances, the actual interviews were conducted by telephone. The respondents received the questions one day in advance, in order to prepare for the interview. The research partners were one public property development and management entity (case B), one corporate real estate function within an oil company (case A), and the property development unit of a local authority (case C). One additional case (case D) was investigated. This was in a corporate real estate unit within a telecom company. USEtool has been used in relation to a large development process of workplaces within this corporation, and for this study, it was interesting to see if there are factors that lead to implementation which differ from the original partners’. One of the researchers developing the USEtool was involved in the implementation in case D, as well as in the research described here. The main findings from the interviews are summarized in Table 1.

We are aware that the data for this paper are qualitative and context-dependent, and that there is a close relation between the researchers and the practitioners, as they have been developing the tools together, and even been taking positions as both respondents and researchers. In “real world research” (Robson 1993), this is often the case. This makes the knowledge we can bring forward contextual.

Table 1: Findings, case studies

A CORPORATE REAL ESTATE. ENERGY	B PUBLIC PROPERTY	C LOCAL AUTHORITY PROPERTY	D CORPORATE REAL ESTATE. TELECOM
Focus on and use of usability evaluations before USEtool			
Not on usability, but used questionnaires to evaluate workplaces. Survey was developed in earlier research projects, and much used to develop and confirm workplace solutions for the company.	Not specific on usability. Evaluations in development projects only on request from clients.	Mostly on functionality from a traditional perspective (briefing) and on technical conditions/ indoor climate Tradition for strong user involvement.	Commissioned major evaluation of functionality and use of new HQ some years ago. Annual customer and user satisfaction surveys and HSSE reviews – some questions on usability issues.
Reasons for engaging in usability work. Expectations			
Increased focus on functions and use created demand for methods to evaluate usability.	Improve the role of FM. Better understanding of client/users and buildings functionality Was established as an R&D project.	Improve the role of FM. Knowledge transfer to new projects. Coming projects on upgrading and development of existing buildings.	Developing new general briefs and ambitions for continuous development of work practice, ICT, workplace.
For partners: Pilot projects. Benefits during project.			
Good discussions and common understanding of expectations. Very satisfied with both process and result (USEtool). Pilot successful, showed relevance.	Increased competence. Learning processes with workshops and pilots. Learning from the other partners and their pilots. Pilot and first evaluations in cooperation with researchers – important for implementation and use of the tool.	Interesting workshops and discussions with other partners. Gave more understanding of own organization and the usability of their existing facilities. Improved their role in briefing for new facilities.	

Has the project changed practice? Is USEtool used in practice? If yes: How and for what?

Formal link to USEtool in process and procedures established. In the process "Change workplace/allocate area" there is a formal reference to USEtool.	More focus on functionality. Greater awareness at the real estate/FM department. Clients have requested USEtool approach.	No. One of the key persons and initiators has left. Think existing processes and ways of working function well.	Yes. In relation to pilot projects (4) for new workplace model. Evaluations (survey, interviews and walkthrough) both before and after renovation of pilot work-zones. A formal link to USEtool and evaluation is made in the CREM toolbox.
In practice, not used in other projects than the pilot.	Used in 4 different real estate projects. Mapping existing facilities for identify critical issues and a better contextual understanding of user organization.		

Experiences from using USEtool?

No experience after the pilot. But the understanding of Usability developed through the project is important for present practice.	Works well when starting up a process and to improve dialogue with users.	No experiences after the project was completed.	Walkthrough works very well as a tool to understand work practice and use of space before renovation. After renovation more focus on users' experiences with new workplace. Web-based survey is replacing the group interview in stage 2.
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What are the success criteria, and what are pitfalls and hindrances for implementation?

Hindrances: Competence and the understanding of roles FM/ customer (need a proactive, consultative role in FM)	Evaluation is anchored in the organization. Hindrances: Lack of capacity, competence and experience doing evaluations.	Head of department does not regard the USEtool as relevant for new projects. Partly because of time and costs. Partly because evaluating existing buildings is looking backwards and seen as less innovative.	Competence to use the tools is main success factor. Incentives to change – are there any benefits from improving? Engaging users takes up a lot of their time – so the user organization (customer) needs to see benefits.
Lack of "demand" from customer (user organization).	Creating expectations among the users that can be difficult to meet.		

Have the evaluations contributed to development and / or innovation in your firm?

Not yet. But web surveys developed previous in R&D projects are used to develop workplace concepts.	Yes. Improved dialog with users. More focused discussions on development and effect	No. No persons to follow up after the initiator left.	Yes. Used to develop knowledge of existing situation, evaluate pilots/tests and new models. Results used for developing new routines and practices
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Suggestions for improvements regarding implementation & use or changing practice & innovation in your business?

Will make this a "service" that is visible to the customers.	Wants a more flexible use of the framework. The whole 5 step process can be too much. Develop and adapt to our business and projects.	Must be far more relevant and efficient in briefing and design process. Look at new and other innovative projects. Challenge the users to think differently. Good experience using the design process, drawings and models to discuss new solutions. The architects as an important driving force in innovation.	Develop more automatic systems for reports and benchmarking between projects. Make part of continuous development circle.
Will start training of dedicated staff to support local delivery roles.			

DISCUSSION

The discussion is focused on three main objectives: has the work with usability evaluations lead to new practice, new solutions, or new “contexts of use” as shown in the USEframe model?

NEW PRACTICE?

It is interesting to see that the companies have different results when it comes to implementation in practice. If we distinguish between canonical practice (formal descriptions and procedures), non-canonical practice (actual practice), and usability awareness / competence, the companies report the following:

Table 2: Changes in usability-related competence and practice in the cases

	Case A	Case B	Case C	Case D
Changes in canonical practice:	yes	yes	no	yes
Changes in non-canonical practice:	no	yes	no	yes
Changes in awareness / competence:	yes	yes	no	yes

These findings suggest that changes in awareness and competence and the understanding of usability is a precondition to develop changes in practice. In the company where the main participant left after the project, there has been no implementation at all. Based on the interviews, it also seems that there is a need to feel confident that you have the competence and skill to perform the evaluation. This is a skill in which the researchers are trained in. In case D, the evaluations were performed by one of the trained researchers. In case B, one of the researchers participated in the first project using the USEtool. During the project, a couple of dedicated staff developed these skills together with the researcher. In both case B and D, there are some special members of staff who are trained in using the methodology. In case A, the main idea has been that the local representatives can use the tool as described in the process map. The company discovered that this is difficult. Skills are needed to perform the evaluation, but also competence and understanding of usability as such: “You need to understand what you are doing, to understand usability. If not, you might just stir things up and create worries among the users” (CREM, case A).

Both competence and awareness, and the actual skill to perform the evaluation, were learned in the research project. Successful implementation seems to rely on training of dedicated staff. This suggests that successful implementation of USEtool requires more training and specialization than we initially hoped for.

Several of the companies mention the need for clear and direct benefits from development. If there is no “demand” for more knowledge, or if there are no direct incentives for the “innovation manufacturers” (all participants and partners in the project provide facilities to users), there is no reason to change existing practices and develop anything for the “innovation user”. In two of the cases (case A and D), the “manufacturers” and “users” are linked, as the studied organizations are Corporate Real Estate Units that are measured on their performance and the satisfaction of the internal client. The same is in a way the case for case B, where the manufacturer is the public entity which handles real estate for the Norwegian State. In all three cases, the “manufacturer” (FM / CREM) is responsible not only for design and construction of real estate, but also for operation and management in use. In case C, there is much more focus on design and construction of new projects (FM vs. project focus).

NEW SOLUTIONS?

In case B, evaluations of a university campus have been used to develop new concepts for future campuses. In the same case, knowledge from the evaluations is fed forward to briefs for new projects. In case D, the evaluations were used for both developing and evaluating the actual workplace (evaluations before and after renovation), but also for understanding the underlying relations between use, facility, technology, and organization, in order to develop corporate concepts and generic briefs. In both cases, the evaluations have lead directly or indirectly to new solutions. From the two cases, it seems that it is important to look at not only the physical solution, but also the other elements, such as the organizational issues.

In case C, evaluations are described as “looking backwards”, and something that would drain the new projects for time and resources, and produce less innovative solutions. In many construction projects, much time is spent visiting new exciting buildings for inspiration. During the development of the evaluation tools, the walkthrough was seen as a efficient method to extract experiences from such visits. Often, innovative solutions are copied, based on how they appear at first sight. The intention in case C, was to use the walkthrough to understand the solutions better, in order to continue to develop and adapt the good solutions even further into

the next project. In USEtool, much focus is on understanding WHY a solution performs well. This understanding can later be used in other contexts, and actually produce new solutions, based on evaluation of existing buildings.

NEW "CONTEXTS OF USE"

USEframe illustrates a development and learning loop which, from evaluations and new knowledge, through governance and action, leads to new contexts of use. Only two of the cases have reached this stage. In case B, the evaluations are fed into new briefs for similar facilities. The impact on context of use is indirect and works through guiding principles (the briefing system). This has a potential to change a large number of facilities, as it represents a feedback loop from use to briefing. In the other case (D), knowledge from the evaluations are used for several purposes: to develop and test pilots, to give input to governing documents and systems (policies and toolboxes), to develop new solutions, to produce "general briefs" (corporate concepts), and to develop knowledge among users and CREM about the users experiences. In both cases, the implementation of usability evaluation tools has contributed to development and new contexts of use. But is this innovation, a change that creates a new dimension of performance? This is probably only the case in D, and even there most of the result is invention, not innovation. But some new solutions and concepts are developed and implemented which may qualify as innovations. In case D, the implementation has been part of an extensive effort to develop workplace strategies and concepts in the corporation. This gave justification to use the needed amount of resources, time, competence and effort, needed to go through the whole process as it is described in USEframe.

CONCLUSIONS

The objective of this research have been to revisit the companies that have been part of developing usability evaluation methods, in order to see if they have used the new tools and if this has lead to new practices, new solutions and new contexts of use. 2 of 4 companies had started using the tools. These were the companies that had used the most resources on implementation, and continued the action research relationship with the researchers to develop own staff with competence to carry out the evaluations.

In the 2 cases that had implemented the USEtool, this had directly or indirectly lead to new solutions and given the companies an instrument to analyze what works well and why in order to feed this knowledge into new projects. In the same 2 companies most of the developments should be labeled invention, not innovation. Some innovations were however identified in one of the cases. This was as part of a larger effort of changing practises, solutions and contexts of use.

Can usability evaluations drive innovation? This study has showed that this is possible, but that it requires that the usability evaluations are part of a larger development project. Usability evaluations can only be drivers for innovation in cases where key players have awareness and competence, and where the need for change is seen as urgent enough to justify the amount of resources needed to both analyze the situation and implement the change. To develop new practice there is a need for sufficient resources, awareness, competence and incentives.

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ANALYZING THE OFFICE SPACE FROM A NARRATIVE PERSPECTIVE – A CASE STUDY OF AN EMPLOYMENT OFFICE

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Experience based knowledge of office users is a crucial element in developing workplaces. In order to gain deeper understanding of the experiences behind the actions of different office users, new in-depth methods need to be developed. A narrative perspective, based on the method deconstruction of cultural products, would expose new information about office users' experiences. This is tested in the premises of an employment office. The data was gathered with user journey observation and with background interviews. Data was then analyzed from the narrative perspective. Analysis showed that an office space becomes meaningful and usable both based on the narratives people produce and narratives the space reflects. The narrative of contradicting expectations of different users and the narrative of power were identified based on the observation. These narratives show that a hidden meaning within the space strongly affects the usage of the space and vice versa. Taking a narrative perspective in analyzing workplaces can bring deeper understanding about the relationship between people and places, both in managing existing spaces and places and in designing new user friendly and inspiring workplaces.

Keywords: narrative analysis, workplace, management, employment office

INTRODUCTION

The experience of a user in the office space is not easy to capture (Nenonen *et al.*, 2008) but it is essential when developing new office spaces. Experience is more than just perceiving the environment. It is a combination of perceiving physical circumstances, subjective understanding of these circumstances and a cultural construction formed in a social interaction. This paper investigates this holistic space experience by combining these different perspectives with a narrative analysis, which emphasizes the fact that space does not exist individually, but is produced from the cultural expectations (Lefebvre, 1974). Equally, a narrative perspective assumes that mental models are derived from social assumptions (Berger & Luckmann, 1967).

To do this a case example of an office space of a Finnish employment office is used to elaborate how space is a combination of mental, physical and social constructs. Assumingly, there is a correlation between the constructs of the physical world and the constructs of individual's mental models (Peponis *et al.*, 2007).

Theoretical background is applied from the narrative concepts of Erving Goffman (1956) who presented the idea of keeping up everyday roles in his book *The Presentation of Self in Everyday Life*. He uses the concepts of dramaturgy to conceptualize our everyday actions in different contexts. These concepts of roles, back stages, front stages, etc. can be quite straightforwardly implemented to study of an employment office. The concepts of Goffman are applied in a following way: the mental space as a "transcript" for behavior in physical space which is a "stage" on which the social space i.e. the "play" takes place.

The objective in this study is not so much to focus on the physical elements of the office but to understand the *narratives* of a physical office space of an employment office. Additionally this research acknowledges that different user groups socially construct the given space differently from their own context and perspective. Thus the same space may tell a different story to a different user.

The research answers questions

- How do the users (customers and employees) interpret the existing constructs of the office?
- What kind of narratives do these two different user groups in the employment office create from the physical space?
- How does the space of the office reflect, hinder or endorse the users' activities in the space of an employment office?

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NARRATIVE PERSPECTIVE

Narrative means a story that is constructed by sequential features (movie, fairytale, speech, drama, etc). In social research, a narrative perspective implies that everyday actions and cultural reality are based on these storylines. Traditionally, narrative analysis is based on the idea that human experiences are understood in the form of sequential storylines (Bratt Paulston & Tucker, 2003). This human tendency to comprehend reality in a narrative form is then applied to studying human behavior. The most common narrative study is the study of stories themselves: how are they constructed, what are the hidden meanings and who and what kind are the actors, the active subjects of the story. Narrative perspective can hereby be used as a tool to describe, investigate, and understand the subject of study. This research is testing the method in a rather untraditional way by applying it to built environment which in this case is environment of an employment office.

MENTAL SPACE – “THE TRANSCRIPT”

Mental space has been a subject of study mainly in the fields of cognitive psychology and applied mathematics. This view is strongly affected by the philosophical and practical perspective that people actually make rational decisions and these decisions are based on more or less mechanical processes. (Khrennikov, 1999; Frith, 1999; Geissler; 1987). The idea of cognitive sciences is to model mental models as structured webs and hierarchies. The idea of a hierarchical trees and maps are also often implemented to user interfaces and research on usability (Ahmed *et.al.*, 2009).

Mental mapping has been applied to space perception in multiple studies (Tversky 2003; Kuipers *et.al.*, 2003; Wineman and Peponis, 2010). Often, the studies combining mental mapping to movement in space also emphasize the system of choices, making this the essential attribute in modeling the space. This research is not about modeling the mental maps of space perception but it is using the concept of mental space in understanding the narratives formed within the space. Accordingly, the system of space is a model of narrative formed in space, in other words, it is *the transcript* of a story (narrative) that the built environment “tells”.

The challenges in modeling the mental space are in irrational behavior. People are making decisions and modeling the sensible world with somewhat inconsistent ways. Their choices may have logic but predicting this logic is not as obvious one would like to think. It is acknowledged that the dynamics of mental states are irregular (Khrennikov, 2007) but how these irregularities can be thoroughly explained remains a mystery. Mental models are thus concentrating in psychological processes. Although psychological perspective is present also in this study, the results presented here are trying to construct a more social and cultural way of understanding people’s experiences and interaction within the space. The captured logic of evident irrationalism and irregularity can be achieved by adding the social constructs to the discussion.

PHYSICAL SPACE – “THE STAGE”

The physical space consists on built tangible structure. The structures of a building or a space are somewhat a “tabula rasa”, a blank slate, and *actions* are the ones that give these constructs an identity and purpose of its own, they turn *spaces* into *places* (Nenonen, 2008).

Eric Sundström (1996) claimed in his literature review on environmental behavior that the theory on environmental psychology can be categorized based on psychological and physiological reception such as stress, adaptation, arousal, etc. This traditional perspective on physical environment is complemented (among others) by Sophia Psarra (2009) who claimed in her book *Architecture and Narrative* that every space can be interpreted also in terms of stories or narratives. This means that space, which thus becomes a place, is a form of language and has symbolic values whether we are aware of them or not. Architectural meanings are also often more than the self evident structures they possess (Psarra, 2009). The narrative perspective can thus be translated into workplace thinking as well.

SOCIAL SPACE – “THE PLAY”

Meerwarth *et al.* (2008) suggest that the typical of “one size fits all” way of thinking does not apply to workplaces anymore. In fact, the culture of the organization and the individuals should be considered when designing new workplaces. When analyzing subjects

such as social dimensions of space, it is necessary to look closer at the position, in other words, the roles that users or actors adopt during the process of using the space.

Office spaces are in the context of work and customer service. This brings the roles, norms, and social behavior to the picture. Nenonen (2005) has conducted a literature review about social space indicating that sociological approach provides evidence about the transactional relationship between people and built environment (Foucault, 1984; Strassoldo, 1993; Eräsaari, 1995; Nevanlinna, 1996; Saarikangas, 1999). Stuart Hall (1966) claimed that both social context and national culture shape the aesthetics and functionality of both “fixed featured” and “semi-fixed featured” of space. More recently, Low and her colleagues have emphasized the historical, social, and symbolic approaches to the physically altered “built environment” (Lawrence & Low, 1990) and urban studies of space (Low, 1988, 2003a, 2003b; Low & Lawrence-Zuniga, 2003). These and other cultural studies (Erickson, 2004; Keohane, 2002; Yakhlef, 2004) demonstrate the critical effect of space on a group’s sense of culture, identity, and belonging, as well as establish the reciprocal condition which architecture reflects cultural differences in identity and belonging (Meenwarth, 2008).

Actually, the whole design of a public office such as a social welfare office, an employment office, or even a bank is basically very similar and maybe the most evident example of everyday roles and stages (Eräsaari, 1995). Equally, Lefebvres’ (1975) *Production of Space* emphasizes the fact that space exists through human comprehension rather than separately.

The roles of an employment office are set both in the level of defining the purpose of an employment office: to employ the customer and in the level of organization structure: categorizing customers to three different groups, based on their ability to find a suitable job. According to Bourdie (1998), people form their statuses based on the idea of distinguishing oneself from others. This is done through physical artifacts, such as doctor’s white jacket or king’s crown. This seems to be the case also in defining roles within space.

WHEN PHYSICAL SPACE BECOMES MENTAL AND SOCIAL – THE FORMATION OF NARRATIVE

To summarize: Mental space produces the so-called “transcript” for the narrative of experiencing space. In this narrative, the physical space is the stage on which the interaction takes place and the social space is the interaction or the “play” performed in a determined context which in this case is the employment office.

In other words, the mental, physical and social spaces form an experience of office space which is a part of the working experience. The users of space are having an ongoing discourse between the mental models they possess and the interpretations of the physical surroundings in which they interact. This forms the narrative of the place which is a combination of users’ mental models (cultural expectations) and actions that are enabled by the built environment *i.e.* physical space.

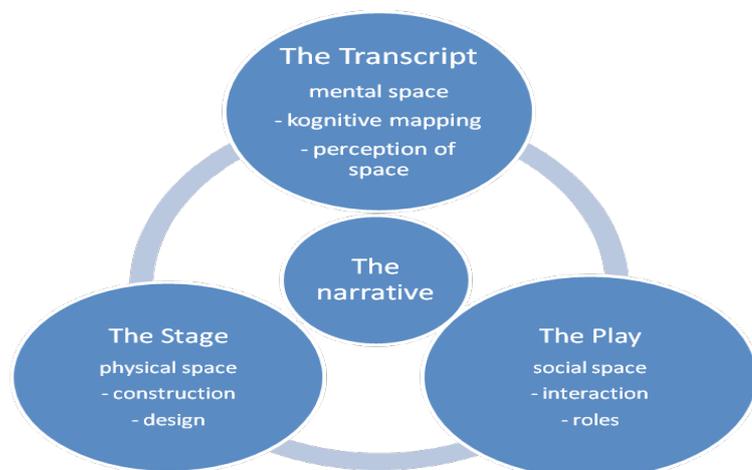


Figure 1: Formation of a narrative in a built environment

Next the method and the data are introduced. Following the results of narratives of employment office are presented.

METHOD

The narrative analysis was conducted as a case study using employment office as an example. The data on user experience was collected with user journey observation and analyzed with narrative framework.

“THE STAGE” – THE CASE OF THE EMPLOYMENT OFFICE

The case of the employment office was chosen because it has two kinds of main users who differ drastically from each other due to their activities, roles, and needs. Employment office is also a work environment, which sets strong role expectations to its users and enables both positive and negative power settings (Eräsaari, 1995). Additionally, the office space was recently renovated and consequently provided new (work) environment for its users. This gave a good opportunity for the researcher to observe users in a physical office context to which they are not used and also to evaluate the usability of the renovated office space.

The building was originally built in the mid-seventies and renovated in 2007 to 2009. The user journey observation was conducted during the first few days after the office was deployed. Office building had four floors of which three were used by the employment office. The actual customer spaces were on floors two and three. Floor one as well as the ground floor were occupied by the personnel rest areas and a cafeteria.

The design of the space was modeling the structure of the organization: the customers were divided into three lines, based on their individual elements, such as long term unemployment, health problem, or short term unemployment, for example. The customer spaces were thus reflecting the customer lines. For example, two of the lines were located on the second floor and the third line on the third floor. The visual and functional designs were also copying the needs of customers. The third floor for more challenging customers was designed to be calm in colors and artwork. The second floor was more dynamic and busy. Additionally, interesting from the research point of view, the new office still lacked all the instructional and informational signs, so the users, especially the customers, relied purely on the hints reflected by the space itself.

DATA

Data collection was done with user journey observation. Observation tells something about the things that people actually do, not what they think they do. Conceptualizing of a space is based on user actions and researcher's interpretation. Spaces as such are not conceptual entities but they become one when combined with human reasoning and action (Lefebvre, 1974).

Additionally, 20 short user interviews among customers and 10 theme interviews among employees were conducted during the observation. The interviews served as support data for the observation. Questions such as: why did you come here, how do you feel about the space, what was difficult and what was not, were presented. The employees were interviewed with more extensive theme interviews, which included themes on general workplace issues, the organizational change and the perspectives to new office space.

The actual observation was based on two frameworks: a pragmatic framework of customer journey by Dale Cobb (2008) and an analyzing tool of descriptive question matrix by Spradley (1980). The idea of Dale Cobb's customer journey was originally an idea of a conceptual journey becoming a customer. Observation applied a model of the different concrete “journeys” users make in the building and in the space (Figure 1).

The precise details are collected using the question matrix by Spradley (1980, p. 82 to 83), that is, what are the spatial features such as objects, acts, activities, actors, time, and events and what are their relations to one another, in each step of customer journey.

Dale Cobb's customer journey, *e.g.* user journey emphasizes the fact that a user journey can be defined by each step. Two user journeys, one of customers and one of employees were observed. Customers' steps are: accessing the building, finding the destination, waiting for the service or self service, the moment of interaction, and departure. Employee, on the other hand, has a different journey because his/her aims are different. The steps of the employee based on the structure of the space are: accessing the building, accessing the informal personnel area, getting to the work desk, serving customers, interacting with coworkers, and departure.

Table 1: User Journey of a customer and an employee

USER JOURNEY

CUSTOMER	Step 1. Access	Step 2. Finding the destination	Step 3. Waiting for the service or	Step 4. Self service	Step 5. The moment of interaction	Step 6. Departure
Transcript Stage Play	objects, acts, activities, actors, time and events					
EMPLOYEE	Step 1 Access	Step 2 Being in informal personnel area,	Step 3. Getting to the work desk	Step 4. Serving customers	Step 5. Interacting with coworkers	Step 6. Departure
Transcript Stage Play	objects, acts, activities, actors, time and events					

The customers were observed for 4 hours in the office lobby and the employees for approximately 2 hours in the rest areas. The physical dimensions and the users were observed in different situations when walking through different spaces of the building for 4 hours. Most of the time, the researcher was considered a member of the staff, excluding the time she spent in the waiting hall with other customers.

THE JOURNEY OF CODING – NARRATIVE PERSPECTIVE

The data on user actions and spatial features on each step were thus analyzed from the narrative perspective, which produced a structure of meanings the space reflected and produced via the actions of two user groups: customers and employees. Narrative analysis can hereby be used as a tool of describing, investigating, and understanding the subject of study which in this case is an employment office.

Consequently, the coding process was based on narrative concepts such as acts, stages, and roles. The roles being the role of user (employee and customer), the stage being the physical space in different steps and the acts the actions completed in certain steps (entering, exiting, etc.) of a journey (visiting/working in the employment office).

It can be claimed that a coding process is conceptualizing the constructed dimension of a building as a journey in which different steps set specific demands on the physical dimension. For example, lobbies are constructed in a certain way based on the act of arriving to building. On many occasions, lobbies are façades of the institution, thus they have certain features which reflect the action taking place in the space.

RESULTS – THE NARRATIVE ANALYSIS

The narratives of an employment office can be categorized into two themes: the narrative of contradicting expectations and the narrative of power. The narrative of contradicting expectations refers to double standards the office design supports. These double standards are a byproduct of the actions of two radically different user roles of a customer and an employee. The second narrative of power refers to the values and hierarchical systems the office reflects.

Narrative of contradicting expectations

The customer’s main motive is to get employed. The expectations of an employee on the other hand are to employ the customers and have a functional workplace which supports this. Based on the interviews of employees the hidden motive of customers is for instance to qualify for the unemployment benefit and hidden motives of employees are the needs of safety. Several comments on “dangerous” and “misbehaving” customers were made and additionally comments of customers such as:

“well, the government pressures me to come here”

implies that getting employed is not the only motive to come to employment office. These background assumptions also affects to

the analysis of the space. Although the obvious function of the employment office is to employ people, based on the data it seems the ambiguous aims of both employees and the customers were present in the space design as well.

If the space acknowledged the employees' need for safety, customers may feel themselves excluded: If customers actually notice the high restrictions, they feel themselves to be an annoyance or even a threat to the workers and this may decrease their trust toward the employment office and eventually their chance to in fact get employed. Based on the observations, this however was not the case. This is because the personnel spaces were not visible to the customers. The doors and corridors were prudently hidden in the back areas of the office. And because the employees' did not even use the same corridors they actually never bumped into customers and the customers never saw the employees vanishing to their own areas.

The invisibility of employees had its downfalls on the third floor of the employment office in which the service line for more challenging job seekers was located. The space was designed to be tranquil and silent. Pleasant artwork was placed in front of the customer service space and therefore the customers could not see whether the staff was present or not. This evoked acts of confusion, such as walking about nervously and sitting stiffly and staring at one spot. The space that was meant to be tranquil became a place of discomfort. The customers acted as they wished to be invisible (probably for several reasons) whereas on the second floor people moved more freely and expressed themselves more openly. An empty space is often considered to be a sort of a non-place (Gregory, 2011). The empty space suggests that one is not welcome or is in a wrong place.

The motivation of the customer affects his/her orientation toward passive acts. This means that for example the open waiting room seems more awkward for those not really seeking for a job than to those who are actually trying to find a job. The awkwardness is multiplied by the fact that the self-service computers were located "on top" of the waiting hall, as if they were to be there to monitor those who secretly did not want to be employed. The employment office was designed to support the specific needs of customers and employees but it also steered their reactions towards a certain direction. The interaction with customers and employees was restricted to service desks and service space. If the customer for instance wanted to communicate with the employee in another space, it was first of all much harder since the employees were using their own routes and own places such as the cafeteria and back-office area. Secondly, it would have been unorthodox since the space also gave guidelines for the type of communication they were to provoke. If, for some reason, the customer wanted to talk with the employee in another space than the designated area, the subject of discussion was more likely one without the motivation of getting employed. And if the subject was in fact dealing with professional issues it would have been considered rude in the sense that the play of "getting employed" was to take place "behind" the service desk, and this desk was one of the main symbols of the role of being an employee. In other spaces, they were not able to take that role in the same way. According to Goffman, the roles are tied to the stage and it is forbidden to break the norms of the play (1954). An actor needs to say his lines and not, for example, answer his own phone during a scene. When applying Goffman's ideas to an employment office, it is obvious that conversations with customers during "the play" are giving conflicting messages regarding the roles taken by different users. The upper floors are usually valued higher than the lower floors. There is an interesting contradiction in this tradition. Public places, such as restaurants, public offices, shops are usually located on the ground floor. Private places, such as other offices and residential floors, are located higher. From this point of view it seemed customers were having troubles finding their destination, but also in appreciating the public office space, which was located in upper floors. It seemed as if the office "was hid from the public eye". The employment office structure was designed to evolve from private spaces (personnel space) to semiprivate (customer service desks), semipublic (conference rooms) to public space (waiting areas). Private spaces were those which were locked and used only by employees. Customer service desk was semiprivate in a sense that it is used by everybody but only one customer at the time. The service desk was not entirely private in the sense that employees could in fact communicate with each other during customer service.

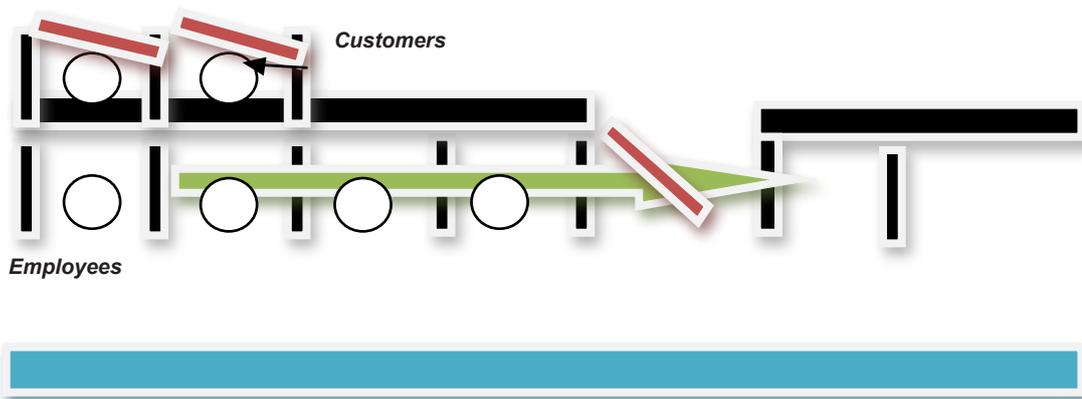


Figure 2: Customer service desk

The conference room was public in the sense that it can be used by everyone but only to specific uses. The conference room was also located in the personnel area, which was a major hindrance both to customers and employees because the door was locked and could not be kept open due to the private features of personnel cafeteria and locker rooms.

The spaces for customers were different than the space employees' spaces. In fact, the employees did not have to encounter customers in any other space than in job seeking center and even there from behind the desk because:

1. Every passage way to the personnel area was locked.
2. Customers and employees interacted only in one space of the job seeking center. Not for example in corridors or toilets, etc.
3. The employees' space was designed to be connected from the first step to last one.

The physical setup for the building was thus designed to support spaces from the viewpoint of restrictions and how these restrictions could be implemented in as usable way as possible.

NARRATIVE OF POWER

Power can be defined as the amount of choices one can make (e.g. Saastamoinen, 1999; Bauman, 1998) For example, the more money you have, the more choices you have in life and the more power you have compared to those who are lacking the freedom or the alternatives for choices and who thus are more dependent on other peoples' choices. The power in a space is thus with those who have more alternatives in the use of the space (e.g. a security guard can go everywhere and has the power to "control" the users of space).

The customer spaces were located on upper floors. From the perspective of customers in public buildings, upper floor are less valuable peripheries. This was evident when observing the acts. Acts of confusion, such as mistakenly turning to a wrong direction or staying put in the hall were quite usual. From the user's perspective, public buildings are most of all functional places, not places with which to identify, such as the places of living or places of entertaining oneself. Also, the cultural aspect of getting used to certain solutions might have affected the customer perception. Usually, customer spaces of public building are in fact situated on the first floor. Based on observation, people have a tendency to turn right. In the employment office, when entering the space, the personnel areas were located on the right side and on the second floor; the customer space was to the left of the entrance. Thus, the space was not supporting the motives of the customer.

The restrictions within the space are the most evident concrete symbols of hierarchy and valued systems. In this sense, employees were obviously "higher" in hierarchy since they had access to wider areas than customers.

The restrictions do not only determine the hierarchy but they determine the role of the user. The space of an employment office sets strong guidelines on how one can act and form his/her role in the organization. For instance, the researcher was granted a gadget used to open the doors to some of the personnel spaces. When the researcher was using this gadget, the customers made assumption she was a staff member as she could access areas which they could not.

THE SYNTHESIS OF THE TWO NARRATIVES

When using the narrative perspective and the concepts of Erving Goffmann (1956), it can be stated that an employment office is a perfect example of a stage and a play. Because of the function (= to employ the customer) of the employment office, the roles of each user are already defined when they enter the building, and the building itself is an evident stage for a play: employing oneself and trying to employ the customer. Although the motivation of the customer may be to get certain qualifications in order to receive the unemployment benefit, the play is always the same. They at least try to act as if they were trying to find employment for themselves.

THE TRANSCRIPT, THE STAGE AND THE PLAY

The narrative analysis showed that although e.g. mental space or the physical space are often studied individually (Hongisto, 2005; Maher and von Hippel, 2005) in this research they were joint together in a way they were impossible to describe without one another. For example the transcript e.g. the mental construction of employment office is constructed from individual space perception combined with subjective pre-assumptions of the space. In the case of employment office the transcript is formed from both conscious and unconscious motives and pre-assumptions of the users. In the case of the employment office the pre-assumptions included themes such as public office is situated in the ground floor, doors should be open and the service desks visible. These assumption are then realized in the physical set up of the office. Additionally certain social behavior was adopted based on these physical and mental constructs. In other words the “play” is the combination, of the transcript, the stage and the roles the users take.

When investigating the play e.g. the social construction of the given space the evident needs, such as the verbal wishes of a employee and unconscious behavioral choices (the transcript), such as being attracted to directions or joining others already there has to be acknowledged. The evident needs are somewhat straightforward and can be verified with surveys, discussion and interviews but understanding user behavior in a deeper sense requires more profound contemplating. In many cases, it is more useful to study the actual actions of the users of space instead of asking what they think they are doing or feeling. This is the reason why the method of observation was chosen. Although it does not give profound answers, it does in fact tell what is actually happening. We are not always aware of our choices and a way of understanding in this case is the space where we function.

CONCLUSION

The objective in this study was to understand the experiences of a physical office space and to find unconscious constructions behind the tangible structures of a built environment. The questions were the following: How do the users (customers and employees) interpret the existing constructs? What kind of mental constructions two different user groups in the employment office create from the physical space? How does the space of the office reflect, hinder or endorse the users’ activities in the space of an employment office?

Based on the narrative analysis of the user journey observation, the conceptual construction of the space of employment office is:

1. in the process of interaction
2. in the valued systems based on cultural habits
3. in the physical constructs which enable or hinder the process of two previous items.

The space thus hinders the everyday actions by:

1. Restricting the users’ possibility to go to places which would intuitively (culturally) seem correct

In the case of the employment office:

- the employee rest areas were located on the bottom floor
- the customer spaces were located to the left of the entrance.

This hindered the intuitive actions and made the office space unusable from the customer perspective.

2. Restricting freedom of choice by locking certain areas meant that the customers were unable to enter (public) conference rooms and back areas of service desks freely which might imply a lack of trust and respect, which might lead to poor customer experience and, at worst, unsuccessful employment process.

The space supports actions by

1. Ensuring the safety of employees, such as all the passage ways to employee areas were locked
2. Ensuring that the restricted areas are not visible to customers
3. Modeling the organizational structure with physical structure
4. Ensuring vivid interaction in designated places without hindering the peace in the places of concentration.

The amount of choices when using the space becomes crucial in experiencing the space; hence the amount of choices correlates strongly with the experienced freedom of using the space. For example, the person who has access everywhere has the most freedom in using the space. Accordingly, it becomes clear that what is seen and what is hidden affects not only the places that the office users access but how they rank their role within the space. For instance: the space itself defines the customer and employee roles in employment office. A person able to see and access every area most likely has the most power in using the space. Equally, he/she experiences the most freedom in terms of spatial questions and usually in terms of organization. Quite often this correlates with time issues. The person who is able to access every area is the person who is most likely able to do that whenever he/she wants. So he/she has also the most freedom in using the time.

The results presented in this case study elaborate the fact that different users have different needs which are challenging to fulfill in the same context, in this case, an employment office. Although this case presented a few downfalls in designing a functional and attractive workplace, it did succeed in fulfilling some contradicting user needs, such as safety of employees and invisibility of restrictions.

DISCUSSION

Every building holds cultural constructions, in other words, narratives which every designer, manager, etc. should take into consideration when planning new spaces and places. This research showed that built environment and the narratives it reflects produces, supports, hinders, manipulates and guides our actions, interactions and experiences. And thus the narrative perspective on workplace management should be taken seriously.

FURTHER STUDIES AND LIMITATION

To understand designing best places for different situations and organizations one has to be aware of the questions of change management, facility management, architectural limitations, and so forth. In the case of this particular employment office, it is essential to use interviews in order to capture the subjective viewpoint of the users. This study concentrated only on the perception and conceptualizing of space and the results presented here are aim to explain how to build a bridge between mental, social, and physical space. In order to capture the essential experience of a user, the observation should be repeated and cross case analysis between different offices or other spaces conducted. Going further to different kind of spaces would also help to understand particularly the space of a workplace in employment office.

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THE NON-TERRITORIAL OFFICE DEBUNKED

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Much has been discussed in recent literature about the merits of the ‘non-territorial’ office. Such arguments are often based on the savings afforded by hot-desking and free address systems, in terms of reduced space costs. The argument is further legitimised by the organisational benefits of sharing and increased levels of interaction. However, few authors have commented on the virtues of the opposing argument – that of territorial behaviour. Instead, such behaviour is ‘designed out’ on the basis of being wasteful and antisocial. This paper presents a counter arguments based on a review of existing evidence in wider disciplines beyond facilities management. It describes a socio-ecological perspective of workplace dynamics. It suggests that territoriality is inextricably linked to ‘place attachment’ – a phenomenon known to enhance belonging and company loyalty. Moreover, in the group context, territory may serve to reinforce group identity. The paper concludes that the ‘non-territorial’ design solution should not go unchallenged. Indeed, there may be an argument for increasing the opportunities for increasing territoriality as a means of nurturing group cohesion and identity in the workplace.

Keywords: non-territorial, office, socioecological, place attachment, territory

INTRODUCTION

The concept of the non-territorial office has been widely embraced as a positive development in modern workplaces. The implicit assumption is that office environments that afford territorial behaviour invite negative behaviour. This includes the securing of valuable organisational resources (space) for political ends, often based on self-serving and petty considerations.

Modern thinking from the anthropological perspective, regarding the importance of territory, suggests that such behaviour is anything but ‘petty’. Indeed, contemporary thought on territoriality indicate that it serves a key role in organising behaviour such that overt dominance, aggression and violence are averted.

This paper examines the ‘myth’ of the non-territorial office and questions the modern day approach of facilities solutions to suppress such behaviour, both at an individual and group level. We then explore how facilities management approaches might embrace many of the positive aspects of territoriality, based on four definable types of territorial behaviour.

NON-TERRITORIAL OFFICE

Research on the merits and demerits of the non-territorial office spans several decades. It has often led to divided opinion. The overriding considerations are driven by technological serendipity and real estate savings. Modern communications have ‘liberated’ the worker from the boundaries of the conventional cellular office.

However, this discussion is not concerned with the appropriateness of ‘open plan’ working: a discussion which remains largely resolved. New ways of working substantially embraces the concept of ‘work anywhere’ environments and all of its many facets including multiple-activity settings. This paper, rather, considers the influence of territoriality. It questions whether ‘non-territorial’ offices are indeed non-territorial. Is it appropriate or indeed possible to ‘design-out’ territorial behaviour?

ARGUMENTS IN DEFENCE OF NON-TERRITORIAL OFFICES

The potential benefits of barrier-free working have been the subject of investigation for several decades. As early as 1973, Allen & Gertsberger (1973, p.2), in a study supported by the IBM Corporation, suggested that:

“A prime determinant of communicator choice is the physical distance separating the parties in the organisation. Opportunity for

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establishing eye-contact with potential discussion partners and the sharing of equipment or physical space are important for developing personal contacts. These contacts are the prime vehicle for transmitting ideas, concepts and other information which is necessary for assuring effective work performance.”

Their study sought to determine the impact of what, at the time, were radical new schemes of office layout – on work related behaviour, communication and performance. Essentially, such a solution involved the removal of interior walls and partitions. The results of the study were somewhat equivocal. The experimental results suggested that the new arrangement (open plan as opposed to the previous cellular arrangement) was successful in terms of user preference and the level of interaction. Communication rose significantly compared to the traditional one and two person offices. However, the one-year study was unable to show any significant increases in department performance over that time.

A similar study by Oldham & Brass (1979) considered the reaction of employees to work following a move from a conventional to an open plan work environment. They identified two alternative approaches to understanding how employees react to work: 1) a social relations approach and 2) a socio-technical approach. The social relations approach suggested that the absence of territorial barriers such as interior walls and partitions in open-plan offices enabled the formation of social relationships between employees resulting in increased employee motivation and the exchange of information.

Oldham & Brass (1979) go on to describe the socio-technical approach which suggests that the presence of physical boundaries can positively affect job experience in two respects. Firstly, the authors suggested that physical boundaries have a transformative effect, providing a defensible private space. The presence of such boundaries enables the occupants to experience a greater sense of privacy compared to an environment with no boundaries. Furthermore, the presence of a boundary reduces the likelihood of disturbance as reported by Gyllenhammar (1977). Secondly, the authors suggested that a bounded work area helps to clarify the work processes, such that employees can easily identify their tasks and equipment required to complete their task.

In a much more recent study by Roper and Juneja (2009) this dichotomy between openness and privacy (what Oldham and Brass described as the ‘human relations’ versus the ‘socio-technical’ perspective) is further explored. Their findings suggest that the impact of distractions arising from open-plan working is poorly understood and remain largely unmeasured from a cost-perspective. Meeting the dual needs of collaboration and concentration arising from modern day tasks, remains problematic.

A more complete analysis of office characteristics and their effect on employees emerged in the 1980s. Oldham and Rotchford (1983) considered the relationship between office characteristics such as openness, office density, work-space density, accessibility and office darkness on several measures of employee reactions including satisfaction, behaviour during discretionary periods (i.e. when they were free to move) and spatial markers. Intervening variables considered in the study included interpersonal experiences (conflict, friendship, opportunities, agent feedback), job experiences (task significance, autonomy, task identity) and environmental experiences (crowding, concentration and privacy). Findings from the study indicated that each of the office characteristics had a significant influence on employee reactions, often through the intervening variables identified.

The polarised debate regarding open-plan or cellular office solutions was exposed by the work of Stone and Luchetti (1985) in their seminal work exploring the concept of ‘activity settings’. This provided a third way, such that employees could move between multiple settings in the workplace according to their immediate needs.

More recently, the idea of alternative officing (AO) has also received attention. This offers a different approach to that of conventional workplace design such that space is occupied on-demand (Becker, 1999). Becker (1999) identifies six different ‘alternative officing’ solutions (though not mutually exclusive):

- Universal plan offices/workstations
- Activity setting environments
- Non-territorial/unassigned offices/workstations
- Home based telecommunication
- Team/collaborative environments
- Virtual officing

Each of these approaches defines a system for leveraging more cost effective use of corporate space. The adoption of universal plan offices for example, has allowed the rationalisation and standardisation of space based on need. The adoption of an unassigned

approach to individual space allocation is one innovation that has only been made possible through the use of modern telephony and wireless connectivity.

Despite the widespread reference to non-territorial environments and variations of this (identified in one of the six workplace strategies above), territoriality remains a pervasive part of workplace behaviour afforded by modern workplace environments. Sometimes these effects can be pernicious; sometimes advantageous. However, what will be proposed in the subsequent analysis of territoriality, is that modern workplace environments do not eradicate territoriality (nor should they); they simply change the possibilities and facilities management challenges. Indeed, as long as there are people in offices there will be 'territorial' offices.

TERRITORIALITY DEFINED

Human behaviour consistently shows that we are innately territorial in behaviour. No more is this played out than in the working environment. In relation to space planning, territorial behaviour is associated with negative and ultimately wasteful behaviour. Such behaviour is associated with proprietary claims on space – both in terms of communicating and maintaining such claims. 'Space grabbing' is one form of territorial behaviour instigated by managers to communicate organisational power. Similarly, individual expressions of ownership provide a means of resisting invasions by unwelcome intruders. To date, limited research has been undertaken to understand the nature of territoriality. It is questionable whether you can 'design-out' territorial behaviour through 'new-ways of working' (NWOW). Indeed, evidence suggests that such environments simply change the artefacts that are used to display ownership.

Early work by Hall (1973) on the subject of territoriality analyzed the manner in which people communicate with one another non-verbally. It was argued by Hall that the concepts of space and time are the 'silent language tools' by which human beings transmit messages. A significant change in our understanding of territorial behaviour emerged soon after with the work of Edney (1974). This highlighted the instrumental role of territoriality in reducing the need for aggression, violence and overt domination. Our modern day understanding of territoriality owes much to this and other contemporaneous work, reviewed by Brown et al (2005). Not all such behaviour can be construed as dysfunctional and irrational, as many popular discussions on the 'non-territorial' office would have us believe. Territoriality has the potential for reducing turnover and simplifying social interactions as evidenced by current research on the subject.

The concept of territoriality is explored in the work by Brown et al (2005) who consider the relationship between territoriality and psychological ownership. They suggest that psychological ownership is a precursor to territorial behaviour and the two concepts are intertwined. The authors define territoriality as an 'individual's behavioural expression of his or her feelings of ownership towards a physical or social object' (Brown, 2005, p.568). Two significant points emerge from this applying a facilities management perspective: 1) territoriality is a social construct and has no meaning outside of an individual's or group's sense of ownership; 2) ownership is not confined to physical objects such as space, office furniture or office zone. Intangible objects such as ideas, roles, and other employees also exist. Indeed, in the context of facilities management, it may be possible to transplant feelings of ownership from the physical to more metaphorical symbols.

PSYCHOLOGICAL OWNERSHIP

Why do people seek ownership of physical or social objects? To understand this question is to explain many of the conundrums faced by facilities managers. Pierce (2001) suggests that psychological ownership underlies territorial behaviour (as shown in Figure 1). Psychological ownership describes the 'feeling of possessiveness and of being psychologically tied to an object' (Pierce et al 2001, p.299). In their analysis they suggest that psychological ownership is rooted in three human drives:

- (1) – the need for efficacy
- (2) – the need for self-identity
- (3) – the need to have a place of your own

An understanding of which of these three arises in employee behaviour enables a more appropriate response. A misinterpretation of the prevailing driver may give rise to an entirely wrong response. Efficacy (1) refers to the natural motivation of people to be competent and efficient at their work. This gives rise to a desire to control their own environment such that their preferred working practices are enabled. Self identity (2) is a second motivator for people to take psychological ownership of an object (e.g. a space, a picture on the wall or a fixture). In so doing, they are able to communicate to others in the organisation, their own sense and understanding of identity. Fulfilling (3) – the need to have a place of your own, is associated with the positive experiences arising from the physical and psychological security that emerge from a familiar setting.

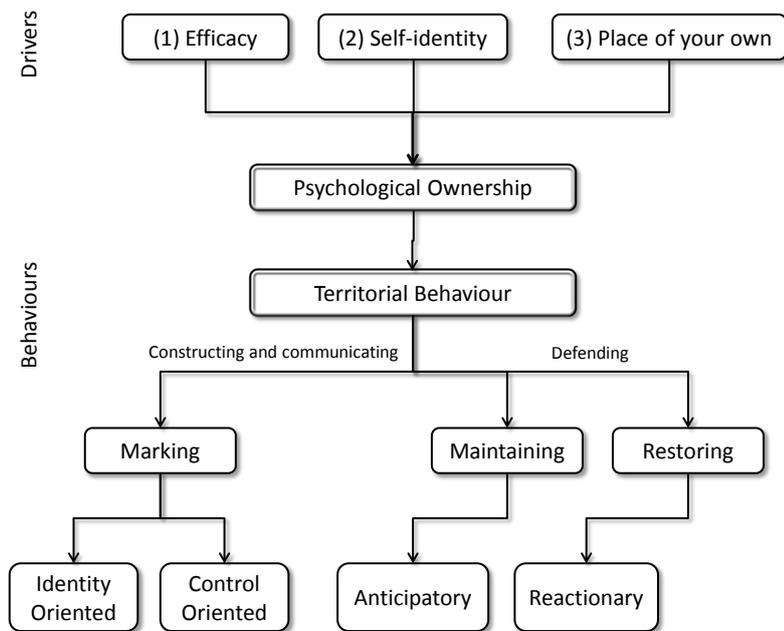


Figure 1: Ontology of territorial drivers and behaviours (based on Brown et al. 2005)

Psychological ownership refers to feelings of possessiveness and attachment towards an object, whilst territoriality as a concept refers to actions arising from this. Specifically, territoriality refers to a series of 'behaviours that seek to construct, communicate, maintain and restore a person's attachment to an object' (Brown, 2005, p.579). The classification of territorial behaviours is shown in Figure 1.

Some key ideas emerge from Brown's classification and conceptualisation of territoriality:

- Territoriality is a social behaviour and only has significance in a social context. Without a social realm and a psychological attachment, territorial behaviour does not arise. Simple attachment to objects is not sufficient to give rise to territorial behaviour – it is proprietary behaviour. It is more than saying 'I love my office': rather it is about saying 'This is my office and not yours!'
- The process of claiming and protecting an object through a process of negotiation enables an object to be transformed into a territory.
- As with power and politics, territoriality is concerned with the distribution and management of an organisation's resources. Indeed, the way in which territory is used to gain strategic advantage through the control of certain objects such as space, can highlight the dynamics associated with certain political strategies.

Markers

The idea of constructing and communicating territory through the use of markers has been a long-established concern in environment-behaviour and facilities management research (Sommer and Becker, 1969; Becker, 1973; Wells, 2000). Examples of markers encountered in the workplace environment include nameplates on doors, personalised screen-savers on computers, clothing left on chairs, papers left on desks. Markers vary in relation to their permanence and the extent to which they represent authorised communications. At one extreme are the formal (espoused) statements of territory at the departmental or group level: at the other level are the informal and temporary markers used to indicate occupancy of individuals in a free-address environment.

Two types of marker can be identified (as shown in Figure 1): (1) identity-oriented marking that empowers individuals to construct and communicate their own identity, both to themselves and others; in so doing, individuals are able to nurture a sense of belonging in their work setting (an example is shown in Figure 2); (2) control-oriented marking that involves the use of symbols (markers) that are not personalised, serving to communicate boundaries of a territory and who possesses ownership of it (Altman, 1975).

Defending

Markers may not be seen as sufficient in terms of defining territory. Boundaries and attachments are subject to differing social interpretations. Individuals may differ significantly in terms of their interpretation of demarcated territories. As a result, both the threat of an 'invasion' by an unwelcome outsider or actual infringement may prompt a more direct response. This may take the form of:

- (1) an anticipatory response that is non-communicative in nature (in contrast to markers) with the sole intent of preventing an infringement. (For example, arranging flexible partitions to restrict access to a workgroup); or
- (2) a reactionary response, which occurs following a perceived infringement (an example is shown in Figure 3).

In the context of managing open space, the absence of a shared understanding of symbols (e.g. in a multicultural setting or where space is shared with transient users), may render markers ineffective in communicating territory. Thus anticipatory defence in the form of mechanisms to thwart infringements provide the next option. Thus, locking of fridge compartments, office doors or barricaded work groups seek anticipatory defence. They, thus, do not rely on the subtleties of communication that may not suffice.

Reactionary defence is a response to actual infringement. In general they provide an emotional expression of the individual's feelings about the infringement. Such a response serves to restore territorial boundaries and to prevent further infringements. Reactions range from informal reactions such as shouting, tut-tutting, glaring or seeking support from colleagues. A more formal response may take the form of complaints to superiors.



Figure 2: Identity oriented markers in the workplace



Figure 3: Reactionary response following an invasion.

MANAGEMENT IMPLICATIONS OF TERRITORIAL BEHAVIOUR

The concept of territoriality is fundamental to understanding space usage in the modern flexible workplace. The determinants of space usage are changing. The hierarchy of needs suggest that building users seek fulfilment in relation to self-actualisation rather than simply functional and security needs. In just the same way that the intangible concept of 'sentiment' drives financial markets, so

it appears that space requirements are driven by an equally intangible phenomena – territoriality. Alternative officing (AO) presents a number of key facilities management challenges:

- The increasing need of space users to introduce control-oriented marking to communicate boundaries in ambiguously defined open-plan environments. This meets the need to signpost demarcation between public and private space.
- The advent of bookable space further adds to the complexity of the territoriality debate. Individuals may claim psychological ownership of particular time windows by means of anticipatory defences (i.e. booking out space in advance) on electronic booking systems.
- The accentuated need to produce a 'sense of I' in environments that are increasingly commoditised, standardised and devoid of personal expression.
- The increasing prevalence of user control-oriented marking to organise and bring meaning to space, roles and other objects.

CONCLUSIONS

This paper has sought to dispel the myth of the non-territorial office. It questions whether a non-territorial office is a desirable or achievable state of affairs. Clearly, territoriality brings with it both positive and negative consequences. However, the introduction of 'free-address' or unassigned environments has not eliminated territorial behaviour. Indeed, modern workplaces have served to amplify such behaviour, owing to the increasing need to find self expression and personalisation in the workplace. Such self-identification provides 'rootedness' and a sense of belonging in an organisation. Moreover, the significant personal investment of time and energy has been shown to increase organisational commitment.

Many comparisons have been made with the animal kingdom. What is clear from studies in territorial marking is that avoidance of conflict rather than the creation of conflict is made possible through territoriality. By means of markers and defensive strategies, individuals are able to clarify the boundaries of territories in a dynamic environment. The avoidance of conflict played out in the spatial arena (i.e. the office environment) is a day-to-day reality. The elimination of territorial behaviour may, in the short-term, reduce conflict, but in the long-term may exacerbate conflict.

The onus is on the facilities management research community to more fully understand the nature of territoriality. As a social construct, it is not something that can be 'designed out' by means of the unassigned office. The concept of the 'non-territorial' office denies the existence of a human behaviour that is intractable. A clearer understanding of territorial behaviours will allow the amplification of useful territorial behaviours and the diminution of undesirable territorial behaviours in the workplace.

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DESIGN AND MANAGEMENT OF BUILDINGS AS LEARNING PROCESSES

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Numerous studies that examine the question of adding value to user organisations through the design and management processes of buildings have focused on the impact of the mediation processes between building experts and users on the quality of the final product. While these research activities focus on the outcomes of the process in terms of built products or in terms of effects it has on the user organisation through the use of the product, little work has been undertaken to understand the effect of the design process on the involved parties, both on the client – customer side and on the designer – provider side: How does the participation in the process question and transform their knowledge, their organisational structures? Individual learning and even more organisational learning are a central aspect of this question. Various aspects of appropriation and of learning on the envisioned socio-technical system during the design process could be crucial for the quality of the forthcoming use and for usability. In order to develop this hypothesis, we will introduce the material of different case studies on complex building and urban projects. Our analysis may enlarge the understanding of service delivery in construction processes not only as the ability to provide facilities that support social processes of the clients but also as the ability of design processes that support and enhance organizational learning.

Keywords: design processes, experience, individual and organisational learning, organisational dynamics, system of players, usability

INTRODUCTION

Research in different areas of architectural and urban design has developed understanding of the interleaving between the quality of products and the quality of processes, tools and methods that lead to them. Usability studies have recently investigated some particular topics like user participation in design processes and culture, situation and experience-based appraisal of workplace performance (Alexander 2008, Jensen and al. 2011, Lindahl et al. 2011). These findings guide the underlying assumption of the present work: The social, economic and cultural function of space, its symbolic, instrumental qualities, as well as its effective and potential use depend on the knowledge and the actions modes of the players involved in the design process.

Clarifying strategic intents or taking into account knowledge about the building-in-use during the design activities is considered as an important contribution to achieve pertinent and useful outcomes from design activities. Some studies, for instance, have focused on the impact of mediation processes between building experts and clients, between building experts and user organisations or end-users on the quality of the final building (Blakstad et al. 2008). While these research activities focus on the outcomes of the process in terms of built products or, in some cases, in terms of effects it has on the user organization through the use of the product, little work has been undertaken to understand the effect of the design process on the involved parties, both on the client – customer side and on the designer – provider side: How does the participation in the process question and transform their knowledge, their organisational structures, the organisation of the project, the quality they seek in a building, the understanding of their entrepreneurial or social finalities, etc. (Fenker 2008).

In this perspective we want to enlarge the understanding of elaboration and development of knowledge during the design process. Individual learning and even more organisational learning are a central aspect of this question. The learning process could concern various aspects for the involved players: optimisation of the project structure; developing professional competences and new resources for future projects; appropriation and learning on the envisioned socio-technical system.

Knowledge enhancement and mobility are neither new nor specific to this activity sector but, in this domain, the acquisition, transmission and recognition of knowledge are faced with a dual problem: entire areas of knowledge cannot be acquired through standard professional training channels; their legitimisation can only take place through operational situations. This problem results from the largely tacit nature of certain types of mobilised knowledge that are difficult to formalise, and the fact that they are only partially linked to the original discipline or profession of the concerned players. Consequently, the practices appear to represent an essential element in the learning and knowledge legitimisation process.

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Knowledge recognition and enhancement are even more problematic if one considers the heteronomous nature of knowledge involved in processes that include a wide range of design professionals, clients (or commissioning authorities) and their customers (sometimes present as end-users).

EXPLORING LEARNING IN DESIGN PROCESSES

EXPERIENCE, A TYPE OF KNOWLEDGE TO UNDERSTAND LEARNING PROCESSES

The articulation between social interaction and knowledge of different nature and origin in architectural and urban production processes is the subject of our investigation. We therefore lean on the notion of experience. Experience as a cognitive activity makes it possible to acquire, consolidate and exchange knowledge (Dubet 1994). It mobilises knowledge that has frequently not been formulated and questions the widespread idea of an asymmetrical relationship between the “ignorant” client and customer and the “knowledgeable” professional. Its usage leads to a different way of studying the distribution of knowledge within systems of players by avoiding any a priori breakdowns into professional categories.

We understand experience to be a support for the cooperation between those involved in the design and production of complex buildings and as a process for mobilising collective knowledge. Experience either designates knowledge acquired elsewhere that is introduced into a cooperative situation (acquired knowledge), knowledge that the players are in the midst of acquiring (experience in progress) or knowledge resulting from all aspects of a professional past (the action of acquiring experience or negotiation to extract knowledge from a specific experience).

Evoking or stating the experience is generally linked to a given situation which has either taken place in the past, with an explanation of where or at what critical moment of the project it has been acquired, or a future situation where the acquired experience could profitably be used again. It is difficult for the players to describe their experience without detailing the context and its conditions, being the aspects giving the experience its value. Experience is always based on a situation. This explains the difficulty in discussing the current experience, as the conditions and duration of the context have not yet been fixed. Explaining the experience in relation to a past or future situation gives sense to the knowledge acquired and to the action that brings it into play. Unlike a capitalisation approach, which aims to provide formalised knowledge, the narrative represents a way to learn from the action by relocating it in a different context and within the dynamics of the projects.

The confrontation of the different points of view that players have of a same situation provides access to their individual experiences. On the one hand, those that they have already used to enter into a cooperative dynamic and, on the other hand, those produced by a change in the dynamic.

THE EMPIRICAL SOURCES: THREE COMPLEX BUILDING PROJECTS IN FRANCE

Three complex building projects were analysed on the basis of qualitative surveys: the arrangement of a square in front of a railway station (Lyons railway station in Paris), the restructuring of an old court building (Bordeaux court of appeal) and the construction of a new hospital building (Annecy regional general hospital).

Front square of the Lyons railway station in Paris

The redesign of this square, formerly crowded by car traffic and largely used as parking area, was aimed at easing access to the station. Reserved for pedestrians, its level towards the surrounding streets was lowered in order to slope gently from the station level to the street level. Started in 2003 and completed in 2007, the complexity of the project is mainly due to the wide range of stakeholders: not only the institutional players of French Railways Company and the Municipality of Paris were taking part in the project, a variety of commercial, social and environmental-oriented associations and interest-groups defended their point of view. Learning of the commissioning authority led to a move from more technical skills and operational building project management to the governance of highly sensitive urban development operations.

Bordeaux court of appeal

Following the construction of an extension to house the high court (tribunal de grande instance), the Ministry of Justice decided to restructure the existing part of the law courts in 1998. The completion of the works in 2007 has permitted a redistribution of legal activities on the site. Given the complex programmatic and institutional context, the project underwent several reversals. The analysis essentially concerns the conditions governing a capitalisation of the work carried out on the extension and the utilisation of the experience held by the users of the building to be restructured.

Annecy regional general hospital

Begun in 1991, the project was completed in 2007. The transfer of all hospital activities to a new site implied a very large number of concerned players both from within the hospital and outside, such as consultants and project managers. Architectural, medical and managerial skills were called on to simultaneously organise the activities and their spatial constraints. This project process has been characterised by considerable technical, economic and organisational difficulties.

The complexity of the projects simultaneously lies in a sophisticated interconnection of players and a long-term process. Three types of players were encountered: contracting authority professionals (project leaders, ministerial representatives in case of projects in the public sector), designers and service providers (architects, programmers, site planning and coordination engineers), as well as customers (user organisations and some end-users).

Table 1 Project Description

	The new front square of the Lyons railway station in Paris (Parvis de la gare de Lyon à Paris)	Restructuring of the old court house in Bordeaux (restructuration du Palais de justice à Bordeaux)	New regional hospital in Annecy (Centre hospitalier de la région d'Annecy)
building programme	square of 3000 m2, reorganisation of vehicle and pedestrian traffic, link to the surrounding quarter by lowering the place to street level; brief started in 2003, delivery in 2007;	building from the 18 th century with 17500 m2, project started just after the construction of the new court (arch. Rogers) which was badly perceived by the employees; Decision to run project in 1998, works finished in 2009	new building to replace old hospital, 94000 m2, 630 beds; First general brief in 1995, works finished in 2007
client	commissioning authority of the French railway company, (a transversal property, planning and construction body)	commissioning authority of the Ministry of Justice (national body for construction of the ministry)	commissioning authority of the hospital in Annecy (supported by the regional health authority)
customer	administration of Lyons Railway station	5 different courts (court of appeal, labor tribunal, etc.) which all occupy the building	general hospital administration Annecy
other stakeholders	Municipality of Paris Road administration 11 syndicates of taxi licence owners Cyclists association Syndicate of shop owners Citizens associations in 12 th district of Paris	Chamber of lawyers	medical body nursing staff administration
designers / service provider	architect	briefing consultant, architect	architect, construction engineering consultant
organisational ties between client, customer and other stakeholders	low ties between client & customer; Non existing with stakeholders;	ministry has no say on how courts must operate;	strong ties between client and customer; between customer and stakeholders: organisational ties concern HR issues but medical body and nursing staff have "technical" knowledge that gives them power in the decision making process;
concerned phases of the process	brief	brief, design, construction	design, construction (adjustment between healthcare / medical project – finance - the building under construction)
critical moments	strike of taxi drivers when project intentions were made public, need of expertise	understanding and translating customer needs is condition of final agreement	adjustment between budget, planning of hospital operations and building was condition for move in

A common point between projects is that the costumers played an active role in the production process. This group includes those responsible for organisational units, end-users and institutional delegates (magistrate delegated to the facilities planning function for the court of appeal, president of the establishment's medical commission for the Annecy regional general hospital). Their intervention was often decisive in assuring the progress of the project. The accounts given by "non-professionals in the building sector" were particularly informative insofar as the issue of mobilising knowledge between players was concerned.

THE ANALYSIS STRUCTURED AROUND CRITICAL MOMENTS

The continuity of the technical and decision-making processes of the projects was profitably used to question players as to actions they had taken in the past when seen in the light of their present intervention situations. The information was used to create a link between their earlier professional histories and their current points of view concerning the projects in which they are involved, the issues they see, as well as all other contextual elements marking the existing situations.

Their accounts provide essential means for understanding the interactions and the knowledge mobilised and produced during the projects. The "reconstructed" nature of the experience reinforces the difficulty in evaluating the effect of mobilised knowledge on the

progression of the processes and, more generally, the validity both within and without the project. This is why it is important that the accounts be seen within the strategic context of the project, that emphasis be placed on an analysis of the decision-making process, and that the stated positions and knowledge held by the players be confronted.

The abundance of material led to the analysis being structured around critical moments of each project. These are repeatedly qualified by the narrators as being decisive factors in the progress of the project. Whether crisis or breakdown, they crystallise the issue of the effect of interaction and knowledge on the conduct of the project within a singular situation. The choice of these specific moments explains why the experiences noted in the accounts generally involve non-technical types of knowledge. It is “relational” and “managerial” knowledge that makes it possible to resolve the crisis. The experience most valued by the players is one that goes beyond routine actions in view of developing a cooperative approach.

KNOWLEDGE IN THE DESIGN PROCESS DYNAMICS

The advent of these moments in the conduct of the process was a determining factor for the configuration of the player system. The role that the customers, contracting authorities and designers can play in a project undergoing difficulties depends on the project phase. The nature and temporality of the examined moments results in the issue of relations between experience and cooperation being particularly enriched by the analysis of cooperative situations within management committees that bring together users and professionals representing the contracting authority.

KNOWLEDGE SHAPING SCHEMES OF COOPERATION

An analysis of the critical moments results in specifying several pivotal points between acquired experience, current experience and cooperative dynamics. These reveal several ways in which experience can intervene in cooperation:

- (1) Identification of skills and the role of the players: during critical moments, a fundamental aspect of cooperation – taken in the sense of working together – is the identification of a player, his skills and the place from which he can act. The identification of the “right place” for the players refers to the idea that by participating in a given action, they will be able to understand the real or potential reciprocal contribution of the others and themselves in managing a situation. This mode shows how players construct a situation governed by confidence and how the recognition of skills breaks through the institutional and technical limits of their functions. It allows a group to mobilise knowledge even when only a few members are holders of the concerned knowledge. This is clearly what occurred during a critical moment of the Annecy regional general hospital design process. The lack of cooperation between the administration, the medical team and the nursing department prevented the balancing of the operational plan and the future hospital’s budget. The recognition of the experience that new players could contribute to the project permitted a change in dynamics. The experience of a continuous exchange between those responsible for the project of the hospital, acquired by the nursing manager in another establishment, was particularly useful in developing the cooperative situation in Annecy. Experience acquired elsewhere and made accessible by the movement of a player from one situation to another plays an important role. In difficult situations, this person becomes an action resource. It permits a situation to be looked at from a different angle and allows the roles taken by players to adapt to new configurations through the creation of new openings which can take the form of a player leaving, the unblocking of an approach or the provision of a skill that no other player can provide.
- (2) Confrontation of representations: the representations that the players form of the process direct their participation. These are often inherited from professional training and experience acquired elsewhere. They are reinforced or transformed by the confrontation with what makes sense in the new situation. This can occur while an action is being taken or ‘a posteriori’, especially during an assessment. This, for example, characterised the cooperation between the contracting authority and the magistrate delegated to the facilities function during the Bordeaux court of appeal project. The intervention of the magistrate, legitimised in particular by the freedom of speech inherent in his status, questioned the dominant way in which the project was being conducted and expressed by the ministerial entity representing the contracting authority. This entity subsequently took into consideration the contribution of a non-linear approach in the design process within which knowledge feedback from users was no longer considered as an accident but rather an opportunity to improve the project.
- (3) Negotiation of the positions taken by the players with reference to an experience in progress: any cooperation implies the interpretation of experiences previously encountered by the players. It is a form of negotiation in which the players act out their own history and continue the construction of their own experience. In a negotiation, not all players necessarily leave feeling satisfied. Depending on the results obtained, the relevance of the mobilised knowledge can be evaluated in different ways. Consequently, and depending on the players, experience has different consequences for the continuation of the project. There are occasionally conflicts of experience, as was made clear through the divergent conclusions drawn concerning the briefing document in the Lyons Railway station square by the commissioning authority and the representatives of the citizens associations.

(4) Negotiation of positions taken by players with reference to an experience they have not encountered themselves. This can concern situations where the players mobilise knowledge linked to experiences encountered by other players, without concerning themselves with the validity of the interpretation made by these other players. The extension of the Bordeaux law courts to house the high court was a determining factor for the restructuring project, despite the lack of interaction between the two ministry of justice contracting authorities. An exchange between the two bodies might have objectified the difficulties encountered by the users of the high court. This situation is also encountered in cases of externalisation, especially when the external service providers hold the essential experience and skills necessary for the project. This specifically raises the issue of experience feedback to the client, as it is the service provider that initially benefits from the knowledge enrichment. The client commissioning the works potentially profits in the long run through an improved quality of services. For the Bordeaux court of appeal building, the programmer – who, following several similar missions, had acquired detailed knowledge concerning his client's procedures and changing regulations – had gained a far more relevant approach to the analysis of his client's needs. In the same project and over the course of eight successive sketch designs, the architect was able to improve the way in which users contributed to the project design. Nevertheless, the experience feedback encountered by other players assumes that the authority commissioning the works has certain "management" abilities such as, for example, an ability to bring together the right service providers for a given project. This knowledge, fundamental for the contracting authority, was developed through experience.

KNOWLEDGE SHAPING THE PROJECT ORGANISATION

The possibility of re-using knowledge in a cooperation situation gives experience a value and makes it an object of transaction. Measures taken to legitimise, circulate and mobilise this resource represent a management issue. This is expressed in a number of ways.

The first concerns intervening on the configuration of the player system and is expressed through the contracting authority or the representatives of customer organisations wanting to make certain experiences available to a project. This means that when organising the renewal of players (recruitment, subcontracting, and financing of additional resources), experience becomes a major factor that, in particular, has an effect on the temporality and the mode of renewal.

The second concerns the organisational system and the tools on which the running of the project or the occupation of the premises are based. The introduction of new organisational schemes or methods is the fruit of accumulated experience. In turn, the experience underway consolidates or modifies the uses made of them and occasionally transforms them. For instance, the acceptance by the ministry of justice contracting authority of a much more circular process approach than in previous projects was possible because of the experience of the non-technical but highly political figure of the customer's project leader (a magistrate) proving that the procedural knowledge is as important as thematic knowledge on the various design and construction topics.

The third concerns the economic aspect of the experience. The development of an experience has a cost. This aspect was raised by an architect and a service provider evaluating the work necessary to specify the contents of their mandates which were often initially ambiguous. Managing the lack of adaptation of their approach or the rebounds of the project resulted in the construction of knowledge that could potentially be used for another project – but this approach takes time. Conversely, contracting authorities do not take the question of the price of experience on board, despite the fact that inexperience can result in a high cost. The accounts concerning the cost of disputes within the scope of a works stoppage on the Annecy regional general hospital confirm this point. Players occasionally envisage the economic aspect of experience from an investment point of view. The multiplication and diversification of projects are seen as an opportunity to increase knowledge, a result permitted by the non-formalised nature of the experience. As for all investments, advancing onto new terrain has its own risks but, unless this risk is taken, there is no experience gained. This aspect was particularly important when recruiting the project manager for the Annecy hospital.

KNOWLEDGE AS A RESOURCE FOR FORTHCOMING PROJECTS

Capitalisation of knowledge and full use of experience are considered as major concerns by the players. They underline the difficulties that exist in passing from an individual level of re-using experience to a collective level or for transforming an experience into formalised knowledge. This is particularly evident in the re-use of tools developed by a player during the concerned project. In the law courts and hospital projects, the magistrate delegated to the facilities planning function and the engineer from the Regional Department of Sanitary and Social Issues introduced management tools (analysis tables, reports on decisions taken by the steering committee) identified by the other players as important to assure the progress of the project. These tools were abandoned on departure of the player having introduced them. Informal professional networks occasionally make it possible to profit from a given experience such as by inviting this player to participate in the commission used to select architects or service providers for another project but without the exchanges resulting in an organised level.

Capitalisation is a formalisation of knowledge that essentially intervenes on the level of the individual player. It allows the player to operate in other situations and make full use of his skills. This resulted in the programmer and the architect for the Bordeaux law courts to improve their work tools and methods and widen the fields in which they can claim skills, such as managing user-involvement.

Experience transfers concern organisations responsible for the production of projects and end-users. For example, the difficulty of managing adaptation between works contracts and the uninterrupted development of programmes within the framework of the Annecy hospital centre contributed to the setting up of a public-private partnership for a subsequent hospital project. In another example, discussions concerning the continuing activity of the magistrate delegated to the facilities planning functions were made possible thanks to a conceptualisation of the experience developed by the magistrate himself. The move from experience to a form of skill allowed it to be incorporated on the scale of the overall organisation. The management of the hospital project director's career represents yet a further example: would he take over the management of the new hospital or the management of another complex building project in the hospital sector? This question, raised by the regional hospital institution, clearly expresses the importance of the project director's experience on an organisational level. As can be seen, the institution can appreciate the joint management of the organisational and spatial aspects of a project as a factor in the success of its hospital service policy.

KNOWLEDGE AS A RESOURCE FOR PROFESSIONAL DEVELOPMENT

Cooperation covers a cognitive activity that goes further than the decision-making process. It also includes the construction and negotiation of the meaning of situations. Experience imposes this type of negotiation which falls into a continuous process: the knowledge resulting from experience is never set, it is constantly reinterpreted by the players to adapt to the situations in which they find themselves. When set, experience becomes an element of formal knowledge.

The largely informal nature of experience allows players to extract themselves from a specific professional or technical field and make links with different types of knowledge from other fields of expertise. This is the way in which cooperation becomes meaningful to the players. Various types of knowledge mobilisation have been noted:

- (1) Knowledge transfer: individual or organisational learning simultaneously concerns procedural knowledge and thematic knowledge. Insofar as procedural knowledge is concerned, certain players, basing themselves on their technical or thematic skills, operate a learning process in the running of the project, arbitration, consulting, etc. For thematic knowledge, the learning process concerns the interleaving of the organisational and spatial dimensions. Experience allows players to understand that the management of this interleaving is a major component of the project.
- (2) Movement to another field: mobilisation of knowledge is achieved by moving players away from their initial field of activity or normal professional area of skill. The player applies his knowledge to a new field without having to transfer knowledge to other players.
- (3) New types of knowledge links: certain moments in the cooperation result in the knowledge held by players being linked in new ways. Experience can modify representations (of issues, the way a project is run, the roles held by the players, etc.) and lead players to reconsider the contribution of their respective areas of knowledge in achieving the end result sought by the collective action. This is particularly applicable where the contracting authority modifies its point of view on the role played by the knowledge held by the customers in developing an occupation strategy for a given site. The experience consists in a learning process concerning possible links that might exist between the various areas of knowledge.

DISCUSSION

The analysis of cooperation situations in complex building projects reveals that players cannot be satisfied – as proposed by the expert concept – with judging the compliance of a model and estimating the divergence between an existing situation and the situation that was expected. Players use their experience to act on a given situation and on the knowledge that they hold to obtain a result. The dynamic of experience lies in a dual adjustment of positions. As such, experience is a continuous process of interpreting and developing knowledge, a process favoured by its lack of formalisation. Because of its continuous confrontation with new situations, the knowledge provided by experience has a particularly local status and its subsequent re-use and adaptation to a collective level is difficult and uncertain. The mobilisation of experience is a non-linear process in which knowledge can play an unexpected role. The management of experience-based knowledge is that much more complicated as players can derive different types of knowledge from a same experience. Each player, either individual or collective, constructs its own experience in function of the situation and the player's history. Gathering experience is

never easy; the mobilisation process is always accompanied by breakdowns, omissions and failures.

The study carried out on the mobilisation of experience clearly reveals that organisational learning cannot simply be reduced to a stipulated and programmed aspect. The potential of experience consists in being able to make use of different types of knowledge that are not based on an a priori evaluation of their relevance. In other words, the circulation of experience-based knowledge is carried out without adopting new routines. Experience as a learning process during critical moments of architectural production goes beyond what Wenger (1999) considered to be an indispensable aspect of the learning: the “reification of experience”, in other words the transformation of knowledge into tools, representations, methods, etc. What appeared essential in experience is the capacity ‘*hic et nunc*’ to attain the updating of the knowledge held by the various players. It is not possible to transform this aspect of learning into a routine; it particularly manifests itself by the capacity of certain players to enter into a role of mediation, something that presupposes the development of their relational and organisational knowledge. This represents one of the collective aspects of learning.

Experience represents a knowledge potential whose mobilisation gains in relevance through the multiplication and diversification of building projects in which the players are involved.

Experience-based knowledge is proven to be essential during critical moments of architectural and urban production but the produced effects go much beyond problem solving in singular moments. Knowledge enhancement and mobility can interfere with 3 different organisational realms:

- the organisation of the project,
- the organisation of future projects,
- the organisation of work processes within the customer body.

CONCLUSIONS

The exploration of the way how design processes question and transform the involved parties, their knowledge and organisational structures, should not lead to consider knowledge enhancement as independent from the artefacts and buildings to be designed. On the contrary, it is the artefact in the process of design that implies engagement from the client and customer to become a meaningful and useful object or place to work in. The object and its usefulness for the customer is not the manifestation of a timeless structure. It is the product of a continuous process of construction of meaning that includes the variety of knowledge available through the involved players. The course of this process, that has started long before the project delivering, needs constant corrections according to the changing situations of use.

This is why it is important to continue developing a better understanding of the design processes as a cognitive process. A process that offers the territory where the different experiences and representations of the building-in-use can circulate, confront each other and cross professional domains and borders in order to generate the conditions for a satisfying and useful building. In this perspective we consider that usability is achieved by the interplay of user experience, design and management processes and buildings.

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POWER OR ACTIVITY? ROLES OF INDIVIDUALS IN RELOCATION PROCESSES

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Relocation of a knowledge intensive organization, even within city limits, can have a significant effect on the organization's future productivity and success. It is a potential and often unidentified risk, but it can also be seen as an opportunity. Relocation has financial consequences, but it can also result in high employee turnover and an undesired change in corporate culture. On the other hand, it can be used as a catalyst to organizational transformation. Research has shown that organizations adopt varying degrees of sophistication when making relocation decisions. However, research has focused on organizations, and largely neglected the individual, whose actions and decision making form the relocation process. The aim of this paper is to understand the roles intra-organizational individuals play in decision making and implementation of a short distance relocation process. Roles of organizational members during relocation were examined on three dimensions: formal power, influence, and activity. Power refers to the formal authority the individual has to make decisions; influence to the individual's capability to influence the process; and activity describes whether the individual does something to act in the process. Data was collected through 32 interviews in 5 case organizations that had recently relocated. The study identified influential individuals with no formal power, individuals who were active in the relocation of their organization but who did not perceive that they had any influence on the outcome, and individuals who did not have a formal task in the process but who still perceived themselves to be able to influence the process outcome. The study contributes to behavioural relocation research, as it deepens the focus to the individual's role in relocation. From a practical perspective, the study benefits user organizations, consultants, agents, developers, and landlords, as it increases the understanding of how different organizational members influence relocation decisions, which have an impact on the entire real estate sector.

Keywords: decision theory, organizational analysis, relocation, roles

INTRODUCTION

Office occupiers' relocation decisions have direct and indirect impacts on all actors within the built environment, and society at large. Decisions about whether to relocate or not, where to locate, and how to relocate affects the business of e.g. developers, investors, landlords, agents, and service providers. On a societal level, organizations' location decisions are linked to the development, growth, and competitiveness of regions and areas.

Furthermore, relocation can have a significant impact on the relocating organization itself. Studies have identified a link between relocation and investor expectations: announcements about headquarter relocation has been shown to have both positive and negative impacts on the stock price, depending on what motivation for relocation is indicated in the announcement (Ghosh et al. 1995). Additionally, relocation has been identified both as a risk for the organization (Allard & Barber 2003; Rasila & Nenonen 2008) and as an opportunity to introduce elements of organizational change (Inalhan 2009).

In order to fully understand why organizations decide to leave their current location and chose to relocate to a certain location, the most critical question to be answered is how decisions are made, which falls within the area of behavioural relocation research. While previous behavioural research on organizational relocation has mainly focused on the decision making process of different kinds of organizations, the impact of individuals has received less attention. However, organizations are social constructs which are formed by people, their minds and their behaviour. Organizations do not make decisions on where to relocate; people do.

Van Dijk and Pellenbarg (2000) point out that understanding the role and influence of the group of actors that participate in the relocation process (e.g. real estate agents, developers, consultants, and facility managers) is one of the challenges in understanding the location decision making process. In the context of industrial site location decision making, Tosh et al. (1989) found large differences between the perceptions of brokers, manufacturers, and economic developers as to who plays what role in the decision making process. Not only was there a significant difference in the opinions about which functions brokers' perform, the respondents also had

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different perceptions about the level of contribution of different individuals within the relocating organization (Tosh et al. 1989). This study looks closer at the roles of intra-organizational individuals in the relocation process of office occupiers.

The term relocation can be used to describe an organization's long distance move, e.g. to another city or country or as "a change of address of a firm from location A to location B" (Pellenbarg et al. 2002) In this study, the focus is on short distance moves that occur within the same urban area, also defined as urban recommitment by O`Mara (1999).

The aim of the paper is to understand the roles intra-organizational individuals play in decision making and implementation of a short distance relocation process. The individuals cover the entire organizational hierarchy: top management; middle management; and employees. While Tosh et al. (1989) assessed different stakeholders' contribution without further specification; this study assesses the role of individuals based on three dimensions: formal power, influence, and activity.

RELOCATION BEHAVIOUR

The theoretical background for location and relocation research is provided by three schools of thought: the neo-classical, institutional, and behavioural. The difference between location and relocation theories is that, while location theories are mainly concerned with the optimal location choice (pull factors), relocation theories also consider the push out of the present location (Pellenbarg et al. 2002).

In short, the neo-classical approach focuses on cost-minimizing and profit-maximising, and defines the "optimal" location choice assuming that organizations make rational decisions with full information. While the neo-classical theories consider the organization as an active decision making agent in a static environment, institutional location theory see organizational location choice as a result of negotiations with external parties, such as deliverers and suppliers, local, regional or national governments, and labour unions. The behavioural approach looks at the actual behaviour of organizations and focuses on the decision making process (Pellenbarg et al. 2002). It also sees organizations as agents that have limited information, are boundedly rational, and act with a satisfier rather than an optimising behaviour (Brouwer et al. 2004; Pellenbarg et al. 2002). For a more detailed description of the three schools of thought, see e.g. Pellenbarg et al. (2002), Mccann and Sheppard (2003), and Brouwer et al. (2004).

While the earliest relocation study dates back to late 1940s, and the behavioural approach was introduced in location theory in the late 1960s, research focusing on office organizations only emerged in the 1990s. During this time, new interest in the process of organizational decision making emerged as a new research theme (Pellenbarg et al. 2002). However, location choice models have still been the form that many studies on office occupiers' choices have taken (Leishman & Watkins 2004). Many quantitative studies have investigated the impact of different internal and external factors on location choice (e.g. Brouwer et al. 2004; Frenkel 2001; Leishman et al. 2003; Leishman & Watkins 2004; Westhead & Batstone 1998). The findings have indicated that tendency to relocate decreases with the organization's size and perhaps also with age (Brouwer et al. 2004) and that organizations' choice of property type depends on the type and size of organization, and the geographical extent of their market (Leishman & Watkins 2004).

The studies that more specifically address the question of how office organizations make decisions concerning relocation, and that thoroughly scrutinize how organizations actually go about selecting new premises are rather few. One of the first ones to elaborate on this topic was Louw (199 cited in Louw 1998), who divided the decision making process into three phases and showed how different location criteria are relevant in the different phases. More recently it has been shown that organizations adopt varying degrees of sophistication when making decisions related to relocation. Differences have been found depending on the type and size of the organization, and the corporate structure and culture. Smaller organizations tend to make decisions based on constrained information, while larger organizations adopt a more complex approach (Greenhalgh 2008). In the context of industrial site acquisition, Mazzarol and Choo (2003) found that the selection process is more personal in nature for smaller organizations. Smaller organizations also rely more on external contacts and networks, as they often do not have enough resources to hire a relocation consultant (Greenhalgh 2008).

As for the actors involved in the decision making process, Pen (2000) identified the key actors as the director, the board, and the head-office. He reports an average organization size of 34.1 (employees) for director decisions, against 195.4 for board or head office decisions. According to Greenhalgh (2008), important decisions are typically made by the owner in smaller organizations. However, the relocation process is not a one-decision process that culminates in the final selection of one location. It includes multiple decisions

related to both the desired outcome (such as new ways of working, office solution, interior design, allocation of operations and work stations) and to the process (such as employee participation, time schedule, and practical arrangements). Greenhalgh (2008) reports that in larger organizations, high level decisions are carried out by people at a lower level with little referral to the person who made the original decision (to relocate). Additionally, what seems to be official decision making can, in fact be, more a technicality. Greenhalgh reports on cases, where important decisions have already been made by influential directors, but are presented to the company board which makes the final decision, as a formality. In other words, the people who make the formal decisions might not be the ones who actually decide about the outcome.

Greenhalgh (2008) concludes that it is apparent that the behaviour, personal preferences, priorities and perceptions of key individuals will influence the final outcome of the decision making process. This is also supported by the findings of Decker and Crompton (1993). Greenhalgh (2008) also notes that even the more sophisticated and objective decision making processes may be manipulated by intra-organizational individuals and also outsiders, and concludes with the statement that “to understand business relocation decisions we must recognize the influence that key individuals exert over both the decision-making process and its outcome”. In addition to addressing the challenge set by Greenhalgh, this study raises another question: do individual employees – that is individuals who agents and landlords seldom communicate with – have some kind of impact on the process and its outcome?

ORGANIZATIONAL ROLES

As presented in the previous section, roles in the relocation process and the impact different individuals have on decision making still remain a rather untouched subject in literature. A wide body of literature can, on the other hand, be found on organizational roles, and also more specifically roles in organizational strategic decision making. The relocation process, in fact, shares many key qualities with the strategy process, and the application of roles within strategy research would be justified. Like the strategy process, relocation is a collection of decisions, it includes multiple actors, multiple and conflicting goals, uncertainty, and decisions made with bounded rationality. Examples of studies and models on roles in management and the strategy processes are: management group roles by Belbin (2010); top management roles in strategy implementation by Bourgeois and Brodwin (1984); and middle management roles in strategy (Floyd & Wooldridge 1992). However, as pointed out by Mantere (2003), the majority of the empirical studies on roles within the strategy process focus on management or middle management roles, while the roles of individual employees have received less attention. Mantere (2003) looked at the roles and social positions of not only middle and top management, but also operative personnel, in the strategy process. He combined the concepts of sensemaking (a term used in organizational studies which means a subject’s capacity to understand the process), influence (which is a specific form of power for which he refers to Huczynski’s (1996) definition “the ability to affect another’s attitudes, beliefs, or behaviors”), and activity (whether the individual is doing something to act in the process) into a three dimensional framework. He then used the subject’s reflections and understanding of the dimensions (e.g. the subject’s conception of her possibilities of influencing issues) in order to understand the subject’s social position in the strategy process. This allowed him to analyse the relationship of individuals – regardless of their formal position in the organization – with the strategy process.

METHOD

CASE SETTING AND DATA COLLECTION

This study was done as a multiple case study with 5 organisations that had relocated during the past 16 months. A brief description of the cases is presented in Table 1 Description of cases 1. The data was gathered through semi-structured interviews between April – September 2010. The themes of the interviews were the relocation process and the phases related to it, the organization involved in the process, the employees and the process, and the interviewees’ thoughts concerning the outcome. From each organization, several individuals were interviewed: both individuals who were formally involved in the process, often through membership in a ‘relocation project group’ that was established to take care of the relocation (e.g. CFOs, managers, assistants and other employees) and employees who had no formal role (e.g. middle managers and employees). A total of 32 interviews were done, and all were recorded and transcribed.

Table 1 Description of cases

CASE	DESCRIPTION	NUMBER OF PEOPLE INTERVIEWED	
		Involved	Not involved
A	A Finnish organisation relocating the HQ with approx. 200 employees. Moved ca. 1km within the Helsinki Metropolitan Area (HMA). Decreased the amount of space from 8000sqm to 4000sqm. The old office consisted mainly of private offices, the new office is mainly open plan.	3	4
B	A global organisation relocating two sites as a result of a M&A. Both organisations had private offices in their old sites, while the new site consisted of mainly open plan.	4	3
C	A global organisation with approx. 45 employees at the case site. Moved ca. 5km within the HMA from approx. 500sqm to 900sqm. Both offices were a combination of open and private space, but the share of people sitting in open space is bigger in the new premises.	2	4
D	Finnish organisation operating globally relocating the HQ with 50 employees. Moved approx. 7km within the HMA. The old office was a traditional private office layout while the new office is a combination of open plan and smaller rooms for a few people.	3	3
E	A global organisation with approx. 30 employees stationed at the new site and another 20 working outside the office. Consolidated two locations into one. Moved 15-20km within the HMA to more modern facilities that support all different operations of the organisation. The total amount of space decreased.	3	3
Total		15	17

ANALYSIS FRAMEWORK

The interest in this paper is in the roles individuals play in the relocation process of their own organization. Mantere's (2003) theoretical framework, presented in the previous section, with the dimensions of sensemaking, power, and activity, would offer an interesting way of analysing the link between the individuals and the relocation process, and more specifically how the individuals position themselves in the process. However, as the purpose of this study is to understand the impact individuals have on the process, the application of the framework as such would not be justified.

While the concept of sensemaking is a very interesting and important topic, it goes beyond the scope of this article. Mantere (2003) looked at a specific form of power, namely influence, which is the ability to affect another's attitudes, beliefs, or behaviours. This can be interpreted as a sort of informal influence that one has on others and on decisions. However, as presented in the literature review, influencing a relocation decision is not necessary the same thing as making a decision. Therefore, in order to understand the relocation decision making process and the roles individual's play therein, the level of formal decision making power is also relevant. As a result, in this study the roles that individuals play in the relocation process are analysed based on three dimensions:

- Influence: the individual's perception of their possibilities to influence issues within the relocation process
- Formal power: the individual's formal rights / authority to make decisions within the relocation process
- Activity: the degree to which the individual reports on trying to influence issues they see as important (e.g. influencing outcome, other people's opinions)

DATA ANALYSIS

Before the data analysis started, the dimensions in the analysis framework were divided into three levels: none; some; and complete. With a grounded approach, the different levels were then defined in more detailed as the analysis proceeded (). During the analysis, it became apparent that the activity-dimension required a fourth level in order to achieve a clearer distinction.

Table 2 Dimension levels and their definitions

Level	Formal power	Influence	Activity
None	No authority to make final decisions concerning any issues	No possibilities to influence other people's opinions or the process outcomes	Did not proactively act in the process in any way, took part only in information given to them and commented if asked for opinion
Some	Authority to make decisions concerning some (small) issues, larger issues had to be presented to higher level decision maker	Ability to influence other people's opinions to some extent, and/or some small process outcomes (interior, layout, work station dedications)	Was not officially assigned a task in the process but acted under informal ways (took part in workshops, filled in questionnaires, discussed the issue with colleagues, asked questions)
High	Not applicable	Not applicable	Had a formal task in the process but was involved only in some phases
Complete	Authority to make final decisions concerning both small and large issues	Ability to influence other people's opinions and the process outcomes	Had a formal task in the process and was involved from the beginning

The analysis of the transcribed interviews resulted in an interpretation of the subjects' perception of their formal power and influence on the relocation project, and their activity during the process. Each subject was then placed in the diagrams presented in Figures 1–3.

RESULTS

The results show that, in relocation processes, intra-organizational members are highly distributed on all three dimensions. First, as shown in Figure 1, the amount of formal power of individuals who are actively involved in the relocation process of their organization varies from none to almost complete. However, the interviews revealed that none of the people actively involved in the relocation process had complete formal power to make decisions.

This means that the relocation project groups did not comprise people who had the formal authority to make official decisions concerning large issues even though the groups, in many cases, were the ones influencing and informally making the decision. Issues were usually presented to a higher level agent such as the CEO or the board who were, on the other hand, not active in the process at all. This means that decisions were often made based on second hand information that relied heavily on the perceptions and thoughts of the individuals who were actively involved in the process.

If the formal decision makers were to be added to Figure 1, they would be placed in the left upper corner with complete formal power but no activity. The lack of formally authorized decision makers within the active relocation groups suggests that organizations do not yet recognize relocation as a strategically important process. Another interesting finding is that two of the cases did not have a single person who was actively involved in the process from the start to finish. In other words, different people determined the aims of the project compared to those who actually implemented the change.

Despite the fact that the subjects did not have full formal power to make decisions, many of them still perceived some or complete ability to influence the process and its outcomes (Figure 2). The people who had at least some formal power to make decisions were generally perceived to have most influence on the process. However, had those who had complete formal power to make decisions (but were not active in the decision making process) been interviewed in this study, they would perhaps have reported less influence on their behalf despite the formal authority.

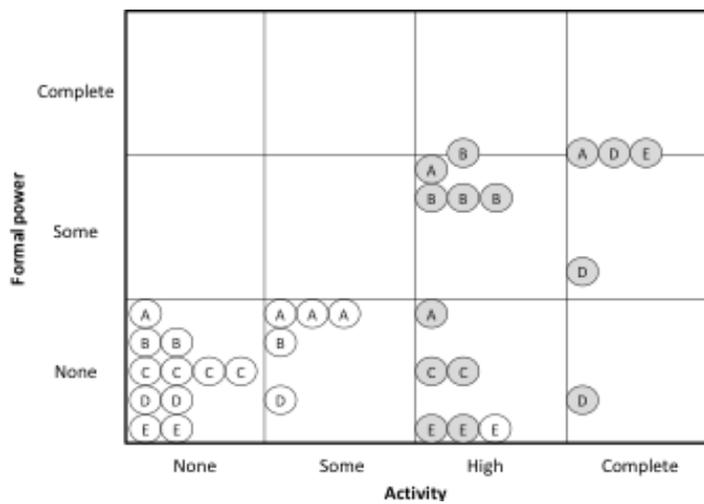


Figure 1 Formal power vs. activity.

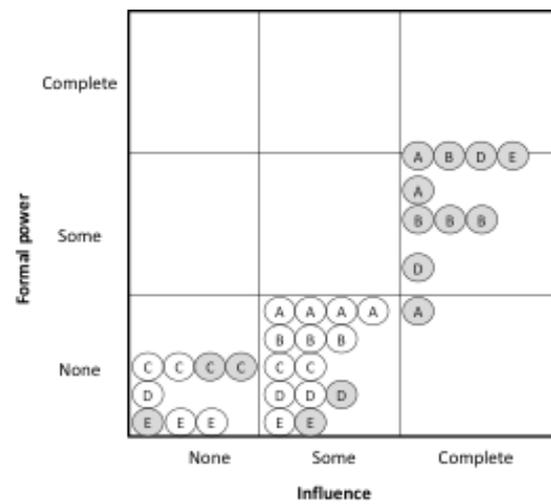


Figure 2 Formal power vs. influence

Each circle indicates one subject; the letter indicates which case the subject belongs to. Shaded circle for individual involved in the process, white circle for individuals not involved.

A more surprising finding are the large number of people who were not involved in the process, who perceived themselves as having at least some influence on the process (Figure 2 Formal power vs. influence and Figure 3 Influence vs. activity). In some cases there were people among the staff, who were not involved in the process, who actually reported a higher influence than some of those involved in the process. In some instances this can perhaps be explained by the proactive involvement of the subjects, they actively tried to make themselves heard, tried lobbying for some specific outcome, and/or took part in workshops, etc. However, as can be seen in Figure 3 Influence vs. activity, some people perceived that they influenced the outcome without acting in the process at all. In these cases, people felt this way because they felt that the employees in general had been heard.

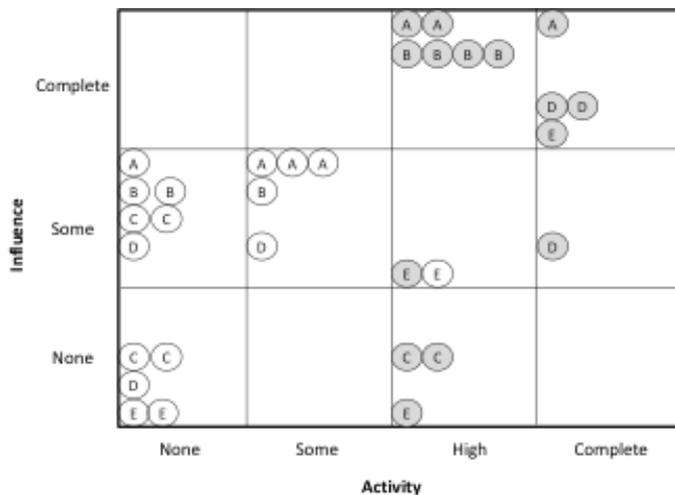


Figure 3 Influence vs. activity

The analysis also revealed significant differences between the different cases in terms of the role of the organisational relocation project group and also how employees who were not involved experienced their possibilities to influence decisions. Cases A and B exhibited fairly democratic processes, and especially Case B differentiates itself by the equal amount of influence and power that the relocation project group members have. Case C is distinguished by the lack of formal power among the actively involved individuals, while Case D was the only case to have one and the same relocation project group taking care of the entire process. Lastly Case E was a one person show, where that person made the decisions while the rest of the participants mainly had an executing role.

CONCLUSIONS

Office occupiers' relocation decisions have direct and indirect impacts on all actors within the built environment and also the relocating organization itself. So far, what goes on within office organizations when making decisions, such as where to relocate,

has remained unclear for actors who often only communicate with one organizational representative. This paper explored the roles intra-organizational members play in office relocation processes, in order to increase the understanding on the impact individuals have on the process and its outcomes.

The roles were analysed based on a three dimensional framework which comprise formal power, influence, and activity. The results support earlier findings that organizations adopt a varying degree of sophistication when relocating, and also shows that the roles people play in the process differ from one case to another. The study identified not only influential individuals with no formal power, it also recognized people who were active in the relocation of their organization but who did not perceive themselves to have any influence on the outcome. Additionally, the study showed that organizational members who do not have a formal task in the process sometimes perceive themselves to be able to influence the process outcome.

The study also gives indications on the relocation capability of organizations. Final decisions are often made by individuals who have not been actively involved in the process, and whose judgment is based on second hand information that relies heavily on the perceptions and thoughts of the individuals who are actively involved in the process. The lack of formally authorized decision makers within the active relocation groups indicates that organizations do not yet recognize relocation as a strategically important process.

Two of the case studies did not have anyone actively involved in the process from the beginning to the end. This brings forward the question of how to ensure that the aims that are set in the beginning of the process are transferred into action and actually implemented at the end, if there is nobody who sees the entire project through.

This study examined the relocation process of office occupiers who were looking to rent new space. However, the analytical framework could be applied to the analysis of decision making roles in other processes within the real estate and construction sector.

The main limitation of this study is the small sample. Five cases do not allow generalized conclusions to be drawn, but it does provide an indication of the variety of ways that office occupiers go about when relocating. Additionally, a larger number of interviewees per case organization would have enabled a better understanding of all the actors that had an impact on the organizations' decision making.

There is still a need for more detailed research on what really goes on within organizations during a relocation process. This study provided a first insight on how the network of people within an organization can impact the relocation process as a whole, but it would be interesting to see in more detail which decisions and phases different actors have an impact on. Further, in this study the focus was on intra-organizational individuals. What kind of impact and possibilities to influence do e.g. agents, consultants, and possible new landlord have? Finally, it would also be important to understand what kind of impact the relocation process, and the way it is executed, has on the relocating organization and its employees.

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SESSION 6

PROCUREMENT

DETERMINING PROJECT PERFORMANCE CRITERIA AND KEY PROCUREMENT METHODS IN NIGERIA: CLIENTS' PERSPECTIVES

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The choice of procurement method is vital to client satisfaction and success on construction projects. But the procurement method selected needs to be a best fit with clients' performance criteria in an increasing complexity of construction processes. Very often the procurement teams' selections are limited to a few familiar procurement methods with little in the way of rational selection for successful project delivery. The study examines whether the clients' performance criteria fits the success/performance of a project based on the procurement method selected. The study presents the findings of a pilot study, which prepared the ground for designing the main study questionnaire. An interview questionnaire used as the instrument in personal interviews of five client organizations who are registered members of the Real Estate Developers Association of Nigeria (REDAN) (a private client group) in order to determine their project performance criteria, their perceptions of different procurement methods and facts and figures from previously completed projects. The results of the survey reveal clients' project performance criteria and priorities when selecting procurement methods, the key procurement methods used in Nigeria, and the relationship between project performance and procurement methods. The paper will propose procurement methods that best fit clients' performance criteria in Nigeria.

Keywords: client, criteria, performance, procurement, project

INTRODUCTION

Various project procurement methods exist within the construction industry, which determine the contractual relationship between the client and other parties at the design and construction stages of a project. According to Love et al. (1998), clients require their buildings to be completed on time, within budget and of the highest quality. The method by which the project is realized or the procurement method selected as noted by Love et al. (1998) and Chan et al. (2004), is a key factor contributing to overall client satisfaction and project success. The selection of the most suitable procurement method consequently is critical for both clients and project participants (Love et al., 1998), who have to decide on which of these methods best fits their overall demands and expectations.

However, according to Bowen et al. (1999), who studied the client briefing processes and procurement methods in South Africa, very often, clients' selections are limited to a few familiar procurement methods with very little in the way of rational selection for successful project delivery. In addition, Bowen et al. (1999) also found out that clients are generally offered advice on only a limited selection of procurement systems. Further, Love (2002) noted that the traditional lump sum methods are the most popular forms of procurement used in Australia, despite calls for the adoption of more integrated methods, such as design and build. While in South Africa, Bowen et al. (1999) determined that with the exception of contractors, the preferred procurement system of choice amongst the respondents was the conventional system.

Bowen et al. (1999), citing Bowen et al. (1997), noted that individual categories of clients determine project success by different criteria, and that it is necessary for the industry to be aware of these various groupings and their characteristics in order to assist in the selection of the most appropriate procurement system for their particular project. The methods by which construction projects are procured became increasingly important also, because of the technical features of different construction projects and the client and contractor needs (Alhazmi and McCaffer, 2000). Further, Alhazmi and McCaffer (2000) stated that the nature of the procurement system selection requires an effective decision-making technique to evaluate procurement systems against criteria such as time, cost, quality and general needs and found in their study of public sector projects that client's needs and project characteristics are considered to be the most important criteria influencing the procurement selection process. According to Bowen et al. (1999), every attempt should be made at the briefing stage to match the characteristics of the particular procurement system with the client's objectives as stipulated in the brief. Bowen et al. (1999) discovered that in the selection of procurement systems, an attempt is frequently or always made by the procurement team to match client needs and systems characteristics.

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Currently, there is little known about the client needs in Nigeria and if these could influence the procurement method selection process or if the procurement selection process is limited to the few familiar ones. The purpose of the paper therefore is to examine whether the clients' need/performance criteria can be matched with the success/performance of the project based on the procurement method used; that is, did the client get what he wanted through the process selected? Choice of procurement method selected should fulfil the needs of the client. The Latham report states that clients do not always get what they ask for (Latham, 1994). The objectives of the paper are therefore to evaluate the client procurement criteria when selecting a procurement method; identify the key procurement method used in Nigeria; and to assess the relationship between project performance and procurement method selected.

To achieve these purpose and objectives, the paper will first of all review the different types of project procurement methods available; identify the determinants of clients' choice of procurement methods; and client needs/project performance criteria. Secondly, the paper will present findings of a pilot study of members of the Real Estate Developers Association of Nigeria (REDAN) on the project procurement methods, factors informing choice of procurement methods, performance criteria required on selected retrospective projects and the project outcome. Thirdly, the paper presents results of an evaluation into whether there is a relationship between procurement method, client's performance criteria, and level of project performance. Fourthly, the paper discusses the implications of these findings to project procurement and delivery and proposes suitable procurement methods that better fit clients' performance criteria in Nigeria. Although procurement methods for project delivery apply to both public and private clients, this study is limited to private clients in Nigeria because they are not bound by non-disclosure Acts, thereby making it easier to source otherwise sensitive and classified information much more easily from them.

OVERVIEW OF PROJECT PROCUREMENT METHODS

According to Love et al. (1998), the terms 'procurement systems' and 'contractual arrangements' are usually used synonymously. Love et al. (1998) defined a procurement system as an organizational system that assigns specific responsibilities and authorities to people and organizations and defines relationships of the various elements in the construction of a project. Harris and McCaffer (2001) noted that the client or adviser/project leader according to need or preference would select the type of contract. Established methods of project procurement identified by Masterman (1992) and cited by Harris and McCaffer (2001), which determines the contractual relationship between the client and other parties at the design and construction stage can be categorized as:

- Traditional (separated and cooperative) method
- Design and Build (integrated and holistic) method
- Management (management-oriented) method
- Discretionary

These methods are further sub-classified into the methods shown in Figure 1. Osanmi (1999) characterizes the traditional procurement method by a clear separation of design and construction process. Harris and McCaffer (2001) notes that traditionally, clients have often preferred to engage someone able to interpret their needs into a clear design before proceeding with the construction phase. An architectural firm, engineering firm or consortium acting as consultants is responsible for design, while a general contractor handles the construction phase after entering into a construction contract with the client through competitive bidding or negotiation. According to Love (2002), an architect is typically the first point of contact for clients and, because their advice is heavily relied upon, it is often in the interest of the architect to persuade the client to use a traditional method, as they can take a lead role in the project as well as maximize his/her fees. The traditional method of project procurement is a widely used procurement method in Nigeria (Osanmi, 1999).

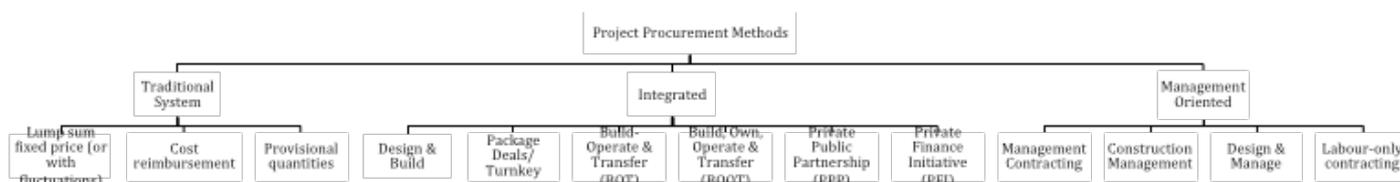


Figure 1: Classification of Project Procurement Methods

Sources: Adapted from Love et al. (1998), Osanmi (1999) and Alhazmi and McCaffer (2000)

Osanmi (1999) explains design and build or design and construct as a procurement method where the contractor provides the design and construction under one contract as different from the traditional system where design is separate from construction. Molenaar and Songer (1998) noted that design and build has steadily become a procurement method of choice for many public sector agencies in the United States. Osanmi (1999) cites that all design and build contracts have two principal characteristics:

1. The contractor is responsible for both the design and construction and employs the services of other relevant professionals (architects, engineers etc.) that may be required, with the client having a professional agent who advises him. Contrary to this assertion, Bowen et al. (1999) found that clients are generally offered advice on only a limited selection of procurement systems.
2. The contract between the client and contractor has a final and inclusive price that does not vary unless the client requires changes to be made.

Love et al. (2000) stated that Project management is not considered as a procurement method because it could be applied to any procurement method, and that the term merely means that the client has employed an agent to assist in undertaking a supervisory and coordination role within the project. The construction management procurement method differs from Project Management in that there are several trade contractors involved in this procurement process. The characteristics of the construction management procurement method are as follows:

- There is no single main contractor;
- The client enters into several trade contracts for work package comprising portions of the project;
- A construction manager runs the project.

The labour-only form of procurement, which is popular in Nigeria, involves the client in the purchase of materials while leaving construction to a labour-only contractor who gets paid for the cost of engaging labour and for his/her overheads and profits. An agreement is normally reached upon who hires plants for the works, be it the client or the contractor.

PROJECT PERFORMANCE

Project performance from the client's point of view can be assessed by its various criteria. Criteria identified by Love et al. (1998), Molenaar and Songer (1998) and Alhazmi and McCaffer (2000) that will assist the client in identifying their principal goals and objectives are as follows:

- | | |
|-------------------------|---|
| 1. Completion time | - is early completion/completion on time necessary? |
| 2. Flexibility | - can design changes be accommodated? |
| 3. Price certainty | - is completion within budget necessary? |
| 4. Technical complexity | - does the project require a high level of structural or mechanical services or other complexity? |
| 5. Quality | - is a high state of quality important? |
| 6. Client satisfaction | - is the owner satisfied with the overall project? |

Time is an important factor in construction projects. Generally, the more time spent on a project the more money is incurred on overheads. Moreover, for commercial projects where early completion is desired, delay translates into loss of earnings. Time can be examined from the perspective of design time, construction time and overall completion time. Some procurement methods have an in-built facility with which the client can order changes during the design and construction stages and hence create some degree of flexibility.

Sidwell (1984) pointed out that quality is a difficult variable to define. However, he proposed that it should be seen as an amalgam of client satisfaction, architectural excellence, standard of finish and utility. Naoum and Langford (1990) also expressed the view that the quality of construction was difficult to compare, because it is difficult to define precisely what is meant by quality and that there is no successful measure save for subjectivity as the function of client satisfaction in respect of quality. However, viewed simply, it is essential that a project be achieved as it was conceptualized in terms of design documentation and standards.

Some projects are more complex than others, especially when viewed from the perspective of the level of mechanical, structural or

other complexities involved. Usually complexity and size go together and it may require the use of different specialists appointed by the client to carry out the construction work. Sidwell (1982) views complexity in three different areas including:

1. the initial complexity of the problem as posed by the client in the brief;
2. the complexity of the solution to the problems as elaborated by the design team in the design solution; and
3. the complexity of the production assembly operation required to implement the design by the builder – the technology of the building.

Sidwell (1982) maintains that the issue of complexity is further compounded by the experience of the client, design team and contractor.

Another project performance criterion, which may be influential in assisting a client in determining his project goals and procurement process, is risk – the amount of risk to be borne by the client, design team and contractor in the contractual agreement.

EFFECTS OF SELECTED PROCUREMENT METHODS ON PROJECT PERFORMANCE

According to Wahab (1994), four factors, which determine the selection of the project procurement method used by clients, include:

- Type, size and location of the project;
- Quality of the finished product as well as the cost of construction itself;
- Owner's expectation to satisfy investment objectives during the project life-cycle with consideration of the cost of operation and maintenance; and
- The experience of the owner in dealing with various professionals in previous projects undertaken.

When considering the benefits of specific construction project procurement methods, Wahab (1994) and Adejuyigbe (1992) note the positive effects of the traditional method on clients' performance criteria as:

- Provision of good checks and balances between client, engineer and contractor;
- Each contractor can tender lump sum figures for work which have been fully described in the contract document;
- A high degree of cost planning is carried out during the design stage and monitoring during the construction phase;
- The possibility of introducing many specialist designers as are necessary into the design operation.

Conversely, Sidwell (1982) noted the following negative effects of the traditional procurement method:

- The level of project integration is least when compared to management contracting and the project management methods of procurement;
- The traditional approach lacks effective communication leading to time and cost overruns;
- Construction expertise does not benefit design; and
- It allows for too many design variations.

Further, Franks and Harlow (1984) provides the following effects of the design and build process on the client's performance criteria:

- It provides single point responsibility;
- The client has a direct contract with the contractor – thus improving direct lines of communication that enables the contractor to respond and adapt more promptly;
- There is closer involvement of the design to the building process, which allows design to have a greater appreciation of construction materials.

Antonio (1992) notes the following negative effects of the design and build technique:

- The likelihood that the system may not offer sufficient value for money since the contractor is overall both on the design board as well as the project site;
- The possibility that in order to effect substantial overall savings, the design solution adopted by the contractor may not be the most suitable for the project.

Osanmi (1999) is of the opinion that clients readily embrace the labour method of procurement because it affords them the opportunity

to control the quality of material used, savings made through trade discounts from bulk purchasing go to the client, and it demystifies the unit-rate pricing, as the client is able to better appreciate what he is paying for. He however, is of the opinion that the major effect of labour-only contracting is that it enables the clients to build at their own pace. The draw back of labour-only contracting according to Osanmi (1999) include the probability of the contractor not being judicious in the use of materials resulting in unnecessary waste, the quantity of materials may be inflated leading to waste, incidents of thefts being more likely to arise, and the view that procurement of materials by the clients could create logistic problems, which translates to delays.

ANALYTICAL AND CONCEPTUAL FRAMEWORK

The conceptual framework upon which this study is based is adapted from past studies and the work of Sidwell (1984), Ausguide (1984), Wahab (1987), Molenaar and Songer (1998), Love et al. (1998), Bowen et al. (1999), Osanmi (1999), Alhazmi and McCaffer (2000), and Love (2002). The conceptual model of the interrelationship between the study variables of Client Performance Criteria, Procurement Methods and Project Outcome is illustrated in Figure 2.

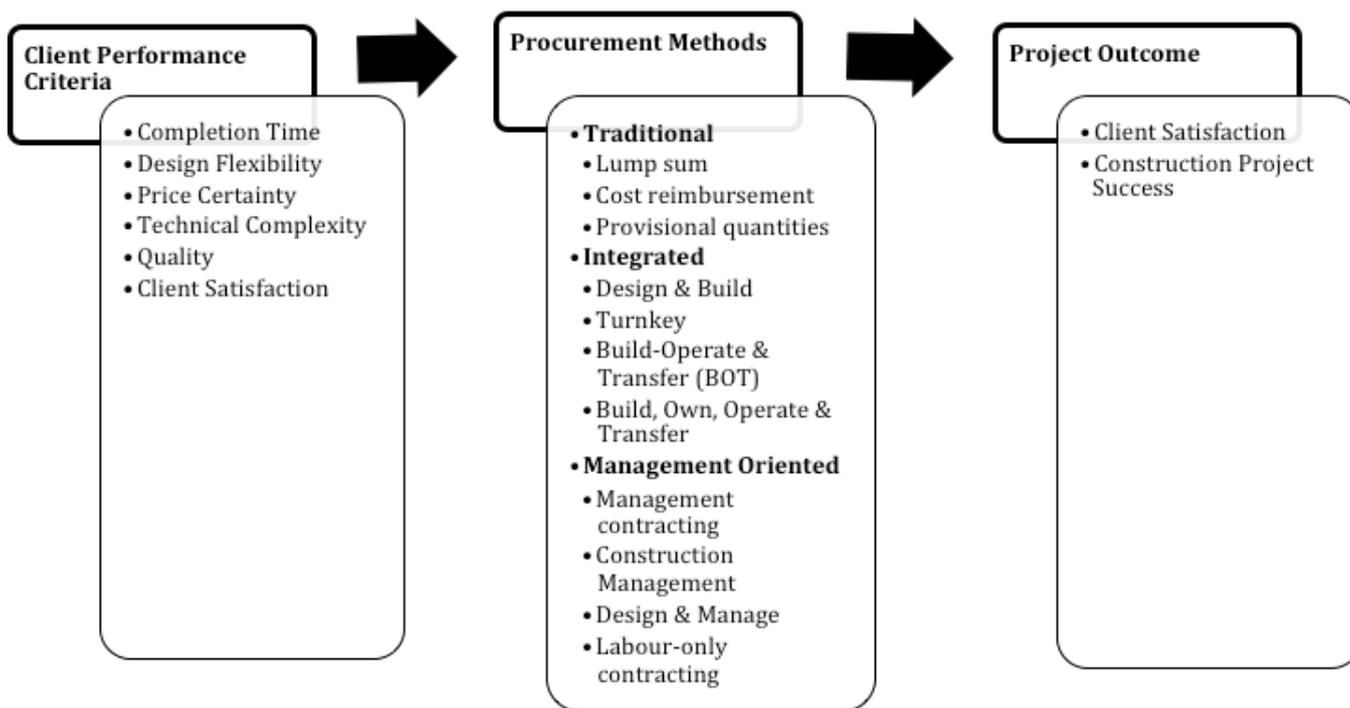


Figure 2: Conceptual Model of the Relationship between Variables used in the study

Sources: Love et al. (1998); Bowen et al. (1999) and Alhazmi and McCaffer (2000)

The conceptual model shown in Figure 2 is used to evaluate the concept that the client's performance criteria can be related to the final project outcome, using the procurement method as an aid in explaining linkages between them. Figure 2 shows that the client performance criteria is an independent variable which affects the procurement method –intervening variable – selected by the procurement team, which in turn affects the final project outcome – the dependent variable. In examining the clients' project performance criteria, project performance and the method of its procurement in the projects sampled, the following proposition was addressed:

- The clients' performance criteria can be related to the procurement method used and the procurement method can also be related to the final project performance/outcome, which can be used to explain the procurement method selected by the procurement team.

The cost and schedule growth is defined as the divergence between original and actual contract value and time of completion for each project (Love, 2002) and used as an indicator of construction project success, is calculated using the following formula (Zeitoun and Oberlander 1993, cited in Love, 2002): -

$$\text{Project}_{CG} = \frac{\sum_{CVP} - \sum_{OCV}}{\sum_{OCV}}$$

$$\text{Project}_{SG} = \frac{\sum_{ACP} - \sum_{OCP}}{\sum_{OCP}}$$

Where: CG = percentage cost growth
 SG = percentage schedule growth
 CVP = Contract value on practical completion
 OCV = Original contract value
 ACP = Actual construction period
 OCP = Original construction period

RESEARCH METHOD

The data collection method used for this study is a retrospective case study questionnaire (Molenaar and Songer, 1998). Rather than developing a questionnaire survey that sought respondents' general opinions about project performance outcomes, the authors asked the respondents to select a recently completed project most familiar to them. However, before developing the main study questionnaire, a pilot study was carried out to trial run the questionnaire before the final data from the whole sample is collected (Naoum, 2007).

The pilot study took the form of a case study interview questionnaire, which was developed and used to validate the appropriateness of the main study questionnaire. The questionnaire was used in the interview of five members of the Real Estate Developers Association of Nigeria (REDAN) who have commissioned real estate development projects within the last five years in Nigeria. The questionnaires were administered between 17 and 26 October 2011.

It is intended that the final study will adopt a triangulation data collection approach, which means obtaining quantitative data about fact and figures from previously completed real estate development projects, and qualitative data about the perceptions, opinions and views of the respondents. It is also intended to obtain a large sample of cases. A minimum of 31 respondents is set as being sufficient to analyse the expected primary data statistically, and draw conclusions. According to Ott and Longnecker (2001), the central limit theorem holds true when the sample size is equal to or greater than 30, and when other assumptions are also met. These provide statistically significant results. The findings presented and conclusions inferred from the pilot study in the subsequent sections, are however limited by the small sample size and can only be used as an indicator of client project performance criteria, key procurement method used in Nigeria and possible relationships between the study variables.

The cost and schedule growth is defined as the divergence between original and actual contract value and time of completion for each project (Love, 2002) and used as an indicator of construction project success, is calculated using the following formula (Zeitoun and Oberlander 1993, cited in Love, 2002): -

DEMOGRAPHIC DATA OF RESPONDENTS AND PROJECTS IDENTIFIED

The analysis of the data collected from the initial pilot study is presented under the following headings:

DEMOGRAPHIC DATA OF RESPONDENTS, AGE OF COMPANY & PROJECT IDENTIFIED

The study sought to know the position of the respondent in the property development company, the age of the company, the number of property development projects handled by the company to date and type of project reported on. Results of the data obtained are presented in Table 1.

Table 1: Distribution of Respondents by Background Information and Project Identified

DEMOGRAPHY	NO OF RESPONDENTS
Position in the company	
Chief Executive Officer	4
Management Staff	1
Age of the company	
Less than 5 years	2
6 – 10	1
11 – 15	1
16 – 20	1
Number of Property Development Projects Handled in the last 5 years	
One	1
Three	3
Ten	1
Project and Facility Type Identified	
Residential Building(s)/Housing Estate	3
Mixed-Use Development (Commercial & Residential)	2

Table 1 shows that most of the respondents are Chief Executive Officers of the company, three of whom are from organizations that are more than five years old and who have handled at least one property development project. The position of the respondent in the company, the age of the company and the number of property development projects handled so far is of relevance to the study because, the higher the position of the respondent, the older the organisation and the more projects handled by the organisation, the more the respondents would have the necessary experience, would have participated in a variety of project procurement processes and implementation and would therefore be able to provide credible and reliable information.

CLIENT PROJECT PERFORMANCE CRITERIA

The client project performance criteria, which are used in the choice of procurement method used by the client is presented in Table 2.

Table 2: Ranking of the Importance of Clients' Project Performance Criteria

Criteria	1	2	3	4	5	Mean Item Score	Rank	Level of Importance
Completion Time (need for timeous completion)	0	0	1	0	4	0.92	1	Very High
Price Certainty (Completion within the Budget)	0	0	1	0	4	0.92	1	Very High
Ease of Project Administration under Procurement Method	0	0	1	0	4	0.92	1	Very High
Reduced Risks (low exposure to uncertainties)	0	0	1	1	3	0.88	4	High
Quality (need for quality finishes)	0	0	1	2	2	0.84	5	High
Government Policy/Statutory Requirements	1	0	0	0	4	0.84	5	High
Widely understood Procurement Method	1	0	0	1	3	0.80	7	High
Technical Complexity of the Project	1	0	2	1	1	0.64	8	Average
Flexibility (Need for design changes)	2	0	1	1	1	0.56	9	Average

Key: 5-highly important; and 1-very low importance

Table 2 shows that the clients surveyed ranked Completion time, Price certainty and Ease of project administration under the selected procurement methods as highly important criteria in their choice of procurement methods.

PROCUREMENT METHOD USED BY DEVELOPERS

The procurement methods used by the property developers in their goals for property acquisition are presented in Table 3.

Table 3: Procurement methods used by respondents in Property Acquisition

Procurement Method	Number of Respondents
Traditional Lump-Sum	1
Traditional with provisional quantities	1
Design and Build (Integrated and holistic)	2
Build-Operate and Transfer (Integrated and holistic)	1

Table 3 shows that the respondents made use of a variety of procurement methods. The procurement methods used the most being Design and Build, a form of Integrated and Holistic methods of procurement. It was noted that none of the respondents made use of the management-oriented method of procurement in property acquisition.

MATCH BETWEEN CLIENTS' PERFORMANCE CRITERIA AND PROJECT PERFORMANCE BASED ON PROCUREMENT METHODS

The study sought to find out whether the clients' performance criteria fit the project success/performance based on the procurement method selected. Table 4 presents findings on the project type, procurement method used, clients' criteria, project performance outcome and level of fit between clients' criteria and the final project performance.

Table 4: Distribution of Data by Type of Project, Procurement Method, Client's Performance Criteria, Project Performance and Level of Fit

Project Type	Project Procurement Methods	Clients' Highly Important Performance Criteria	Project Performance					Level of Fit
			Time (T)	Price (P)	Quality (Q)	P. Admin Difficulty (EA)	Conform with Expectation	
Residential	Traditional Lump-sum	EA	+ 10%	+ 5%	High	Low	High	100%
Residential	Design & Build	T, P, Q, EA & RR	- 50%	- 34.4%	V. High	High	V. High	∅ (75%)
Commercial & Residential	Design & Build	T, P & EA	+ 40%	+17.9%	High	Average	-	None (0%)
Commercial & Residential	Traditional + prov. quantities	T, P, RR & EA	+ 40%	- 14.2%	High	Low	High	2/3 (67%)
Residential	Build-Operate Transfer (BOT)	T, P, Q & RR	+ 40%	+27.1%	Average	Low	Average	None (0%)

Key: EA = Ease of Project Administration; RR = Reduced Risks
+ = Schedule/Cost Growth; - = Schedule/Cost Saving

Table 4 indicates that the performance criteria common to the respondents in the pilot study that influences the decision of construction industry clients in Nigeria to select a procurement method for use in project delivery include Time, Price certainty and Ease of Project Administration. To a lesser extent, they also select procurement methods that will reduce their exposure to project risks.

The level of fit shown in Table 4 is determined by matching the clients' highly important criteria to the indicators of project performance obtained. The clients' need for reduced risks (RR) was not included as an indicator of project performance in the questionnaire. This is seen as a limitation of the questionnaire in its present form. It therefore emerged that the project performance outcome should also include obtaining data on the subject of reduced risks/if the procurement method provided low exposure to uncertainties.

Visual inspection of Table 4 reveals that the clients project performance criteria is best achieved with the Traditional Lump-sum method of project procurement followed by the Design and Build Method of Procurement and lastly by the Build-Operate Transfer method of procurement. It also emerges from Table 4 that the clients had higher expectations from the choice of procurement method selected, which was found to be much higher in the Integrated Methods of project procurement – Design and Build; and

Build-Operate Transfer (BOT) than in the Traditional System. This might account for the lower level of fit of the latter form of procurement when compared to the former.

For the clients who chose the Traditional System (separation of design from the construction process) method of procurement, the area of commonality in respect of clients' needs and choice of procurement method was in the area of Ease of Project Administration. Table 4 shows that both clients encountered low levels of difficulty in administering the contracts. Table 4 indicates that the use of the Traditional System of procurement fits the client's key requirement of Ease of Contract Administration. The client's requirement for Ease of Contract Administration may explain the major conflict in the finding by Bowen et al. (1999) that the procurement systems preferred by the clients do not match the respondents' overall ranking of procurement systems in terms of attaining clients objectives of time, cost and quality. Further, Table 4 also shows that the client who selected the Traditional System, and who had time and price as an additional criteria, was able to achieve the requirement of reduced cost.

The clients who chose the Integrated Procurement Methods of Design & Build and Build-Operate & Transfer, had Time and Price as a common area of important performance criteria. It emerged that only in one of the cases presented, was this client need achieved. The other cases presented suffered significant time and cost losses. It also emerged that 75% of the client's criteria was achieved in only one of the projects procured with the Integrated System, while none of the clients' criteria was achieved in the remaining cases. An additional finding was that the Integrated System of project procurement is difficult to administer by the procurement team. When asked if another procurement method will have served their purposes better, one of the respondents who made use of the Integrated System of Procurement answered affirmatively, indicating that the Traditional Lump-sum System of project procurement would have served him better, because it would have enabled him to transfer the construction risk and minimize the effect of sharp practices of site operatives.

CONCLUSIONS

It emerged from the study that the project performance criteria/needs of clients that determines their choice of procurement methods in the construction industry in Nigeria are Time, Price certainty and Ease of Project Administration. The case study research carried out also indicates that the procurement selection process is limited to the Traditional System and the Integrated Procurement Methods, which are the familiar methods of procuring projects. None of the respondents in the study made use of the Management-Oriented Procurement Methods and this might be suggestive of the small sample size used in the study. It also emerged that the clients' performance criteria can be matched with the success/performance of the project based on the procurement method used, with the traditional system of procurement having a better level of achievement of client performance criteria, than the integrated methods. This finding casts doubts on the suggestions made by scholars that integrating the design and construction stages of a project will result in better project outcomes and client satisfaction.

Because of the small sample size, it will difficult to conclude on whether the clients' need/performance criteria can be matched with the success/performance outcome of the project as a result of the method of project procurement in Nigeria. A larger sample will need to be examined and data analysed with the use of inferential statistics to establish the relationships (or lack thereof) between procurement methods, project performance outcomes and clients' performance criteria, in order to reach more definite conclusions.

It can be concluded, based on the anecdotal evidence available in this study that the Traditional System is the procurement method that will deliver project outcomes that have the best fit with clients' performance criteria/aspiration in Nigeria. However, it is recommended that construction industry clients and professionals should assess and analyse the clients' project performance criteria against the likely project performance outcomes of the various procurement methods, before a procurement method is finally selected.

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FACILITIES MANAGEMENT OF COMPLEX HEALTH BUILDINGS: V-DESIGN APPROACH FOR OPERATING THEATRES

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Buildings need to perform more efficiently. The need to increase competitiveness, leads to the necessity to be able to do things within buildings faster, cheaper and better. The building has to optimally facilitate the core process of clients. At present it is difficult to define the performance of buildings, in our case Operating Theatres, in an objective way to efficiency and as a facilitator for the 'production' process. Needed is a new design approach, which enables to simplify the complexity of the design process structure to focus more effectiveness of the resulting production process. A derived supportive framework, based on the Validate-model, structures the design process and also forms the basis for validating the process performance. The focus of the new approach is on interpretation of the client's intentions, formulated in the design brief as starting point, within the design process. The formulation of production related demands and wishes should be supported, in such a way that decisions about fulfilling 'production' aspects, related to the operating theatres, are made transparent for all stakeholders within the design process.

Keywords: V-model, design performance measurement and management

INTRODUCTION

Organizations can be described as complex systems, in which value-adding activities take place and necessary governance is predominantly achieved by managing processes (Coenen et al. 2011). This applies to goods producing organizations, such as manufacturing, as well as to service organizations, such as health care institutions. For facilities management (FM), the main task is to engage in value-adding activities that support and improve the effectiveness of the core business (EN 15221-1: 2006). These supporting activities often take shape in processes as well. Thus, knowledge of processes has a great importance for modern facilities management.

A comprehensive literature review by Meng and Lines (2011) shows that various models have been developed to measure the performance of organizations, which may include the Balanced Scorecard (BSC), the Business Excellence Model (BEM), the key performance indicators (KPI), the Capability Maturity Model (CMM), etc. Although these models come from different backgrounds various efforts are made by researchers and practitioners to apply these models in their own fields (Meng and Lines 2011). However, still there is a lack of a systematic investigation of performance measurement in the context of Facilities Management of health care facilities and especially of Operating Theatres.

During the last years, aspects of used technology for comfort, as well as environmental process conditions and energy control within the building industry became more important. Especially investments for heating, cooling, ventilation and electricity installations and their control technology has risen from less than 10% up to now sometimes more than 30% of the overall initial building costs. In special buildings like hospitals the percentage of the building Services component of the overall initial building costs is even more than 50%. As a result of this growing part of building services the complicatedness of buildings has increased enormously and as a result of this complexity more and more things go wrong. Within the Dutch building practice present estimated costs of failures are around 10 percent of the annual turnover (USP 2004): this means already around 8 billion Euros in such a small country as the Netherlands! Some of these costs, according to various researches, are caused / created during the building design processes. As complexity and scale of design processes of buildings increase, the traditional approaches may no longer suffice (van Aken 2005).

In the last year the facilities management of healthcare facilities, especially the facilities management of operating theatres became more than once front-page news in the Netherlands. More than once Operating Theatres had to be closed due to unsatisfactory indoor air quality within the operating area. Besides the damage to the image for the healthcare institution there is a direct effect for the whole sector as counter measures often are quickly applied to all institutions to reassure the public opinion with all side effects connected to it. Recent reports from the inspection for the Health care in the Netherlands show that the management of

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Operating Theatres (OT's) in Dutch hospitals could be improved on a large number of aspects. Infection prevention and the services management of the air-handling systems of the operating theatres are the major aspects for improvement.

OT's are the "heart" of any major surgical hospital, with the patient as the centre point of a functioning OT complex. The flow of the patients, staff and materials within these operating and procedure rooms, affect the design layout. Because of the variety of specialized procedures and equipment, operating rooms will vary in layout, size and equipment needs (Assem et al. 2011). The design and establishment of OT's is not a simple straight forward design job, but involves sophisticated work by architects and engineers. These projects need specialized planning and execution effort from all architectural and engineering specialists driven and coordinated by the needs, preferences and safety of the medical/surgical team (Assem et al. 2011). Evidence from clinical outcome, social studies of patient satisfaction and design field, proves that a well designed OT improves patient outcome and reduces staff costs significantly (Ruddock and Aouad 2011). This shows the possible added value of the development of new design approaches and demonstrates as such the business case for good design.

Only measuring conditions at the commissioning moment of the building services is not enough, it is important to already check the design brief and look into the implicit assumed perfect operational handling by the operating team. Unfortunately the human behavior is often far from perfect when looked from the infection prevention point of view. The results of these imperfections have large influence on the actual performances of the air-handling systems.

A facilities management control plan, for the air-handling of an operating theatre, offers a good starting point, to make a connection between the actual use by the doctors and the possibilities of the technical systems installed. Systematic use of the structures from the system approach of Validation-V makes it possible to reach an integral level of operational quality that maximizes infection prevention within an operation ward. The actual behavior of the operating team should be taken in consideration. Measurements and validations become then really relevant for the actual results on infection prevention.

At the moment, there are no demands on micro-biological purity parameters to control the outcome of the air-handlings process, in real action during operating patients. Still, it is very important to work on these demands and to register specific parameters during the real process. Learning from these trends is important and could be a major support for the design and possible optimized facilities management of air-handling systems in hospitals. The added value of the V-Validation design process is explained for facilities management of Operating Theatres.

INFLUENCE-KNOWLEDGE CONTRADICTION

Design can be viewed as an articulate process composed of phases, where each phase represents a combinatorial action on the parts the composite object is constituted of (Colombo et.al 2007). However the conceptual design stage is especially vague. It often starts with rough initial ideas about the situation in which the building has to be placed and rough initial ideas about the function that the building should have (Aliakseyeu 2003). The design process starts from making/reading the brief by the architect. The brief is a very important way of communicating between the architect, design team and client (see Figure 1).

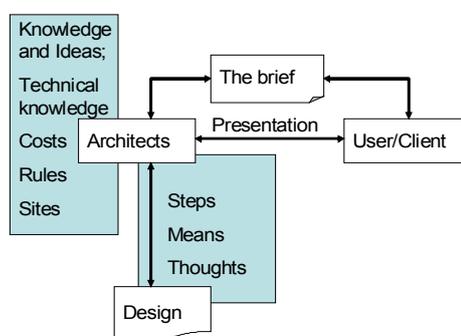


Figure 1. Role of the design brief in the conceptual design stage (Aliakseyeu 2003)

The white boxes are the action subjects and the grey boxes are the underlying and implicit knowledge and structural steps that are needed for the interpretation. Work done in later phases of the design process may change one's understanding of the design problem and new information may become available. Therefore modification and refinement of the initial specification should be undertaken

regularly. The design specification is best further developed, in strong interaction with all stakeholders, through successive iterative cycles, until design requirements and decision criteria fit one another. At the early design stages, usually only conceptual sketches and schematics are available, often rough and incomplete. Architects tend to develop their designs in a drawing-based, graphical way. Building design is a creative process based on iteration: it consists of continuous back-and-forth movements as the designer selects from a pool of available components and control options to synthesize the solution within given constraints.

As the design proceeds, more information and detail will be developed (Holzer 2009). However the main part of the project performances are determined in the early conceptual phase of product development, still in this phase only few resources (manpower, money) are actually spent on the project (Buur and Andreasen 1989). By the dichotomy of this design process at the early stages of design there is little information, even though nearly all the important decisions have to be made at this time, see Figure 2 in analogy with representation by den Hartog (2003).

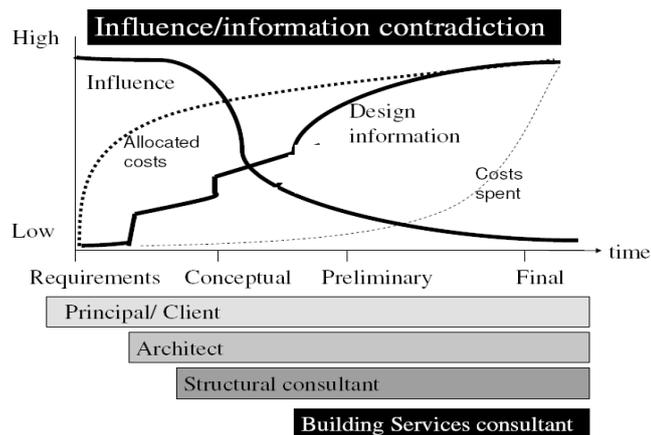


Figure 2. Relation between allocated and actually spent costs during a design project

The effectiveness of decisions, defined as the relation between the impact of the decision on the final building performance and the cost of the action needed to implement the decision, declines during the various stages of the life of a building. The decisions made early have the greatest impact on the performance and the efficiency of a building for its entire life, while the cost is minimal (Heiselberg 2007) (see Figure 3).

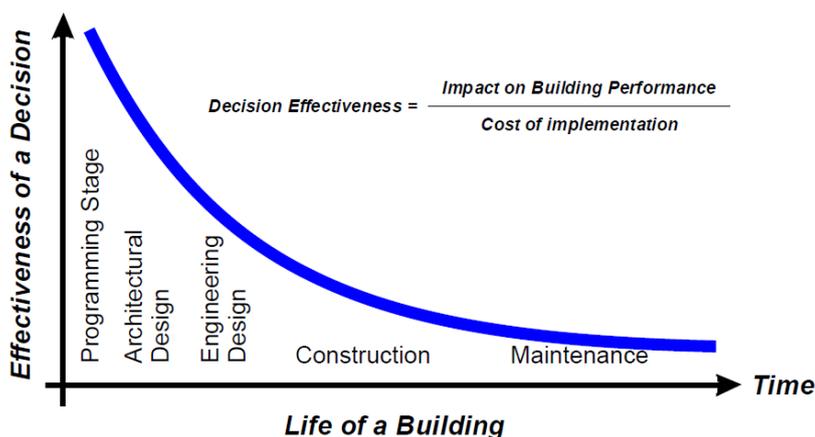


Figure 3. Effectiveness of decisions made in different stages of a buildings lifetime (Heiselberg 2007).

The construction industry is in the early stages of a revolution to reinvent the design process that was used before the large-scale application of HVAC systems (Heiselberg 2007). Building design is conducted more and more in multi disciplinary design teams with a view towards integrating all aspects of the life cycle aspects of a building. Collaboration between architects, engineers, construction managers and owners is difficult as each group has different world views and different modes of practice that are almost incompatible with each other (Kalay 1998). All this makes design a highly complicated process (Hendrickson et al 2008) in which already at the beginning of projects, design teams have to include both architects and engineers. It is necessary to transfer building design into an iterative collaborative process, right from the conceptual design ideas to the final detailed design.

FROM DESIGN TO THE PRACTICE OF MANAGING OPERATING THEATRES: VALIDATION “V”

At the moment in the Netherlands, there are no requirements on micro-biological purity parameters to control the outcome of the air-handlings process in real action during operating patients. In fact, there is no regulation at all, on the operational performance of an Operating Theatre (OT). Most important is the general law on quality in healthcare establishments (Kwaliteitswet zorginstellingen, 1 April 1996). This general legislation dictates that healthcare establishments should monitor, manage and improve their quality. In the management plan for air-handling in the Operational department (Beheersplan Luchtbehandeling Operatieafdeling, maart 2005), this is made more specific for the operational department and follows the risk based approach of the HACCP (Hazard Analysis Critical Control Points) (NACMC 1997). These result in a number of technical parameters to be controlled, monitored or validated on a continuous or intermittent basis. In normal practice, the term validation is used when parameters are measured and reported like the flow, room pressure, filter integrity and microbial parameters.

In nearly all cases, this is done without proper reference of design specifications or defined operational performances. So a clear discrimination, between acceptable results or results to be rejected, becomes difficult. Assuming the result identifies a non-conformity, it is quite difficult to determine the exact cause. A defect can be the result of some mechanical components, it can be the result of problems in the balancing of the air flows, the control system can be incorrectly programmed or the design itself can be erroneous. However, even when measured parameters are reported to be acceptable, it does not necessarily mean there is no error or misbalance in the system. This is the reason why validation is useful: Validation is defined as “establishing documented evidence which provide a high degree of assurance that a specific process will consistently produce a product meeting its predetermined specifications and quality attributes” FDA 1987).

This definition emphasizes the following aspects: documented evidence, high degree of assurance, specific process and predetermined specifications and quality attributes. To handle the terms two methods are needed: A systematic approach to the lifecycle of an OT, and a more object oriented approach to the infection prevention mechanisms. A useful systematic lifecycle approach is provided by the V-model, coming from the ict world (Forsberg and Mooz 1991, Forsberg and Mooz 1998) and adopted in the pharmaceutical industry (see Figure 4).

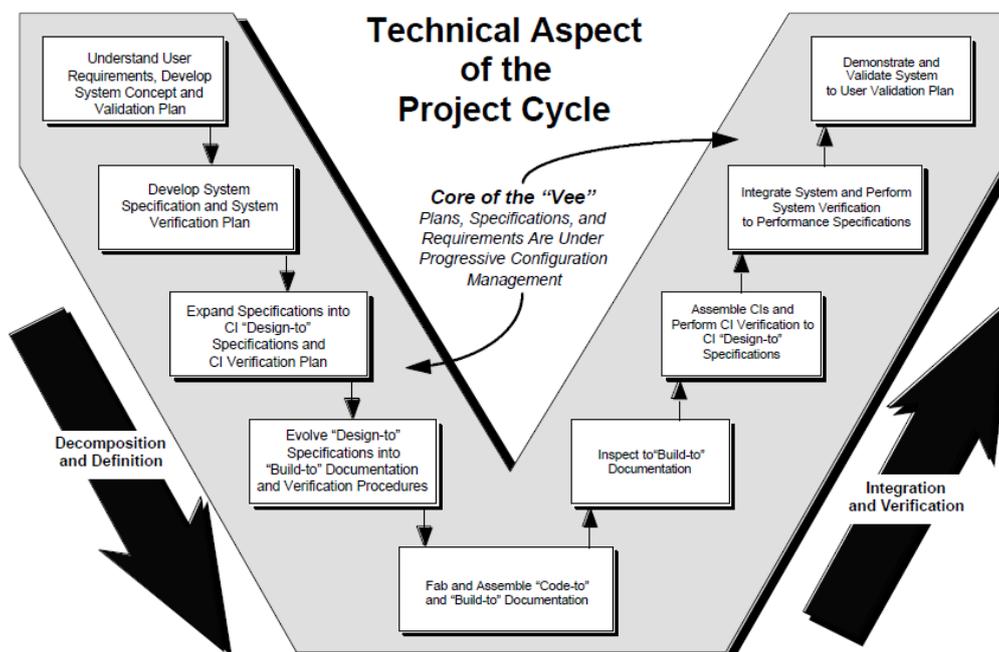


Figure 4. V-model to describe a systematic lifecycle approach (Forsberg and Mooz 1998)

The V-model is a system development model designed to simplify the understanding of the complexity associated with developing systems by a graphical representation of the systems development lifecycle. Forsberg and Mooz (1998) describe the process as requirements-driven, and starting with identification of user requirements. When the user requirements are fully understood and agreed-to by all people involved, they are then decomposed into system concepts from which are developed the system specification. The decomposition process is repeated over and over, until ultimately, single parts are identified.

Agreement is needed at each level, and the decisions are made all together by the stakeholders before proceeding to the next level. When the lowest level is reached, the process proceeds upward through the integration and verification process on the right leg of the V, to ultimately arrive at a complete verified and validated system. At each level there is a direct correlation between activities on the left and right sides of the V – the rationale for the shape. Everything on the left and right legs of the V are sequentially placed under configuration control, and is the “core” of the V” (see Figure 5).

The right side of the V-model describes the steps in the commissioning and qualification process which will verify that the facility and system were installed and operate as intended and that they produce the desired results. The basic difference between commissioning and qualification is that the former is concerned with good engineering practice, whereas the latter primarily verifies facility and systems aspects that can affect product quality (Butterfiled 2005).

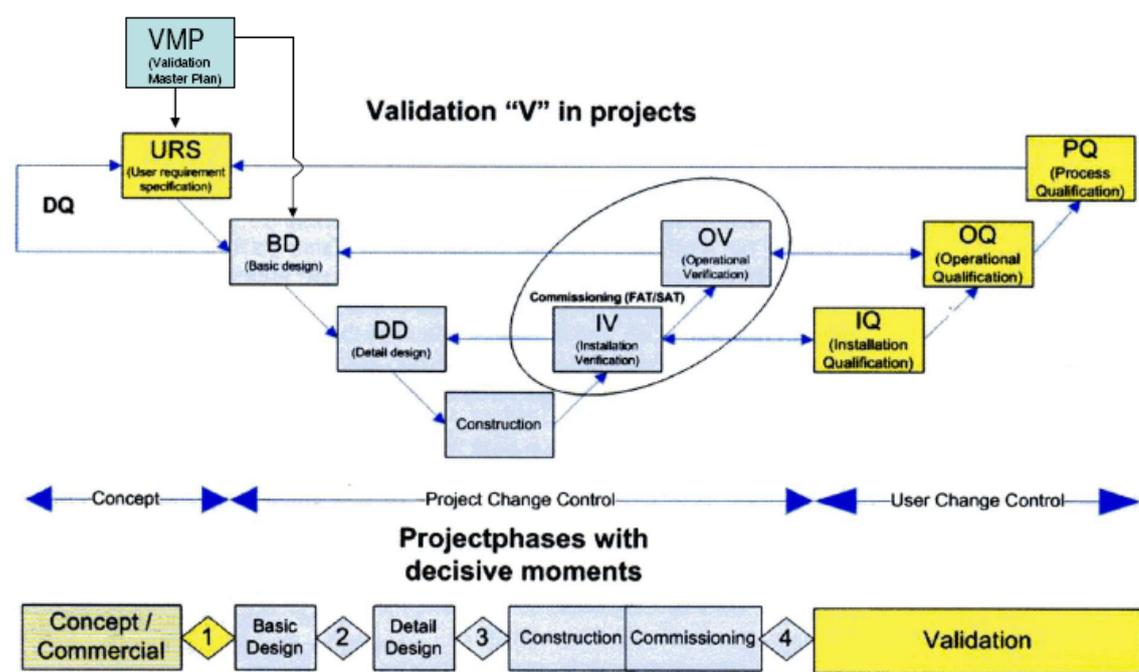


Figure 5. Life cycle V-model approach

Commissioning is a methodical, documented process to ensure that facilities, systems, and equipment meet established design requirements and stakeholder expectations. The commissioning process verifies the following: what was specified was installed; that it functions properly; and that it was successfully turned over to the user. Qualification is a process that extends beyond commissioning because it is primarily concerned with verifying facility and system aspects that can affect product quality. Starting point are always the intended use and the process and product parameters required. The User Requirement Specifications need to lay down, the way the OT is intended to be used, material end personnel logistics, equipment needed, infection prevention, and as specific as possible, the operational specifications and quality attributes needed. Because there will be a lot of information and documents, having relevance to any degree for the documented evidence, a separate frame work is found useful to specify the handling and authorization of documents. Also an impact assessment on process parameters and quality attributes needs to be done to determine which are critical and have impact on the product. This information is usually called Validation Master Plan (VMP).

With a structured life cycle approach, the objects of the design process can be used to provide infection preventions mechanisms. These can be defined in the contamination control zones. The operating table is the primary protection area. By the flow of clean HEPA-filtered air the wound of a patient is protected from ingress of micro organisms. However rigidness of this area is challenged in various ways. Not only by personnel and material used in this zone, but also influenced by the modesty of air movement and thermal balance. The air flow is strongly affected by the position and thermal characteristics of operating lighting, medical panels and

monitors. This explains the need to discuss the way the OT is operated: the number and nature of lighting and panels, the place of the instrument tables, the personnel and material flows and necessary thermal comfort. The next design step, Basic Design, will provide the technical solutions to fulfill the required conditions in the OT. Essential is that the Basic Design clearly specifies the functionality and the technical parameters on which the operational performance of the OT is based. This means solid design efforts as well as proper documentation and description of the design.

To ensure that the design meets the requirement and is an adequate solution, a check is needed. This is usually referred to as design qualification. In the design qualification the design team will be compare the design outcome with the requirements and check it per specification. In many cases no major non-conformities will be detected, but both the User Requirements Specification and the basic design could have been formulated more precise. Sometimes, as the design is reviewed in its final and complete form, as opposed to presentations in design meetings on specific aspects, the client for the first time gets a clean view of the consequences of his requirements and way of operation. This may lead to a wish for adjusting the process conditions. At the end of the design qualification process, the design quality report and the modified basic design documents are approved and ready to be released for detail design. The basic design needs to incorporate the way the system is put into operation and the way the final system can be tested. During detail design, the basic design is made more in depth within the functional specification and envelop of performance, specifying actual system dimension and components put on construction drawings and component lists.

The actual construction will be done, using appropriate work methods and using the approved construction drawings. When construction of (sub) systems is completed, they can be tested and verified. This can be referred to as installation verification. Performances and quality attributes of the (sub) systems can be checked: strength, air tightness, cleanliness, completeness, accordance to drawings etc. When all is checked and defects are resolved, the next phase can be entered: operational verification. During the operational verification, the systems are balanced and put in operation. Verified is whether the system is able to operate on the specified levels from the basic design. All functionality can be tested: all operating statuses of systems and the functioning of alarms. Sometimes this involves a single system, however in many situations this involves the combined functionality of different systems. This interaction must have been specified in the functional design of the Basic design. When this operational verification is accomplished and all defects are dealt with by the contractors, the system is ready to be put in use by the actual users. Here comes in, the operational procedures of the end user, the cleaning, the personal discipline, etc. Finally it is necessary to inform, instruct and train the end user to understand and behave in accordance with the way the OT is specified in the user requirements specification. When the OT is in full operation, the final and most decisive measurements can be performed to check if the OT does perform correct to all aspects.

DISCUSSION

Using the V-model has great advantages: the various levels of abstraction and the distinct phases provide a built up of documented evidence, as well as make explicit how the system was conceived, designed, built and tested. When, after years of operation and proper maintenance, a supposed problem occurs, it can be more easily determined by re-validation, whether the system still performs within specs.

The biggest challenge of using this model for the OT is the lack of clear directives on the performance quality of the OT. The most recent directives have no specifications on air quality and sedimentation of micro-organisms on the critical places. A lot of emphasis is given to the description of functionalities on basic design level. That implies practically, that nearly all hospitals “validate” their OT when not in use and do the testing, only based on conditions specified in the technical performance brief. The effect of behavior and movements of the OT-team, in normal working conditions, are not taken into account! Which is strange, as actions of the operating team can disturb the protecting air flows and thus reduce the perceived air quality. As recent reports and actions by the health care inspection made very clear, there is a substantial problem with awareness and discipline of personnel. Therefore to get a clear idea of the achievable level of indoor air quality, how the actions by the operating team affect the perceived air quality must be included in testing. In addition to all this in many existing OT’s, the technical infrastructure is not controlled and managed adequately: essential functional performance of the technical infrastructure are not specified, checked or maintained. Furthermore and even worse: the use of an OT will often be out of the range of performance of the designed and constructed system. Par example, sterile instruments are not placed in a protected down flow zone or lighting and technical shuttles are obstructing the intended down flow of clean air. So clearly the OT should be tested in ‘real’ working conditions.

RECOMMENDATIONS AND CONCLUSIONS

Buildings and thus building design processes are necessary to facilitate the core processes of organizations. To cope with the risen complexity of the technology used in the buildings, multi-disciplinary approaches were needed. Failure costs as a result of inadequate cooperation between the different evolved disciplines in the design process are large. Synergy between the different disciplines involved in present building design processes and the experiences of the actual users is necessary to reach the best designs to be able to optimize facilities management of complex (medical) buildings like Operating Theatres. A first step towards improving design for facilities management of OT's, is to increase knowledge on how an OT actual performs in practice. This can be done by frequent monitoring with micro-biological settle plates close to the open area and on the sterile instrument tables. This will help to find a practical range based on the most relevant parameter: the actual chance a micro-organism falls in the wound or on a sterile instrument and thus will be transported in the wound also. The second step is the monitoring of the performance of the OT technical system. Is the system still in its range of performance? If not, a variation in microbial fall-out can be explained as a result of operating outside the specs, else it will be caused by some other aspects such as the hygienic performance of the operating personnel. Validation supports both stakeholders and design team members, by supplying more information on the tasks and decisions. For the client, this abstract ordering of the design process should be made clear, by presenting it as the direct decomposition of the client's intention. The integrally working design team, should not only design the building, but first of all the design process itself, so that the results can be used to improve on the facility management process of the client. The structure of V-design helps to structure the process as well as the communication and is therefore a useful approach to improve facilities management of highly complex medical facilities such as OT's.

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THE PROCUREMENT OF INDIGENOUS SOCIAL HOUSING IN AUSTRALIA: A PROJECT ALLIANCE APPROACH

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Poor living conditions for indigenous Australians in remote areas of the Northern Territory (NT) is a common problem and challenge in the development of social housing. Various models of project delivery have failed to address issues of overcrowding and insufficient infrastructure that have led to poor health and reduced life expectancy amongst the indigenous population. Delivery models for indigenous social housing and infrastructure is in need of reform to overcome the mounting problems and disadvantage in indigenous communities. A current Government initiative is the Strategic Indigenous Housing and Infrastructure Program (SIHIP). This program is using an Alliance approach to deliver the planning, design and construction stages for social housing. Relational contracting methods, such as Project Alliancing, provide value for money, trust, management of team goals, multi-disciplinary expertise and develop innovation in order to deliver the best possible solutions for successful project delivery. Alliance projects are characterised by arrangements that ensure that risk is shared across all stakeholders under a pain/gain-share system to overcome adversarial and inefficient traditional contractual approaches. Using a case study approach, this paper analyses the SIHIP Project Alliance framework and focuses on specific outcomes of the Alliance stakeholders. The SIHIP has delivered sustainable housing projects for indigenous Australians and was particularly successful with regards to community involvement and consultation, developing a regional focus and providing value for money.

Keywords: *Australia, indigenous culture, project alliancing, social housing, sustainable procurement*

INTRODUCTION

The management of construction projects is grounded in achieving successful production throughout the life cycle of the construction process. Effective management and use of resources throughout the entire process is the key to producing a successful product in the built environment (Harris et al., 2006). Project success is influenced by the procurement approach that provides a framework for all the aspects of construction to be holistically brought together (Walker, 2008). Procurement strategies can effectively drive the success, efficiency and sustainability of a construction project, and it is this that governs the aim of this paper, which sets out to identify issues with the provision of adequate and appropriate housing for remote indigenous communities. This has been identified as a serious problem throughout Australian history by the likes of Memmot (1989), Pholeros (1993) and Read (2000), who discuss the social, political and cultural problems with the construction and provision of houses in the remote Northern Territory (NT) of Australia.

According to Cheung et al. (2005), Jefferies et al. (2006), and Walker and Rowlinson (2008) recent innovations in procurement have led to the development of contracting frameworks that aim to address the increasing nature of change and complexity of the construction industry. Formed around the characteristics of developing relationships, sharing risk and collaborative and innovative development of solutions, Project Alliancing is a contracting system which embraces change, adapts to obstacles and enables participants to work together to achieve increased project performance and improve the key outcomes of time, cost and quality. It is the implementation of a Project Alliancing framework for the delivery of remote indigenous housing (IH) in the Strategic Indigenous Housing and Infrastructure Program (SIHIP) that forms the basis of this paper.

Subsequently, the aim of this paper is to:

“Evaluate the SIHIP Project Alliancing procurement model in delivering culturally, economically and socially successful Indigenous Housing outcomes.”

The problems associated with indigenous housing are significant and evidence is wide spread. With overcrowded houses, poor performance of utilities, no maintenance and deteriorated, unsafe buildings (Pholeros, 1993) N.S.W.: Healthabitat, c1993, (ABS,

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2006), (FaHCSIA, Australian Dept. of Families, 2007), Indigenous Australians in the remote areas of NT have the lowest socio-economic profile of all Australians. Long and Memmott (2007) identify IH as having to incorporate all aspects of production, management, maintenance and occupation of indigenous living environments. The NT's Department of Local Government and Housing, in identifying problems with current IH, have proposed a solution which involves the use of different procurement models to provide adequate housing and services to remote indigenous communities.

The development of the SIHIP led to the choice of Project Alliancing as the most effective contracting method for successful delivery of IH (FaHCSIA, Australian Dept. of Families 2009). Therefore, drawing on issues of remote IH and the successful attributes of Project Alliancing, this paper will evaluate the success of the SIHIP in solving problems that plague the NT indigenous communities.

HISTORY OF INDIGENOUS HOUSING

The management and quality of housing and infrastructure have always been a primary determinate of indigenous disadvantage, particularly in remote communities. The 1970s saw the first official identification of these issues and how it served as a major element of concern for the living conditions, health and overall social wellbeing of the indigenous Australians. Rowley (1971) described housing as an issue decaying the standard of living of many remote aboriginal communities and the poor standards of living including poverty, lack of education, violence and health issues became attributed to the primary issue of insufficient and inappropriate housing. Heppell (1979) drew similar conclusions along with the need for improved government policy aiming at the immediate need to develop long term strategic solutions to solve the problems with IH in remote Australia.

Insight into housing policy for indigenous Australians was provided by Memmott (1990) and Saunders (1990) and they covered the need for both state and federal policies to understand the specific need for housing development. This related to holistic provision including design, construction and delivery of the projects that would be appropriate to the needs of remote Indigenous communities by paying particular attention to culture, living standards and sustainability. The situation in recent years has continued to be problematic with issues of overcrowding, low quality construction, poor planning, and lack of basic services and utilities (ABS 2002). Reviews of government programs also confirmed these problems, and not only with the housing itself, but also with the method of delivery, and focused specifically on poor construction, lack of maintenance, inexperienced management of housing, fragmented housing organisations and an ill allocation of funding (FaHCSIA, Australian Dept of Families 2007).

Phleros (1993) identified the need for a system of procurement involving industry, government and community partnership and he stated that it is time to develop solutions to improve the day to day living environment. He went further by stating that the policies must match the practical work, which is often difficult with the complexity of previous and current policy. From his work in the communities he identified the problems with IH were attributed to inferior design, poor construction standards and inefficient management of the construction process. According to Barker (2003), it was also identified that for Government programs to achieve their objectives the process of implementation and construction must be managed and organised better. Reference has even been made to developing a specific section of the Building Code of Australia (BCA) for indigenous and remote housing and infrastructure (AIHW, 2005).

The current SIHIP is utilising almost A\$700M funding and is the largest IH program undertaken by the Australian and NT governments (FaHCSIA, Australian Dept. of Families 2009). The primary aims reflect those of similar policies and past programs, with additional objectives to improve remote indigenous built environments through the construction, rebuild and refurbishment of houses.

PROJECT ALLIANCING

Construction projects are dynamic, ever changing and inherent with risks. These levels of risk and the growing size and complexity of projects has attributed to the adversarial and fragmented nature of the construction industry (Noble, 2007). Project Alliancing aims at effectively managing risks and encouraging more collaborative and relational partnerships between stakeholders to better achieve the objectives and improve overall project performance. Alliancing utilises the principles of sharing risks to better develop relationships and integrate the project team to maximise project performance (Walker, 2008). According to the Victoria Governments 'Project Alliancing Practitioners Guide' (Dept. of Treasury and Finance, 2006), an Alliance is defined as "a commercial/legal framework

between a department, agency or government-business enterprise as ‘owner-participant’ and one or more private sector parties as ‘service provider’ or ‘non-owner participants’ for delivering one or more capital works projects.” Alliancing demonstrates characteristics of a partnership in that there is a collective sharing of almost all project risks and benefits, a no blame/no disputes agreement, with an integrated project team selected on best placed entities and a principle based strategic management process. In partnership, each entity provides their services on a net cost basis, and upon completion of the project the parties share in the profits and or losses respectively.

Traditional forms of contract, such as Construct Only or Design and Construct, consist of project risks being allocated to the party believed best placed to manage the risk. The terms and conditions of traditional contracts aim at predicting all possible outcomes and assign liability and when changes or alterations occur, the result often ends in dispute. Whereas Project Alliancing is built on partnering in order to embrace collaboration, change and innovation in project delivery (Sakal, 2005). Another prime characteristic of an Alliance is the early involvement of contractors and other stakeholders to encourage innovation, collaboration and allow the design, construction and occupation of the project to be integrated (Scheublin, 2001).

Alliance systems have been used on numerous capital works and infrastructure projects in the Australian public sector. To take advantage of this approach, some Australian State Governments have developed a set of guidelines detailing the processes and framework for using Alliances to deliver major capital works. Australian projects utilising Alliances include Sydney water infrastructure works, Defence Department infrastructure, and major road and civil works from both local and state governments (Dept. of Treasury & Finance, 2006). However, the use of Project Alliances to deliver building projects has been limited, with the National Museum in Canberra a notable exception, and the SIHIP is one of the first major building projects to utilise this system. The following table lists the benefits and risks associated with using an Alliance based contracting system such as Project Alliancing.

Table 1: Benefits and risks of project alliancing (Adapted from Sakal, 2005; Victorian Government, 2006; and Walker & Hampson 2008)

BENEFITS	RISKS
‘Best for Project’ not ‘Best for Individual’ commercial focus.	Participants are responsible for larger range of risks & liable for the performance of other participants.
Improved ability to manage risk, uncertainty and change through shared responsibility and resources.	The absence of competitive tendering and pricing may lead to questioning the VFM.
Early involvement of contractors and consultants.	Larger levels of involvement by senior participants.
Reduced need for contract administration, reduced disputes, claims and litigation.	Resource intensive.
Encourages innovation and high standard of work.	No maximum or capped pricing for clients/owners.
Collaboration provides development opportunities for client and alliance teams.	Risking profit and overheads for non-owner participants.
Increased accountability and cost transparency, more robust budgeting and value for money.	Relatively high costs of tendering.
Project objectives aligned and achieved efficiently through incentives for non-owner participants.	Requires full commitment and may reduce the ability to perform normal business activity.
Costs and budgets are developed over the course of the project to reduce overall prices providing VFM.	Legal recourse against participants is limited to wilful default or acts of insolvency.

RESEARCH METHODOLOGY

Primarily, the data collected for this paper focused on published literature and secondary data. This allowed the researchers to understand the themes based entirely on the information at hand without opinion or subjectivity (Knight, 2008). The preliminary stages of research analysed current and historical literature to gain an understanding of the issue of remote indigenous housing and identified the need for a procurement approach specific to this problem. The principles of IH were established via a review of the literature which were identified as both problems and contributors to successful outcomes. Subsequently developed into criteria, the principles were used to evaluate a case study of the Project Alliancing procurement system developed for the SIHIP in the Northern Territory of Australia. The evaluation was based on the performance review documentation and published statistical data representing the outcomes of the SIHIP.

FINDINGS AND DISCUSSION: THE STRATEGIC INDIGENOUS HOUSING AND INFRASTRUCTURE PROGRAM (SIHIP)

The Strategic Indigenous Housing and Infrastructure Program (SIHIP) is a current initiative of both the Australian Federal and NT State governments and is aimed at improving housing outcomes for indigenous Australians in rural and remote areas of the NT. The program is the largest of its kind and SIHIP will construct new houses and refurbish existing houses in over 70 remote regions in the NT. Delivered using Alliance contracting, the SIHIP was developed to achieve the objectives of national IH policy and address the issues of previous projects through timely and cost-efficient delivery.

DEVELOPMENT OF SIHIP

The SIHIP, as a part of the reform agenda depicted in the National Partnership Agreement on Remote Indigenous Housing (NPA RIH), was initiated in 2007 and formally announced in April 2008. The program replaced the previous arrangements of the Aboriginal Rental Housing and Community Housing and Infrastructure Programs, following the trend of joint federal and state funding and state controlled delivery of this type of program. It was the agreement between the federal and NT governments which initiated the SIHIP in response to the recognition that previous housing programs had been unable to achieve the desired outcomes (COAG 2008). The project aimed to address the large shortfall in housing stock, overcrowding, poor living conditions and overall community, social and economical disadvantage to the Indigenous population in remote NT (ABS 2006).

Recognition that previous programs were failing to achieve the desired outcomes prompted a change in program structure and project delivery. As the general delivery method was previously standard one-off, lump-sum contract agreements, the programs failed to achieve value-for-money and the economies of scale that are needed for successful outcomes in a unique project such as this. Presented with a range of business and policy challenges unique to the remote Indigenous regions of the NT, such as cultural and social considerations, history and heritage, environmental and climate restrictions and limited resources, the government agreed that an alternative procurement approach may be able to achieve the required outcomes (FaHCSIA, Australian Dept. of Families, 2009). A system which provided an incentive for quality outcomes, sharing of risk, responsibility and benefits, and greater elements of indigenous employment, training and overall community development would be a significant driver for change to achieve more sustainable improvement.

The SIHIP aimed to deliver new housing, refurbish and upgrade of existing housing, improve living conditions and provide new infrastructure and capital works. The program was initially provided with \$538 million worth of funding from the Australian Government and an additional \$100 Million from the State Government. The NT Government delivered the program through the Project Alliances procurement system and was also responsible for property management, collection of rent and routine maintenance through the public housing framework. The Australian government would provide support throughout the program, oversee the delivery and provide governance and guidance of key decisions and the strategic direction of the program.

THE PROJECT ALLIANCE APPROACH FOR SIHIP

A Strategic Alliance procurement system was adopted as it was determined that this would be the most effective approach to achieving the program objectives through best practice procurement. Alliances had the potential to achieve greater economies of scale, better value for money, and grab the attention of innovative and successful companies who had the ability to partner with smaller local firms capable of integrating and engaging the local community (FaHCSIA, Australian Dept. of Families, 2009). Initiated in 2007, the SIHIP was based around the Victorian Government's 'Project Alliances Practitioners Guide' and the procurement approach is based around the following characteristics:

- Collective sharing of project risks;
- No fault/No blame and no dispute between Alliance participants;
- Payment of NOPs for their services under a '3-limb' compensation model:
 - *Reimbursement of NOPs project costs on a 100 percent open book basis;*
 - *A fee to cover corporate overheads and normal profit; and*
 - *A gainshare/painshare regime where the rewards for good performance and the penalties for poor performance are shared equitably.*
- Unanimous principle based decision making on all key project issues;
- Integrated project team selection based on best person for each position; and
- Early involvement of contractors.

Specific details of the SIHIP Project Alliance are summarised in Table 2.

Table 2: The Structure and Details of the SIHIP Project Alliance

PROCUREMENT SYSTEM	<p>Alliance Contract System:</p> <ul style="list-style-type: none"> Separated into 3 regional project alliance partners assigned work packages in separate geographical regions. Engaged to collaboratively manage the delivery, design, construction, refurbishment and management/maintenance of the project
GOVERNANCE	<p><i>NT Government:</i> Contracting entity, responsible for the delivery of the program, management of contracts, organisation of land tenure, capital works and development planning.</p> <p><i>Australian Government:</i> Strategic guidance and management of the program and contracts; development and support during procurement process and program establishment.</p>
ALLIANCE STRUCTURE	<p>Governed by the agreement between the federal and NT governments the alliances consist of a combination of the following:</p> <ul style="list-style-type: none"> Head Contractor; Developer; Local Construction Firm; Engineering firm; Civil Contractor; Specialist Trade Contractor; Building service company; and Suppliers
ALLIANCE DELIVERABLES	<p>The alliance method led the Australian and NT Governments to select and engage professional services including:</p> <ul style="list-style-type: none"> Program management services; Cost management; Design coordination; Construction management; Financial Audit services; Value for money.
TIME FRAME	Completed by the end of 2013
HOUSING DELIVERABLES	<p>New Houses = 750 Houses Rebuilds = 250 Houses Refurbishments = 2500 Houses</p>
ALLIANCE DELIVERY METHOD	<p><u>Phase 1</u> <i>Selection of alliance partners:</i></p> <ul style="list-style-type: none"> Selection and engagement of for a collaborative alliance construction consortia through public and select tendering. Non-competitive environment to encourage partnering, innovation and commitment. Public Expressions Of Interest (EOI) in May 2008 Selective Request For Proposal (RFP) in June 2008 Detailed Selection and evaluation panel Engagement and development of alliance terms <p><u>Phase 2</u> <i>Planning and Development</i></p> <ul style="list-style-type: none"> Develop cost and scope packages based on community engagement Employment & Workforce Development including minimum of 20% local indigenous training & employment Detailed design and planning <p><u>Phase 3</u> <i>Delivery/ Construction:</i></p> <ul style="list-style-type: none"> Procurement of local services Delivery of Houses Construction, refurbishment and rebuilding of houses Continuous community involvement, training and employment
ALLIANCE PARTNERS	<p><i>Earth Connect Alliance:</i></p> <ul style="list-style-type: none"> Canstruct Pty Ltd; WorleyParsons Services Pty Ltd; Force 10 International Pty Ltd; Greene & Associates Pty Ltd; and Ostwald Bros. Pty Ltd <p><i>New Future Alliance:</i></p> <ul style="list-style-type: none"> Leighton Pty Ltd; Broad Construction Services Pty Ltd; Opus Pty Ltd; and Ngarda Civil & Mining Pty Ltd <p><i>Territory Alliance Partners:</i></p> <ul style="list-style-type: none"> Sitzler Pty Ltd; Laing O'Rourke Australia Construction Pty Ltd; McMahon Services Australia Pty Ltd <p>With a Sub Alliance Participant:</p> <ul style="list-style-type: none"> Compass Group (Australia) Pty Ltd
INITIAL BUDGET	<p>Australian Government: \$ 547 Million NT Government : \$ 100 Million Additional: \$ 25 Million Total = \$672 Million</p>
ESTIMATED UNIT COST (Standard unit cost per dwelling from cost planning)	<p><u>New House Target Cost:</u> \$350,000</p> <p><u>Estimated Regional Package Cost:</u> \$30-\$50 million</p>

PRINCIPLES FOR SUCCESS

Identification of the primary issues associated with remote IH is the first step in developing the objectives and desired outcomes for such a program. The focus of the procurement and contract system must successfully address the issues present through the delivery of a housing project that achieve sustainable housing and associated outcomes (Tipple and Willis, 1991). Through thematic and statistical analysis of literature, government surveys and statistical reporting, a number of themes were established as key principles for success in the procurement of IH. These principles affect the success of remote housing programs and are critical issues that can assist in improving the outcomes of remote IH in the NT. These principles are listed below and some are discussed further in order to elaborate on their success in delivering the SIHIP Project Alliance. 11 principles were identified in total, however, due to the word limit constraints of this paper, only the first three are reported in detail in this paper. The 11 principles for success in the SIHIP Project Alliance are:

1. Community Involvement and Consultation;
2. Regional Focus;
3. Value for Money;
4. Cultural and Social considerations;
5. Design Suitability;
6. Economic Development;
7. Adaptability;
8. Sustainable Practices;
9. Effective Program Management;
10. Construction Standards; and
11. Time.

The following discussion of 3 of the key principles for success draws upon the outcomes and results of the SIHIP in accordance with 'The Review' (FaHCSIA, Australian Dept. of Families, 2009) and the PRA (SIHIP Post Review Assessment, 2010).

Community involvement and consultation

Further to the findings of Tipple and Willis (1991), who identified participant observation and involvement as fundamental to the successful development of low socio-economic and remote communities, the evidence of previous housing initiatives in the NT attribute success to the involvement of the community and the occupants of the new houses (HealthHabitat, 2009). Community involvement should not only be during the planning stages but throughout the processes of design, construction and asset management. This can ensure a greater understanding and sense of participation in the project (Ross, 1990), and indigenous involvement can also lead to increased employment, education and training opportunities in addition to the improvement of supplementary social and health issues.

The key objectives of the SIHIP detailed the development of relationships as a primary outcome with a strong emphasis placed on community consultation and local involvement. The Alliance partners collaborated with local stakeholders from the housing reference group, community members and with local land councils. The processes aimed at improving the outcomes of the housing delivery through community visits, workshops and information sessions to establish relationships and allow the community to participate and provide input into the decision making process (FaHCSIA (Australia Dept. of Families), 2009). Routine correspondence with housing groups and regional local government officers attributed to the local knowledgebase. Communities were given the opportunity to provide a high degree of input when developing the scope of works, design considerations, location, size and planning. These processes were instrumental in prioritising and programming work packages with temporary works and training.

Regional focus

Addressing regional focus when delivering a remote IH project is important to ensure that each project maintains 'localised' in order to meet the specific needs of the geographical location (PriceWaterhouseCoopers, 2007). Along with the need for cultural and social considerations, many other aspects change over the various 73 community locations that were part of the SIHIP and this warrants the need for the procurement and contract system to encourage a regional focus in its project delivery.

The Alliance team is under agreement to utilise the input from the community and local officers from government, housing reference groups and land councils. This enables the Alliance to obtain a greater understanding for each of the specific regional areas within the SIHIP, while developing relationships with the occupants and users by allowing them to gain an understanding of the construction processes so that they can feel involved in the projects implementation. This regional focus is supported by the requirement under the

alliance agreement to employ a minimum of 20% local indigenous resources. Up until March 2010, the Alliance partners employed 36% local indigenous workers, contractors and subcontractors (Donald and Canty-Waldron 2010). A major component of the SIHIP Alliance approach is to address the principle of regional focus by triggering construction activity and this was achieved by not only direct indigenous employment, but also the use of local contractors, suppliers and consultants.

Value for money

Accurately determining the standard unit cost per new dwelling is difficult to determine due largely to the previous use of lump sum contracts and varying unit prices quoted by contractors which led to large variations in standard unit costs. The Alliance approach allows a standard target cost to be developed across the range of projects within the alliance providing greater accountability and transparency of costs per dwelling. Developing these standard costs provides a target for the alliance partners to work towards to achieve the outcomes of the program. Successful project outcomes when using Alliancing are strongly attributed to the fact that no entity is able to make extra profit by transferring costs to another party. This encourages and initiates parties to cooperate in a way that is not typically seen in the construction industry (Scheublin 2001). One feature of the SIHIP alliance agreement is the development of the works packages through the Project Development Report (PDR), which was developed by the Alliance team prior to works being started and involved community consultation to propose a scope of works and costing which is assessed and approved based on numerous criteria including the ability to provide value for money (FaHCSIA (Australia Dept. of Families), 2009). Once approved the contractors are locked-in to the specified budget and all cost over-runs and under-runs are shared according to the pain/gain-share agreement.

Under the SIHIP Alliance, participants are paid under the 3-limb compensation model, which through open book accounting and detailed reporting of all levels of cost ensures transparency and accountability within the project. The model is headed by Limb 1: which are guaranteed and represent the direct costs and site/project overheads; Limb 2: the potential and limit of payment in the form of corporate overheads and profit; and Limb 3: the Painshare/Gainshare commercial arrangement which is a defining characteristic of the alliance model, and are dependent on the outcomes of the project. This system encourages participants to achieve, innovate and improve outcomes, while ensuring that costs are transparent and fully reportable. This is an improvement on traditional forms of contracting with fixed prices where construction and combined costs which are not detailed or conveying in the overall price (Sakal, 2007; Dept. of Treasury and Finance, 2006). One of the challenges that this alliance payment system addresses is the unit cost of housing construction. Due to cost implications of building in remote communities where resources, materials and workforce is scarce, the cost reporting and transparent claim system allows for these cost to be monitored, where previous procurement methods failed in obtaining value for money and delivering sustainable outcomes (Donald and Canty-Waldron, 2010).

CONCLUSIONS

Living conditions for indigenous Australians in remote areas of the NT are below the standards of the remainder of the population. Problems of overcrowding, poor living conditions, homelessness and severe shortage of appropriate housing have not been addressed by previous programs. Delivery methods for remote Indigenous housing are in need of reform to address the problems and disadvantage of remote Indigenous communities. Successful housing outcomes are driven by the procurement of design, construction, management and maintenance services. Using a case study analysis of the SIHIP Project Alliance, 11 principle success factors were identified as being critical for the project. This paper identified these 11 principles, but due to word limit constraints only reported in detail on 3 of them. The 3 reported principles being 'community involvement and consultation', 'regional focus' and 'value for money'.

The SIHIP is the largest scale IH program and is improving the outcomes of remote Indigenous housing. Project Alliancing is identified in this paper as providing a shift from traditional contracting methods and subsequently offered a range of benefits toward the improvement of IH. The SIHIP Alliance framework was found to encourage collaboration, embrace innovation and allowed all participants to work as an integrated team towards reaching the project objectives. Alliancing is characterised by arrangements which ensure shared risk and responsibility and a pain/gain-share payment system which collectively ties project objectives together and ensures all participants are working together towards goals and either win or lose as a group. Repeatedly defined as being suited to complex and dynamic projects that have an undefined scope of works, Alliancing is as an appropriate procurement method to be applied to the ever-changing problem of remote IH delivery. Project Alliancing is a pioneering procurement method and the SIHIP is the first time this approach has been applied to a Capital Works program in Australia's NT. Innovative procurement methods such as Alliancing have the potential to contribute successfully to remote IH and significantly improve future outcomes. Through greater

experience and further commitment with relational contracting methods, Alliancing will be at the forefront of project delivery of IH programs for remote Australians and ultimately close the disadvantage gap.

The findings reported in this paper warrant further research into the procurement of remote IH. SIHIP has shown that Project Alliancing has the potential to improve the outcomes of similar challenging projects and has the ability to change the way in which other large-scale Public Sector projects are procured. The following areas are recommended for further research in order to improve IH procurement:

- Report on the other SIHIP 'success' principles not detailed in this paper;
- Conduct further analysis of SIHIP outcomes on project completion in 2013;
- Assess the impact of policy and legislation on standard methods of procurement for IH; and
- Develop relational contract conditions for Australian construction contracts such as AS2124 and GC21.

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COMPARISON OF RESPONSIBILITY AND RISK ALLOCATION IN DESIGN-BUILD CONTRACT FORMS OF JAPAN AND AMERICA

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Besides Traditional method, Design-Build (DB) is a leading construction project delivery method in Japan. In spite of the fact that many construction projects from small to large-scale developments employ the DB system, there is no standard DB contract being established to clarify the responsibilities, or to address and allocate potential risks of key project stakeholder, especially the Owner and Design-Builder (DBr). The Building Contractors Society (BCS) of Japan introduced the Design and Construction Service Agreement in 2001, in an attempt to develop a standard contract form. In this sense, this study aims to highlight the allocation of responsibilities and risks for the Owner and DBr in the DB contract form, and to make clear their similarities and differences with the A141 – 2004, a widely used DB contract form of the American Institute of Architects (AIA). Responsibilities and risks of Owner and DBr throughout various phases in a project were extracted from clauses of both contract forms. Comparative analysis was conducted to identify the similarities and differences between the two contract forms. There is no drastic change of responsibilities allocation from Owner to DBr during the pre-bidding and post-bidding (contract) phase in the BCS. Both the Owner and DBr have equitable allocation of responsibilities and risks. In contrast, the AIA assigns greater responsibilities and risks to the Owner during the pre-bidding phase, particularly in providing information to the DBr. During the contract phase, the Owner significantly transfers his responsibilities and risks to the DBr. This indicates clear distinction between the Japanese and American design-build contract forms, which can be attributed to the different nature and characteristic, as well as condition of construction projects, as reflected in the contract form.

Keywords: AIA, BCS, design-build contract, design-builder, owner, responsibility, risk

INTRODUCTION

Design-Build (DB) has been used as a construction project delivery method in Japan for many years. Many construction projects in Japan from small to large-scale developments employ the DB system even though there is no standard contract available for DB projects in Japan (Saito, 1999). Without any established standard DB contract, presumably either a modified traditional contract form or a non-standard one specifically compiled for each project is used for the DB projects. In view of the seemingly arbitrary practice, the Building Contractors Society (BCS) of Japan has introduced the Design and Construction Service Agreement, as an endeavour to develop a standard contract form to clarify the responsibilities, address and allocate potential risks of key project stakeholders, especially the Owner and Design-builder (DBr). Yoshihara et al. (2011) pointed out that its structure and content are almost similar with that of a standard traditional (design-bid-build) contract form, i.e. the Shikai Rengo (the Japan Federation of Four Construction Associations) Standard Stipulations for Construction Works Contracts (Revised in 2000). It is therefore, worthwhile to study how the contents of this new contract resemble a DB standard contract form.

Liu et al. (2008) conducted a comparison study on the Traditional (1987 edition), DB (1985 edition) and Construction Management (CM) (1992 edition) contract forms of AIA. It was concluded that in the DB contract, the risks allocated to Owner is less and contrarily, Contractor assumes more risks than in the Traditional and CM contracts. These are in agreement with general perception that in the DB contract, the Owner transfer more risks to the Contractor than in the other two contracts. The Japanese DB was reported to be distinct from the DB in the US in terms of organisation perspective and the range of risk management (Saito, 2003). Hence, this study focuses on how the DB of Japan and the US allocate the responsibilities and risks between Owner and DBr in their contract forms. For comparison, AIA's widely used DB standard contract documents, i.e. the A141 – 2004, Agreement between Owner and DBr, was chosen as the base reference. Specifically, the General Conditions of Design/Build Basic Contract (Part A) and Design/Build Contract (Part B) of BCS and Exhibit A-Terms and Conditions of AIA were studied for the comparison purposes. This paper aims to highlight the key similarities and differences of responsibilities and risks allocation between Owner and DBr in the BCS and AIA contract forms.

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Responsibilities and risks of Owner and DBr were extracted and identified from clauses of both contract forms. Some important contractual issues were selected for more in-depth discussion, to highlight the similarities and differences of these two contracts, as well as to illustrate the responsibilities and risks allocation between Owner and DBr throughout various phases in a project, as stipulated in both contract forms. For ease of reading, each contract clause referred to throughout this paper was written in the following format: [A-7(1)] to represent Articles 7(1) of Part A of the BCS and [A.2.2.2] to represent the Articles A.2.2.2 of Exhibit A of the AIA.

PROJECT PHASES AND STRUCTURE OF CONTRACT

Basically the contract clauses indicate when an action, measure, procedure and other relevant actions should take place. Based on this, the corresponding project phase, whether it is the pre-design, design, construction and/or completion phase was carefully indicated for each responsibility or risk identified. The four project phases which parallel with pre-bidding, bidding and post-bidding (contract) is shown in Figure 1. The start and/or the end of pre-bidding, bidding and contract occurs in the design phase. Hence, each milestone is to make clear the boundaries between pre-design and design, pre-bidding and contract, and design and construction phases respectively. The responsibilities and risks discussed are mainly during the pre-bidding and contract phases, considering that bidding is merely a transition point to the contract phase.

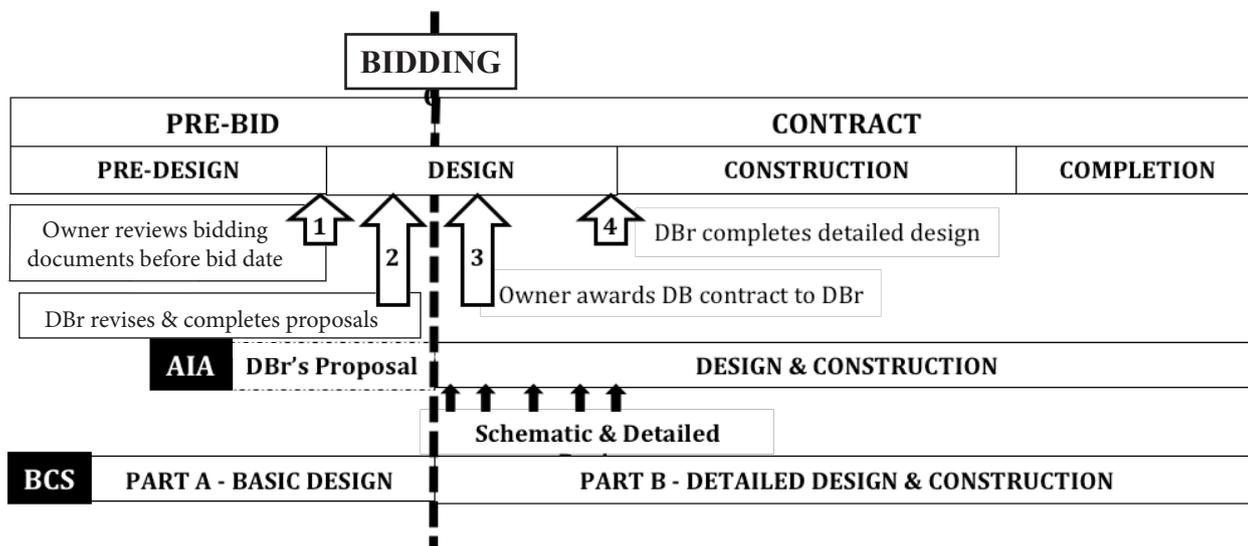


Figure 1: Phases of project and structure of contract bidding

The relative start point of Owner-DBr relationship, for which each contract may find suitable, depends on the contract structure as indicated in Figure 1. In the US, a DBr starts his relationship with an Owner at the pre-bidding meeting, where the selected DBrs are each given a copy of the bidding document (Sieben, 2003). The document contains the project criteria, and is usually substantially developed by the Owner beforehand (Haltenhof, 1999). The Owner will revise and update his project criteria based on feedback from the DBrs during pre-bidding meetings. Subsequently, based on the Owner's revised project criteria the DBrs will develop and submit their design and cost proposals to the Owner for evaluation. After the contract award, the chosen DBr will further develop the proposals into schematic drawings and gradually into detailed designs. Under the BCS, a DBr may start his relationship with an Owner earlier than under the AIA. The BCS contract is a two-part contract consisting of Basic Design Contract and Design and Construction Contract. The normal practice is to have first part of the contract being carried out before the contract is signed. The Owner and DBr will together develop the project criteria, prior to the DBr developing the basic design. Saito (1999) points out that indefinite scope of project before starting a contract is one of the characteristics of Japanese DB. This explains the necessity for Owner to work closely with DBr at earlier points of time. In both contracts, even though the contract that binds Owner and DBr is materialised only after the bidding, the rapport and collaboration were actually established since pre-bidding as both have certain responsibilities to fulfill.

The AIA contract is a single contract. It was revised from two parts of the former 1996 edition which consists of Part 1 for preliminary design and budgeting (a feasibility study) and Part 2 for the full design and construction phase. The two-part format allowed Owners to decide whether to go forward with the team (or with the project) after a feasibility study. Due to complaints that Owners sometimes

terminated DBr after getting often inexpensive design and estimating services, the current contract insists that Owner must proceed with the same DBr, unless the Owner elects to terminate the contract for private reasons, but at an exorbitant cost (AIA, 2005). On the contrary, the BCS contract is a two-part contract which allows Owner to appoint a new DBr for the second part of the contract. However, it is stated in both parts of the contract [A-1(2) and B- 1(2)] that Owner and DBr have entered the contract with expectations that the same DBr will undertake all the planning, design and construction works. This serves as a form of guarantee that the DBr would be continuously engaged by the Owner until completion of the project. Interestingly, Stark and Perkins (2003) reported that it is common in some countries like Japan, where the DBrs is sophisticated, for design-build teams to appoint a project after the design has been developed by a separate design team. This can be perceived as an indicator of the inherent complex nature of DB projects in Japan. It also highlights the risk of termination faced by DBr when adopting two-part contract. All these point towards the need to design and implement a more comprehensive standard contract form which caters for the interest of all parties involved, in a fairer and more transparent manner.

RESPONSIBILITIES AND RISKS DURING PRE-BIDDING

PROVIDING INFORMATION AND SERVICES

Owner has crucial responsibility to provide information and services necessary for DBr to perform work at the initial stage of the project, mainly during the pre-design and design phases. Sufficiently described and communicated project criteria and other relevant information by Owner are vital to ensure DBr fulfils the Owner's desired end product and to avoid risk of the incompletion later. Each contract describes the information as required to be provided by the Owner (see Row 1 of Table 1). The BCS gives a brief account of the Owner's responsibilities to provide the necessary information in general terms. Conversely, the AIA provides more detailed description of the various information and services necessary for the Owner to furnish and communicate to the DBr. The AIA also mentions that the DBr is entitled to rely upon the accuracy and completeness of all information etc. provided by the Owner. These impose greater responsibility on the Owner to ensure that transfer of all the necessary information is accurate, complete and ready for the DBr before the bidding.

In regards to project criteria, Levy (2006) reported that the A141 document was revised from two parts into single contract after taking into consideration the concerns of some owners who question the need for a separate preliminary phase type document, when they are able to develop their own project criteria agenda or hire their own consultants for that purpose. This explains the expectation for the Owner to provide well-conceived project criteria for the DBr during pre-bidding phase under the AIA. In contrast, under the BCS as reflected in the foregoing general clause statement, the project criteria provided by the Owner is rather preliminary. The Owner has to cooperate and work with the DBr to further develop the project criteria.

SITE INVESTIGATION AND DIFFERING SITE CONDITIONS

In shifting the risk of site uncertainty to Contractor, the bidding price inevitably rises to the disadvantage of Owner, as the problems may never arise at all. Rather than prepaying for such unforeseen problems, it is believed that the Owners may best handle this exposure by permitting the Contractor to recover additional costs and to obtain a time extension under a differing site conditions clause (Beard et al., 2001). Considering this possibility, especially if the anomaly is discovered later after the bidding, the AIA places the responsibility to obtain information relative to site characteristics on the Owner, which includes site surveys and geotechnical studies. In addition, the "concealed conditions" clause in the AIA's holds the Owner responsible to investigate and account for all subsurface latent and unknown physical conditions, so that the DBr is fairly granted appropriate adjustments to the contract price and period (see AIA-Row 2 of Table 1).

Conversely, the BCS does not specifically mention on surveys and geotechnical studies, let alone state who should bear this responsibility. On differing site conditions, the BCS again does not specify who should conduct the investigation. The clause [B-29(1)-(3)] requires Owner, DBr and Nominated Supervisor to negotiate in resolving the anomaly (see BCS-Row 2 of Table 1). Based on this clause, presumably this responsibility and the associated risks are shared by Owner and DBr.

Table 1: Excerpt of selected clauses for responsibilities and risks during pre-bidding

Row	Contractual issues	BCS	AIA
1	Information and services (including site investigation) to be provided by Owner	Owner's intention, requirement, or request in connection with project. Data, information and other materials necessary for DBr to perform its service [A-7(1)]	Project criteria [A.1.1.2]; services of survey, geotechnical engineers or other consultants [A.2.2.2, A.2.2.10]; results and report of test, inspection or investigations [A.2.2.3]; and other required information and services [A.2.1.2, A.2.2.1 and A.2.2.6].
2	Differing site conditions	Observing party shall give notice to other parties. Owner, DBr and Nominated Supervisor shall negotiate to reach a consensus if it becomes necessary to make changes in the construction work, extend time completion and adjust remunerations [B-29(1)-(3)].	Observing party shall give notice to other party. Owner shall investigate the subsurface/ concealed/ unknown physical conditions, negotiate with DBr to adjust Contract Sum and Contract Time if necessary [A.4.1.4].
3	Reliability of Owner's information & services / DBr's feedback to Owner's information	DBr may require Owner to confirm, explain, consult or negotiate data, information and other materials provided by the Owner that DBr has doubt in [A-7(3)]. DBr shall report any discrepancy in Owner's data, information or other materials; changes in laws, etc. and; other causes that may affect the scope, details and/or term of the services [A-8(1)].	DBr entitles to rely upon the accuracy and completeness of services, information, surveys and reports [A.2.26] and information contained in project criteria [A.1.2.2], shall carefully study and compare DB Documents, materials and other information provided by Owner, take field measurements of any existing conditions related to Work, observe any conditions at site affecting Work, report any errors, inconsistencies or omissions discovered [A.3.2.4].

GIVING FEEDBACK TO OWNER'S INFORMATION

With the information and services provided by Owner, both contracts allow DBr to give some feedback throughout the project, especially during the pre-bidding (pre-design and design phase) (see Row 3 of Table 1). In both contracts, risk of inaccuracy in the Owner's information can be avoided by the DBr's feedback, meaning responsibility in ensuring the accuracy of the Owner's information is partly transferred to the DBr.

RESPONSIBILITIES AND RISKS DURING CONTRACT

OWNERSHIP AND USE OF DESIGN AND DOCUMENTS

The BCS has a wider scope of project products than the AIA, as listed in Table 2 (see Row 1). The risks allocation in this issue is considerably equitable between Owner and DBr, even though the AIA vaguely states who owns the copyright in the Instrument of Services. If the Owner terminates its DBr, the Owner is granted a license by all of the design professionals to use the documents for completion of the project as long as the Owner assumes the DBr's duties to design professional and pays all amounts due to the design professional and its consultants. If the Owner does not agree to assume these duties, the Owner can still use the documents as long as the Owner indemnifies and holds harmless the design professional from claims, expenses, and attorney's fee incurred, as a result [A.1.6.4].

The BCS clearly mentioned that DBr shall be the owner of the copyright of the project products (see Row 2 of Table 2). In the case of Basic Contract termination, Owner is given the ultimate right to use the project plan [A-11(3)2 and 3, A-16(1)1 and 2]. The DBr's liability related to project plans depends on when the termination happens. If the termination happens before the submission of the report, the DBr is not accountable [A-11(3)5] but, if it happens after the DBr's submission of report stating the completion of services and project plans, the DBr is liable to the Owner's request for rectification of defect (due to the the DBr's negligence) and claim damages arising from such defect [A-11(3)4]. This increases the liability and hence risks of the DBr. By paying the proportional fee to the DBr, the Owner legitimately owns the design, but the DBr is still liable for it. This can be construed as being unfair to the DBr in comparison to what is provided in the AIA as previously discussed, which provides the alternative to relieve the DBr from defect and claims arising from the design.

Table 2: Excerpt of selected clauses for responsibilities and risks allocation during contract

Row	Contractual issues	BCS	AIA
1	Project products	Project Plan [A-5(2)] – similar to Instrument of Services in AIA. Design documents, records, fully or partially completed Building, construction materials and building equipment [B-5(2)].	Instrument of Services – drawings, specifications, other documents & materials including those in electronic form [A.1.6.1].
2	Owner of copyright	DBr shall be the owner of the copyright of the project products [A-12(1) and B-8(1)].	DBr, DBr's Architect and other providers of professional services shall retain all common law, statutory, and other reserve rights, including copyright in that Instrument of Services [A.1.6.1].
3	Scope of changes in works	Services [A-8(1-2)], project plan [A-9(1-3)], design work, design document, construction work, completion time [B-15(1-2)], [B-40(1-2)].	Services, project criteria [A.1.2.2], design work, design document and other submittals, construction work, completion time [A.8.3.1].
4	Insurances and bonds (DBr)	Fire insurance or Contractor's all risk for partially completed building, construction materials and building equipment [B-35(1)]. Any other insurance [B-35(2)].	Insurances to protect DBr from certain claims [A.11.2.1.], Performance Bond and Payment Bond (if requested by Owner) [A.11.5.1].
5	Scope of damages	Building, construction materials and building structure, adjacent structure [B-31(1)], third party [B-32(1)].	Similar to BCS. Additional: employees, other persons who may be affected, equipment to be incorporated with the work and other property at the site [A.10.2.1].

CHANGES IN THE WORK

Both contracts allocate balanced responsibilities and risks by giving rights to Owner to request changes and in exchange provide DBr with reasonable contract sum, contract time and reimbursement due to the requested changes (see Row 3 of Table 2 for the scope of changes). The AIA provides three approaches of change instruction i.e. Change Order (based on Owner-DBr written agreement on a change in the Work, the amount of adjustment in the Contract Sum and the adjustment in Contract Time, if any) [A.7.2], Construction Change Directive (change instruction prior to DBr agreement) [A.7.3] and Minor Changes (changes not involving Contract Sum and Contract Time adjustment) [A.7.4]. Under the BCS, the nature of change instruction approach is identical to the Change Order under the AIA.

INSURANCES AND BONDS

The BCS requires specific insurances to be purchased and maintained by DBr, and the AIA states the scope of insurance cover that DBr should take into account (see Row 4 of Table 2). The BCS does not specify any insurance to be purchased by Owner, whereas under the AIA, Owner is responsible to purchase and maintain liability insurance [A.11.3.1], property insurance [A.11.4.1,4-10], boiler and machinery insurance [A.11.4.2], and loss of use insurance [A.11.4.3]. Under the AIA, both the Owner and DBr are well protected by the aforementioned insurances and bonds. But, under the BCS, not any single insurance the Owner is obligated to purchase and maintain to protect his interests. This may impose the Owner with very high risk of loss and damage if things do not turn out as planned.

DAMAGE PREVENTION AND LIABILITY

Both contracts point out DBr's responsibilities to take necessary damage and accident prevention measures (see Row 5 of Table 2 for scope of damages). However, the allocation of liability related to damages between Owner and DBr is more balanced under the BCS than under the AIA which place the responsibility more on the DBr. Under the AIA the cost of compensating loss and damage is placed entirely on the DBr's shoulder except for damage or accident which the cause is attributable to the Owner [A.10.2.5]. The BCS explicitly separates the cost of taking prevention measures and cost of compensating damage and loss. Basically, the DBr is responsible to perform the measures at his expense. But, the Owner will bear costs of any necessary measures taken for or in connection with protection of structure adjacent to the building and prevention of accidents that beyond the DBr's scope (or due care

and attention) or the cause is attributable to the Owner [B-31(2-5), B-32(2) and (4)]. The liability of compensating loss and damages: in general [B-33(1)-(2)], to third party [B-32(1)-(5)] and caused by force majeure [B-34(1)-(3)] has mostly the same principles of liability allocation in the damage prevention clauses as described before.

INDEMNITY

Indemnification provisions are standard tools for distributing the risk of loss on a contract. There are three major areas of indemnity issues typically arise in the design-build context, i.e. general indemnity, patent indemnity, and hazardous waste indemnity (Beard et al., 2001). The AIA's general indemnity is in a limited form that limits DBr's indemnity obligations to Owner and his personnel against claims, damages, losses and expenses to the extent of the DBr's own negligence [A.3.17.1-2]. The AIA form contains provisions requiring the DBr to indemnify the Owner for patent right violations [A.3.16.1]. There are no explicit clauses to address this issues in the BCS, but subtly mentioned in few clauses. DBr is liable for any loss or damage arising from or due to copyright infringement and responsible for the subsequent consequences. If there is any negligence from Owner, the Owner is to share compensating such loss or damages proportional to infringement [A-13, B-12].

The indemnity for hazardous materials in the AIA is from Owner to DBr as long as such damage, loss or expense is not due to the DBr's negligence [A.10.3.3, A.10.4 and A.10.5]. The BCS does not specifically address, but implicitly covers this issue under the prevention damage clause [B-31(1-5)]. In both contracts, whether stated explicitly as in the AIA or implicitly as in the BCS, adopt limited form of indemnity for the DBr to be exempted from any liability except for the losses due to its own negligence.

LIQUIDATED DAMAGES

The BCS provides a clear description on the reasons and value of liquidated damages that Owner and DBr are entitled to claim. It is interesting to note that the BCS fairly uses the liquidated damages not only as a technique to establish a 'penalty' to the DBr for late completion and delivery [B-42(1-2)], but also to compensate the DBr if the Owner is in arrears of or has delayed a certain payment to the DBr [B-42(3-5)]. The AIA does not address liquidated damages at all but approaches the failure of Owner making payment to DBr by allowing the DBr to claim for additional cost [A.4.1.6].

REPORTING PROJECT PROGRESS AND COMPENSATION FOR PROJECT DELAY

Any project is always exposed to the risk of project time delay. By requesting DBr to inform progress of the project at a certain frequency or time interval, Owner and DBr can possibly identify, mitigate and rectify problems that could lead to project time delay, hence reducing the occurrence of this risk. The AIA makes clear and states firmly that it is a duty of the DBr throughout design, construction and completion phases to prepare, submit, keep current schedule and perform work pursuant to the recent schedule [A.3.3.6 and 3.9.1]. On the other hand, this is not firmly stated in the BCS, except that the DBr is required to report and update the progress of the project upon the Owner's request [A-2(2), A-7(2), B-4(1) and B-14(1)]. This is in agreement with Kusayanagi (2007), who highlighted that normally in Japanese construction contract progress monitoring depends on the client's request. The contractor can change the work sequence freely provided that the completion date is ensured, in which case the completion date is the only milestone of the project. Pertaining to compensation for project delays, the AIA states that Owner and DBr should reimburse each other for any delays, improper timed activities or defective construction [A.6.2.3]. The BCS clearly states the calculation of value of the liquidated damages that the DBr should pay to the Owner due to project delays [B-42(1-2)]. This helps to emphasize the importance of strictly meeting the project completion date even though the responsibility of reporting project progress is loosely mentioned.

WARRANTIES

Warranty for defective design and defective construction respectively are among warranty-related issues that are unique to DB contracts and deserves careful consideration of the contracting parties (Beard et al., 2001). Both contracts do not contain warranty clause for defective design and the "standard of care" clause. The AIA specific warranty clause for defective construction requires the materials and equipment to be of good quality and new, work to be free from defects and conform to requirement of Design-Build Documents [A.3.5.1]. The warranty limits the defect liability period, the DBr's "call-back" obligations to defects that occur during the first year after substantial completion of the work or the date for commencement of warranties [A.12.2.2.1]. With this warranty, the DBr's responsibility to ensure acceptable quality of materials and equipment is greatly emphasized.

The BCS does not have the warranty clause. In regards to ensuring quality of materials and equipment, the BCS requires DBr to use only construction materials and building equipment that have passed the inspection of supervisor if such inspection is required by Design Document [B-26(1)]. This obligation in this clause can be perceived as optional as Kusayanagi (2007) points out that the quality of the works depends on the honesty of the Contractor because supervision or inspection depends on the Owner's interest

and if the specifications or drawing requires the Owner to observe the works and materials. In other clauses, the BCS also requires the DBr to ensure supervisor's inspection of furnish materials and lent articles by the Owner [B-27(1)] and ensure the quality of materials and equipment is in accordance with Design Document or of medium quality if not specified in the design Document [B-26(4)]. As for the period of defect liability, the BCS sets it for one (1) year or two (2) years from the date of delivery or the date of completion depending on the structure of the building. This period can be extended to five (5) year or ten (10) year if such defects have been wilfully caused by, or due to negligence on the part of the DBr [B-43(1)-(9)]. This longer period means higher risks for the DBr's call back obligation under the BCS than under the AIA.

SUSPENSION AND TERMINATION

Both contracts allow Owner to suspend or terminate services or contract for convenience. Under the BCS, if Owner suspends the DBr's services [A-14(1)], clause A-14(3) states the Owner's responsibility to take necessary measures. In the case of termination of Basic Contract [A-15(2)], the DBr can claim Services Fees proportional to the Services the DBr has already performed on or before the termination [A-16(1)]. As for suspension or termination of DB Contract, the DBr has the right for compensation for any loss and damage he suffers because of such suspension or termination [B-44(1)] and to claim an extension of time for completion of the construction work [B-44(4)] due to the suspension. The AIA approaches this contract suspension and termination slightly differently. In the case of contract suspension, DBr is entitled for Contract Sum and Contract Time adjustment [A.14.3.2]. Meanwhile for the case of contract termination, the DBr is entitled to receive payment based on the design service performed or construction work executed (depending on whether the termination is prior to or after commencement of construction), reasonable overhead and profit and cost incurred by such termination [A.14.4.3]. With regards to termination with cause by the Owner, the BCS requires the DBr to refund to the Owner the sum overpaid, upon the termination [B-46(2)]. The AIA sets a strict procedures where DBr shall not be entitled to receive further payment until the work is finished [A.14.2.3] and the DBr will be paid only the excess, if the unpaid balance of the Contract Sum exceeds costs of finishing the Work and other damages incurred by the Owner. If such costs and damages exceed the unpaid balance, the DBr shall pay the difference to the Owner [A.14.2.4].

The BCS allows the DBr to suspend the services or terminate the contract in certain cases due to the Owner's fault [A-14(3), B-45(1), (4), (5)]. In the case of suspension, the DBr may claim an extension of time for construction work from the Owner [B-45(3)]. In both suspension and termination, the DBr is entitled to claim damages from the Owner [B-45(6)]. Under the AIA the DBr is allowed to terminate contract for certain causes not only due to act or fault of the Owner, but other parties such as court, public authorities or government [A.14.1.1-2,4]. Upon termination, the DBr is entitled to claim from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages [A.14.1.3]. The DBr also has the right to stop the work due to failure of payment by the Owner [A.9.7.1]. In both contracts, the Owner and DBr are given the fair rights to terminate and suspend work or services.

DISPUTE RESOLUTION

Settlement of dispute before mediation or conciliation is through litigation [A-17(2)] under certain procedure or act for the Basic Contract of the BCS. Meanwhile, the AIA recommend a Neutral (or Owner, if a Neutral have not been identified) to provide initial decision of claim between the Owner and DBr before resolving it through mediation or arbitration or other equitable dispute resolutions proceedings [A.4.2.1-3]. The BCS and AIA adopt similar approach of dispute resolution i.e. through mediation and arbitration if the preceding resolution procedures cannot resolve the disputes. In both contracts the Owner and DBr bear the related expenses equally.

OVERALL ALLOCATION OF RESPONSIBILITIES AND RISKS

SUMMARY OF RESPONSIBILITIES AND RISKS ALLOCATION DURING PRE-BIDDING

The main responsibilities of Owner during pre-bidding phase revolves around providing project criteria and other necessary information and services, which includes site investigation for the DBr to perform his work. The AIA mentions all these responsibilities clearer than the BCS. Under the AIA, Owner is expected to provide well-conceived project criteria. The Owner under the AIA bears greater responsibilities and risks in ensuring its accuracy and completeness compared to Owner under the BCS which works with DBr in developing it. Both contracts place the responsibility to provide reliable information and other services on the Owner. However, through feedbacks from the DBr, the Owner's responsibilities and risks related to the inaccuracy of the information and services are, to some extent, transferred to and shared with the DBr. In summary, under the AIA the Owner bears higher responsibilities and risks than the DBr during the pre-bidding. This goes the same if compared with the Owner under the BCS especially with regards to project criteria. As the DBr is significantly involved and assists the Owner throughout the pre-bidding phase, the responsibilities

and risks borne by both parties are pretty balance under the BCS. Compared to the DBr under the AIA, relatively the DBr under the BCS has greater responsibilities and risks. The left side of Figure 2 depicts this allocation of responsibilities and risks during the pre-bidding phase.

SUMMARY OF RESPONSIBILITIES AND RISKS ALLOCATION DURING CONTRACT

Under the BCS, there is no drastic change of responsibilities and risks allocation from Owner to DBr during pre-bidding and contract phase. In many cases, together with the DBr the Owner partly bears some of the responsibilities and risks. Specifically, the considerably equitable responsibilities and risks allocation between the Owner and DBr is evident with regards to differing site conditions, prevention of damages during construction, changes in works, dispute resolution, liquidated damages and rights for termination and suspension of services or works as previously discussed. The top right side of Figure 2 depicts this equitable allocation of responsibilities and risks between the Owner and DBr under the BCS during the contract phase.

Without acquiring any insurance, the Owner under the BCS exposes himself to risks that may jeopardize his interests related to the projects. Only the BCS clearly addresses that Owner also bears some responsibilities and risks with regards to his furnished materials or lent articles and settling disturbance to performance of construction work due to any cause not attributable to the DBr. Hence, the Owner seems to bear greater responsibilities and risks under the BCS than under the AIA.

Under the AIA, Owner responsibilities including coordinate subcontractor and supplier participation and review and approve most technical documents are significantly transferred to DBr and the Owner maintains his roles to perform necessary reviews. The Owner also significantly transfers the responsibility and risks to maintain construction quality control to the DBr, especially during construction. The DBr's responsibility to warrants the quality of materials and equipment under the AIA, impose greater risks in comparison to the measures ensuring their quality taken by the DBr under the BCS which lacks of enforcement.

Providing and updating construction schedule is one the responsibilities that Owner transfers to DBr. Reporting project progress is firmly emphasized in the AIA as one of the DBr's responsibilities during contract phase. Therefore, the DBr under the AIA has greater responsibility compared to the DBr under the BCS which the necessity to report relies on the request from the Owner. Other DBr's responsibilities which are exclusive in the AIA includes responsibility to make necessary payment for execution and completion of the Work related to labour and materials and taxes and to pay Contractor and to ensure Contractor pay his sub-contractor and supplier which the BCS does not address. These contribute more risks to the DBr under the AIA than under the BCS. In overall, during contract phase, the Owner significantly transfers his responsibilities and risks to the DBr as shown in the bottom right side of Figure 2.

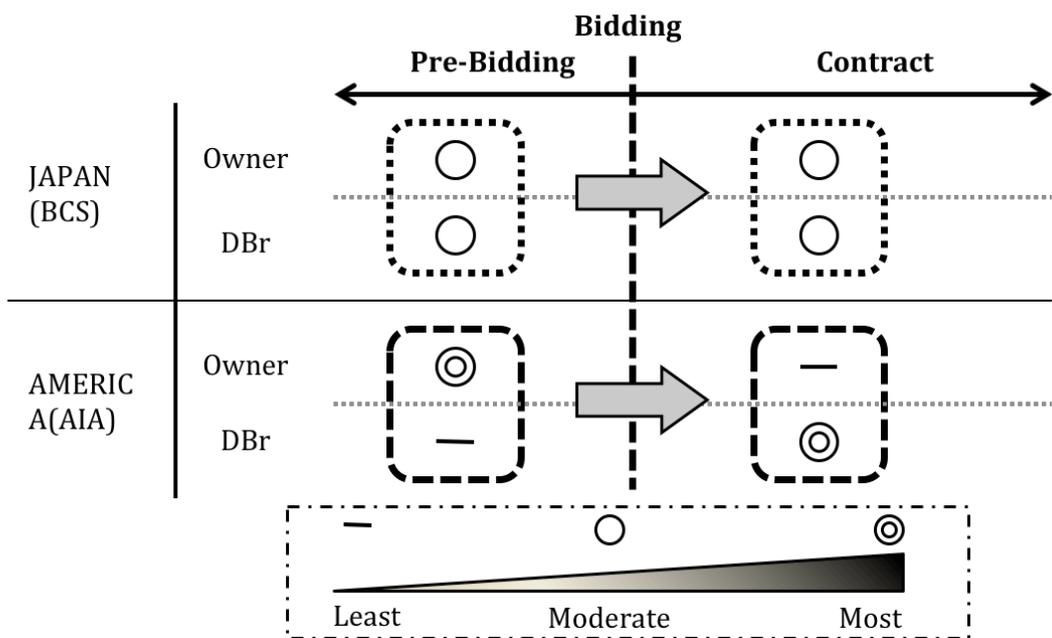


Figure 2: Allocation of responsibilities or risks of Owner-DBr throughout project phases

CONCLUSIONS

This paper has made clear the differences and similarities of the primary contractual issues and the pattern of responsibilities as well as risks allocation in both contracts. In the AIA, the Owner is responsible to furnish the DBr with all relevant information and project criteria in the pre-bidding phase, on which the project's success is heavily dependent. A shift in the level of responsibility is observed in the contract phase though, where the Owner significantly transfers his responsibilities and risks to the DBr. On the contrary, both Owner and DBr seem to have equitable allocation of responsibilities and risks in the BCS. As the project progresses from pre-bidding to contract phase, there is no drastic change in the responsibilities and risks between the Owner and DBr. Through this comparison exercise, it can be concluded that the BCS contract addresses all important contractual issues rudimentary to a DB standard contract form. However, some issues such as site investigation and differing site condition, insurance for Owner, indemnity and warranty were found to be lacking in emphasis. These are areas which require further review for their inclusions in the contract. Two-part contract, start point of Owner-DBr relationship and readiness level of project criteria are also observed as key differences between these two contracts. These hint that the Japanese DB contract is distinct from its American counterpart due to the different condition, nature and characteristic of construction projects, as reflected in the respective contract forms.

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DEVELOPING VIABLE MEANS OF DELIVERING INFRASTRUCTURE PROJECTS IN NIGERIA

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This article presents a holistic approach towards the development of a viable (successful) infrastructure delivery system in Nigeria. It portrays the already established theory which supports the relationship between the availability of infrastructure stock and economic growth, particularly looking at the importance attached to infrastructure development by industrialized economies particularly the UK. The study also takes a critical look at the situation of contemporary infrastructure stock in the country and asserts, after a review of literature on the subject matter that there is a massive infrastructure deficit in the country. It identifies the contributions of other researchers towards identifying the barriers and resolving these barriers towards achieving the much needed infrastructural development and economic growth. It also concerns itself with trying to ascertain the parameters used for the measurement of success of infrastructure projects in Nigeria and concludes that the overriding parameter for such measurement should be the use of the organisation's major objective for engaging in such a project and that this parameter should be project-specific. This would enable stakeholder satisfaction in the long-run. The Nigerian government has insisted, through the issuance of policy documents ranging from the National Economic Empowerment Development Strategy (NEEDS) to the most recent Vision 20:20:20, that improved investment and subsequent delivery of infrastructure remains central to its delivery of socio-economic benefits such as employment and poverty reduction initiatives to the citizenry. It obviously lies with the government, as the largest procuring authority in the country, to make these socio-economic benefits come to fruition. This paper sought to understand the preferential procurement systems in existence in certain parts of the globe, in principle that is with a view highlighting the benefits of such policies so as to bolster the attainment of this success criterion. After a thorough review of literature on the aforementioned issues, this paper concludes by summarizing all the suggestions which have been made in the literature reviewed for the development of viable infrastructure in Nigeria and recommends for further investigations to be carried out to verify the feasibility or otherwise of these suggestions within the Nigerian scenario towards the development of a viable infrastructure delivery system. This study forms part of an on-going PhD study, aimed at developing an alternative infrastructure delivery mechanism for Nigeria.

Keywords: infrastructure, Nigeria, procurement, public procurement, viable infrastructure delivery

INTRODUCTION

Nigeria, with a population of 154 million and a landmass of about 900,000sq km, remains the most populated country in Africa (World Bank 2011). The country is the largest exporter of oil in the continent and sixth largest in the world, with huge natural gas reserves and currently ranks second to South Africa in the league of the continent's biggest economies (World Bank 2011).

In spite of its acclaimed wealth, the country is currently suffering from severe infrastructure deficit (Okonjo-Iweala and Osafo-Kwaako 2007, Soludo 2007). Nigeria is lagging behind among its peers in infrastructure development and this is due to issues such as the exposure to the incessant fluctuations in oil revenue which constitutes about 86% of its total revenue (Gidado 2010), lack of transparency and prevalence of corrupt practices within the realm of public procurement. Other factors include; – lack of the requisite project management skills, poor regulatory capabilities, weak local financial markets (Gidado 2010, Okonjo-Iweala and Osafo-Kwaako 2007). This has led to strident calls for the adoption of private financing to serve as a boost for the much anticipated infrastructural development initiative (Okonjo-Iweala and Osafo-Kwaako 2007). It is envisaged that major investments in Infrastructure would aid the growth of the Nigerian economy, thus providing employment and avenues for the empowerment of the teeming army of unemployed people and enhancing the country's chances of attaining the Millennium Development Goals (MDG)'s in the nearest future (Alkali 2005).

This paper carries out a literature review of the salient issues hindering the successful delivery of infrastructure in Nigeria and highlighting areas where further studies are required for the purpose of proposing ways of eliminating these hindrances. This paper is

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based on a comprehensive literature review of the infrastructure procurement practices in the UK. In the next phase of the research, this will be reviewed and detailed analysis of other developed and developing countries will be undertaken. The types of infrastructure delivery systems in the UK are analysed and an overview of the present state of Nigerian infrastructure is reported. The paper attempts to proffer a definition of infrastructure and also highlight the relationship between infrastructure and economic growth according to a particular school of thought ((Schubeler 1996; Kirkpatrick et al 2006; Esatche 2004; Howes and Robinson 2005; Sineska and Simuknaite 2009; Akampurira et al 2009). It also understudies the use of privately financed procurement systems (PPPs) which has been deemed as a panacea for Nigeria's infrastructure development woes (Okonjo-Iweala and Osafo-Kwaako 2007). The UK practice was selected due to its advancement in PPP and PFI in infrastructure development. In trying to explore effective means of delivering infrastructure, the paper appraises the parameters for measuring project success in line with viable infrastructure delivery. It looks at public procurement strategies and how they could be modified to achieve viable infrastructure delivery based on the established project success criteria. This study concludes by highlighting the various means proffered by various researchers through which Nigeria's infrastructure delivery systems could be optimized but advocates for further research in this area as most researches are centred on the PPP procurement system with numerous recommendations for its immediate usage in the Nigerian context.

INFRASTRUCTURE – A DEFINITION

A universal definition for the term infrastructure continues to evade most researchers thus causing Sineska and Simkunaite (2009), Baldwin and Dixon (2008) and Prud'homme (2004) to posit that there is no generally accepted definition for the term infrastructure. They further stated that instead of proffering a definition for the term infrastructure, most researchers were content on stating what constituted the term infrastructure. As if to buttress this point, Oyegoke, (2010) refers to Miller (2002) to have defined infrastructure as comprising of capital facilities, transportation, public services and utilities and environmental restoration. Howes and Robinson (2005) cited Jochimesen (1966) as having described infrastructure as “the sum of all basic materials, structures, institutional conditions and human resources available to the society, needed for the proper functioning of the economic sector. Infrastructure has often been classified along the economic and social divides (Sineska and Simkunaite 2009). Jochimesen's attempt at classifying infrastructure led to the creation of three categories namely, institutional infrastructure, personal infrastructure, and physical infrastructure (Howes and Robinson 2005).

In the UK, the OECD (2009) stress that economic infrastructure drives competitiveness and supports economic growth by increasing private and public sector productivity, reducing business costs, diversifying means of production and creating jobs. Sineska and Simkunaite (2009) maintain that economic infrastructure pertained to any type of infrastructure, usually highways, airports, seaports, telecommunications and electricity, which promotes economic activities whereas social infrastructure, such as libraries and hospitals, are defined as those infrastructure that boosts health, education and cultural standards within the society. Howes and Robinson (2005) in a functional categorization of infrastructure alluded to the fact that physical infrastructure assets could be classified into the following, namely; – social, trade and technical (economic) infrastructure, where the economic infrastructure could be said to comprise of the long-lived networked, capital-intensive and engineered structures indirectly supporting economic production. For the purpose of this study, the term, infrastructure, shall be used to connote only economic infrastructure, which can be defined as any physical improvement or structure capable of increasing the levels of productivity of any given society and encouraging better living conditions among its citizenry (Ashauer 1989; Howes and Robinson 2005; Baldwin and Dixon 2008; Akinyosoye 2010).

INFRASTRUCTURE – AS A CATALYST FOR ECONOMIC GROWTH

Infrastructure has been identified as a major factor, imperative for sound economic growth (Schubeler 1996; Kirkpatrick et al. 2006; Esatche 2004; Estache and Limi 2008; Sineska and Simuknaite 2009; Akampurira et al. 2009; Akinyosoye 2010). The impact of infrastructure on the economic productivity has also been highlighted by several authors (Prud'homme, 2004; Liang et al. 2004; Harris 2004; Estache 2004; Khan 2005; Kirkpatrick et al. 2006, Sineska and Simuknaite 2009; Gidado 2010; Infrastructure UK 2010; Hawkins and Wells 2006; Akinyosoye 2010). Thus the inherent processes leading to effective and efficient infrastructure delivery has become a central theme to most economic and construction discourse in contemporary times. Akinyosoye (2010) captures it aptly when he asserts that direct investment in infrastructure would lead to the development of intermediate inputs to production and the improvement of productivity levels in other sectors of the economy such as manufacturing. He further draws a relationship between the declining investment in infrastructure in Nigeria and the attendant retarding economic growth. This is more prevalent in developing countries where much emphasis is laid on infrastructure development as means of achieving any meaningful economic growth.

GLOBAL INFRASTRUCTURE – DEVELOPMENT STRIDES

In most economies, there has been renewed drive for infrastructure development or renewal with such issues reaching a crescendo in recent times (Akintoye et al. 2003; Infrastructure UK, 2010). Taking a cue from the UK scenario where there are plans to improve on and/or renew infrastructure stock over a five year period (2010-2015) through the National Infrastructure development plan (Infrastructure UK, 2010), a plan that is virtually lacking in Nigeria, we can understand the need for continuous investment in infrastructure. The anticipated infrastructure development plan is expected to gulp about £200BN (Two Hundred Billion Pounds) thus portraying the huge costs of infrastructure development on the nation's purse. This plan among other studies maintains that private finance would continue to play a leading role in the development of the country's infrastructure (Infrastructure UK, 2010; Kwak et al. 2009; Medda 2007; Akintoye et al. 2003). In the UK, many infrastructure assets have been procured and are still being procured within the past two decades through several privately financed schemes such as the Private Finance Initiative (PFI) and the Public-Private Partnership (PPP) (Kwak et al. 2009; Medda 2007). The provision of infrastructure under the PPP/PFI regime in the UK has witnessed a shift from the delivery of buildings and other civil engineering works to the supply of public services by the private sector counterparts for a fee.

Having asserted that most of the issues that led to high infrastructure delivery costs in the UK were attributable to the pre-construction stage and other ancillary costs, the report went ahead to identify five (5) key objectives that would lead to effective and efficient infrastructure development in the UK (Infrastructure UK 2010). These key objectives include:

- The creation of greater visibility and continuity of the infrastructure investment pipeline through the publication of future investment programme in the national infrastructure plan
- Effective governance
- Greater discipline in the commissioning of projects and programmes
- Smarter ways to use competition
- Encouragement of industry and advisory community to invest in efficiency and the subsequent reduction of direct costs of construction (Infrastructure UK, 2010)

In other parts of the world there have been renewed efforts by the various governments to increase the investment on infrastructure in recent times (Baldwin and Dixon 2008; Akinyosoye 2010; Infrastructure UK 2010; Estache and Limi 2008). Instances abound of several countries leveraging on the use of the private sector to procure various infrastructural assets as this strategy has proved to be not only politically expedient but also trustworthy in the procurement of numerous assets within a short duration as can be seen from the UK scenario (Grimsey and Lewis 2005; Zang 2005; Medda 2007). In fact, Lewis (2005) cited various surveys carried out by Flyvberg et al. (2003), HM Treasury (2003), and NAO (2005) as agreeing with the fact that PPP/PFI arrangement witnessed no time or cost overruns when used for the development of infrastructural projects in the UK.

STATE OF INFRASTRUCTURE IN NIGERIA

In a recent study carried out by Foster and Pushak, they successfully catalogued the current state of Nigerian infrastructure ranging from telecommunications to power and energy, from transportation through to water projects (Foster and Pushak 2011). They lamented the absence of access to potable water projects for a majority of the citizenry and the inadequate power generation and transmission capacity (Foster and Pushak 2011). They stressed the negligible number of motor able roads and when they were, they were in very bad condition (Foster and Pushak). The recent success of the telecommunication sector which was privatized was also highlighted in their study, using it to serve as a poser to the need for private sector finance and expertise in hitherto public sector areas. Infrastructure delivery in Nigeria is decentralized along the various tiers of governments namely; – Federal, State and Local governments in such a manner that is similar to the USA approach to infrastructure delivery (Miller et al. 2000). That these various tiers of government have performed abysmally in the provision of the required infrastructure is no longer news given the vast amount of available literature which highlight this fact (Okonjo-Iweala and Osafo-Kwaako 2007; Gidado 2010; Akinyosoye 2010; Ibrahim et al. 2006; Kauffmann 2008; Foster and Pushak 2011), what would be received as news is the development of a more efficient and effective means through which this abysmal tide can be overturned in the nearest future, and this is what this study is all about.

Nigeria ranks top among African countries wherein the state of the transport infrastructure among others has been described by Kauffman (2008) and Hammouda (2006), as strikingly underdeveloped. After a thorough appraisal of the transportation infrastructure in Africa, she lends credence to the views held by Soludo (2007) and Okonjo-Iweala and Osafo-Kwaako (2007) that the continent

in general needed more than government's investment to bridge the infrastructural deficit (Kauffmann 2008). Kauffmann (2008) opines that the problems which have given rise to the falling standards in infrastructural development in Africa are as a result of the following namely: Lack of a coherent policy framework, Inadequate financing, financing of socially desirable but non-bankable projects and high transaction costs. These factors have been taken care of under the UK National Infrastructure Plan for the UK. Table 1 presents in a tabular form these enunciated problems acknowledged by Kauffmann (2008) and the solutions proffered by the UK to such problems in the Infrastructure UK report (Infrastructure UK).

Table 1 Problems with infrastructure development

IDENTIFIED PROBLEMS AFFECTING INFRASTRUCTURE DELIVERY IN SUB-SAHARAN AFRICA	UK BASED SOLUTIONS
Lack of coherent policy framework	Good governance
Inadequate financing	Maintenance of Pipeline of works
Financing of socially desirable but non-bankable projects	Ensure proper commissioning of projects
High transaction costs	Standardization of contracts

There has been severe clamour for the adoption of private finance for the bridging of the infrastructure deficit currently stifling the country given the attendant costs which the government would have to incur if the public sector were to shoulder such expenditure (Okonjo-Iweala and Osafo-Kwaako 2007; Soludo 2007; Gidado 2010). In the raging debate about the amount needed to shore up the nation's infrastructure stock, Soludo (2007) insisted that there is need for an annual investment of approximately \$10 billion (£6.3BN) per annum for a period of 10 years to bring Nigerian Infrastructure up to date or at par with that of its contemporaries. Okonjo-Iweala and Osafo-Kwaako (2007) have called for an annual investment of \$5 billion annually (£3.1BN) over a period of 10 years. The sum mentioned by these parties portrays the lack of proper and effective information with regards to the cost of bridging the attendant infrastructure deficit in Nigeria. The UK with its current infrastructure stock according to the National Infrastructure Plan (NIP) is budgeting to spend about £40BN per annum over the next five years (Infrastructure UK 2010). Foster and Pushak (2011) posit that Nigeria needs to invest \$14BN (£9BN) or 12% of the GDP over the next decade to address its infrastructural constraints. They reveal that the current investment in infrastructure in Nigeria at the federal level stands at \$5.9BN (£3BN) per annum (Foster and Pushak 2011). This signifies a percentage increase of 200% from the present day funding arrangements if any success is to be achieved over the next decade. It is worthy to mention here that the figures given are only with regards to the federal infrastructure as there was no evidence of prior investments and/or projected future investments in infrastructure among the federating states, as at the time of writing this paper, from the litany of literature available on the subject area.

A proper picture of the state of Nigeria's infrastructure stock can be obtained in Foster and Pushak (2011). They (Foster and Pushak 2011), under the auspice of the World Bank conducted a comprehensive review of the state of Nigeria's infrastructure. The much advocated for PFI/PPP initiative is not devoid of problems as previous studies have shown (Grimsey and Lewis 2005; Palmer 2000; Medda 2007; Zang 2005). These studies have shown that the implementation of the scheme in the UK has encountered problems ranging from the authenticity of the value for money claim, poor relationship management within the partners, financing amongst the participants, inadequate risk allocation among the partners, governance issues, long term contracts constraints to uncertainty issues which have led to higher contracting costs (Grimsey and Lewis 2005; Palmer 2000; Medda 2007; Zang 2005). In their appraisal of PPP/PFI schemes around the globe, Kwak et al. (2009) identified numerous problems confronting the success of projects delivered through this arrangement. The problems included ranged from the absence of local capital markets in developing countries, the lack of transparency and the inability of the public sector to effectively negotiate and enter into contractual agreements of such nature with the private sector (Kwak et al. 2009). Akintoye et al. (2003) lamented the lack of project management skills within the public sector especially in developing countries, stressing that this was capable of undermining project success.

Gidado (2010) in assessing the possibility of implementing a PFI model within Nigeria, through an extensive review of literature, identified certain factors as being responsible for the failure of most infrastructures being delivered through the traditional infrastructure delivery system in the country. These factors include the following, namely:

- Declining funds in real terms
- Spiral corruption resulting from lack of transparency
- Lack of legal and financial frameworks
- Poor capacity in managerial and technical expertise (Gidado 2010)

Whilst comparing these factors identified by Gidado (2010) with the ones established by Kwak et al. (2009) earlier on, it becomes glaring that the same issues also affect infrastructure projects being procured through private sector intervention in other regions.

Ibrahim et al (2006) whilst advocating for the utilization of the PPP medium as an avenue to improve on Nigeria's Infrastructure deficit, evaluated the potential risks of the PPP scheme and suggested that the public sector need to accept to bear some risks which they are better placed to bear. Kauffmann (2008) is of the opinion also that the cooperation between the private sector and the public sector should be arranged in such a manner that it would be in the overall interest of the public through the employment of strong accountability mechanisms, consistent contractual arrangements and effective relationship management.

From the foregoing, it becomes pertinent to note that the same problems remain capable of deterring the Nigerian nation from its infrastructure development efforts under a PPP/PFI regime. Despite these advocacies for the involvement of private sector finance in bridging the infrastructure gap between these countries (developing countries) and the developed/industrialized ones, it is noteworthy to state that the inherent lack of transparency within the realm of public procurement in countries such as Nigeria stands to undermine whatever benefits are expected to be derived by such involvement (Soreide, 2004). So what is the way forward for Nigeria in this regard?

Given the recent support accorded to the advocates for the adoption of the PPP initiative by the Nigerian Government as can be ascertained from various actions such as the inauguration of the Infrastructure Concession and Regulatory Commission, and the various policy documents such as the NEEDS document (NPC, 2004) and it thus becomes necessary to insist that the introduction of the PPP initiative, into the Nigerian Infrastructure delivery system, must take into consideration the inherent peculiarities of the Nigerian society such as the socio-cultural and economic inclinations of the host communities. The earning power of the average Nigerian should also be taken into consideration given the fact that the end users are expected to pay for the services rendered by the procured infrastructure as has been advocated by Estache (2004) in his study of privatization in Latin America.

Despite the adoption of the National Economic Empowerment Development Strategy (NEEDS) charter in 2004 under the erstwhile administration of Mr Obasanjo, there has not been any commensurate improvement in the living standards of the average Nigerian and most of the core objectives of the NEEDS initiative remain unattained or even forgotten. The country presently has an estimated fifty million unemployed youth (World Bank 2011), and Alkali (2005) maintained that about seventy million Nigerians were living below the poverty threshold. It could be argued that given the relationship between Infrastructure and economic growth (Estache 2004), this statistics can be reversed if the provision of infrastructure is handled in such a manner that it empowers the host communities and also gives them a sense of ownership of the potential infrastructural project thus enhancing good governance and transparency.

VIABLE INFRASTRUCTURE DELIVERY

The Oxford Advanced Learner's dictionary defines the term viable as connoting the fact that something "can be done; that will be successful". What constitutes and which process leads to project success for the delivery of such public goods like infrastructure becomes an issue of further arguments.

With regards to the development of a viable means for infrastructure delivery in Nigeria, there is need to decipher what viable infrastructure system represents. The term "viable" in most literature especially with regards to systems has been used to connote that particular characteristic of a given system to survive in a given environment notwithstanding the degree of adversity or comfort which the environment exerts on the system (Espejo 2003). These systems don't only possess the ability to survive but also retain within themselves the capability to respond to any uncertainty resulting from its host environment capable of undermining its performance (Espejo 2003). Within the Nigerian scenario, the term viable infrastructure delivery system represents the capability of the system selected for the purpose of delivering infrastructure to withstand the exogenous and endogenous risks (Ibrahim et al. 2006) posed by the Nigerian project environment to deliver the client's (public) objectives.

London (2004) and Akinyosoye (2010) argue that the use of the most appropriate procurement strategy plays a major role in determining project success. Given that no procurement system can be deemed as the best for all construction projects, infrastructure projects inclusive due to the inherent uniqueness and complexities involved (Reve and Levitt 1984; Baccarini 1996; Liang et al. 2004; Gidado 2010), this study realises that there has been negligible or no attempt to localize these procurement initiatives and the parameters for measuring project success so as to suit the cultural and socio-economic objectives of the host societies where these projects would be situated. Luu et al. (2003) whilst trying to develop a new model for procurement method selection, advocated for the selection models to be tailored towards proffering bespoke solutions to specific projects. They stated that the selection of a wrong procurement approach for a given infrastructure project could spell doom for the given project (Luu et al. 2003).

This study, in aligning with the opinion that project success parameters should be project-specific and reliant on the project sponsor's objectives (De Wit 1988; Simkoko 1992) and considering the statements credited to the NEEDS document on the use of infrastructure development to achieve socio-economic outcomes for its citizenry (NPC 2004), believes that the success parameters to be used for measuring the successful delivery of infrastructure in the country should be inclined towards the achievement of these set objectives and not just about cost, time and quality. This gives rise to the need to appraise the current traditional infrastructure delivery system currently in operation in the country with a view to ascertaining why it has not contributed in resolving the high unemployment, poverty rates, and the pressing need for competence development within the local construction industry within the country even with the huge investment made by the government as can be verified from Foster and Pushak (2011). This work is part of an ongoing research programme which aims to develop a viable and effective infrastructure delivery system that can lead to the attainment of these objectives.

PROCUREMENT SYSTEMS AS PROJECT DELIVERY SYSTEMS

Miller et al. (2000:59) defines procurement as “the acquisition of goods or services through a transparent, competitive, public process”. From a public sector perspective, procurement has been described as “the formal process through which government agencies obtain goods and services, including construction services or public works. It also includes all functions that pertain to the obtaining of any goods, services, or construction, including description of requirement, selection and solicitation of sources, evaluation of offers, preparation and award of contracts, dispute and claim resolution and all phases of the contract administration”(www.sice.oas.org). Construction procurement systems have been defined by Rwelamila (1996) as referred to in Rwelamila et al. (2000) as “the organisational structure adopted by the client for the management of the design and construction of a building project.” Rowlinson (1999) describes it as being all “about the acquisition of project resources for the realization of a constructed facility” (p. 29).

McDermott (1999) in corroborating Rowlinson's view, referred to the International Council for Building and Construction (CIB) Working Group 092 as defining construction procurement as the framework within which construction is brought about, acquired or obtained. He further identified the components of an effective procurement system as including the methods employed in the design and construction of the given facility; the cultural, managerial, economic, environmental and political issues which might affect the implementation of the procurement process itself.

Rowlinson (1999) asserts that what is mostly referred to as procurement systems namely; Design Build approach, Traditional approach and Divided Contract approach are not really procurement systems but rather contract strategies. He admits that these contract strategies alongside other variables such as the national culture, organisational form, payment methods, overlap of project phases, selection process, source of project finance, contract documents, leadership, authority and responsibility and performance form what could be referred to as a procurement system. Based on this submission, this research shall disagree with the opinion held by Oyegoke et al. (2009), that the PPP was not a procurement system but rather a financing tool. The PPP can be described as a procurement system but not as a procurement contract strategy given the fact that the SPV can adopt any of the contract strategies available to it (traditional approach, design and build or the divided management approach) to execute their task, the difference residing among the variables.

PUBLIC PROCUREMENT AND SOCIAL OUTCOMES

Various researchers have stressed that the procurement of public facilities such as infrastructure is increasingly being structured in such a manner that it could be used to attain social aims in various countries of the world (Macfarlane and Cook 2002; Watermeyer 2003; McCrudden 2004; Khan 2005; and McCrudden and Gross 2006). This is an understandable fact given the high level of importance which the public procurement system assumes in the procurement of infrastructure especially in developing countries. Macfarlane and Cook (2002) posit that given the huge public expenditure employed to provide basic amenities in certain areas with high poverty/unemployment rates, it would be most expedient for the procuring authority(the public sector) to utilize such investment in resolving such societal malaise. They insist that this can be done through the incorporation of the desired outcomes in terms of employment or poverty reduction levels, into the specification of the product (infrastructure) emphasis mine, being purchased (Macfarlane and Cook 2002). The procurement of infrastructure is an inherent part of the public procurement systems in most countries and the current state of infrastructure in most developing countries, Nigeria inclusive, is a mere reflection of the lack of transparency and unbridled corruption laden public procurement in these countries (Soreide 2004). Hawkins and Wells (2006) agree with the insinuation that proper procurement procedures possess the ability to sustain socio-economic development

objectives. They categorized the benefits accruing from an infrastructure procurement activity into two broad areas namely:

- “The benefits accruable from labour: Benefits classified under this sub set include, the expansion of opportunities for employment with decent working conditions during the construction and operation stages of the asset lifecycle; and the development of business opportunities through the local production of inputs such as machinery, equipment, materials and components, required during the construction process (Local content)
- The benefits accruable to the society: Benefits classified under this subset include, the delivery of a fit for purpose asset, operated and maintained in an appropriate manner to serve the needs of the community over many years thus contributing to the socio-economic development objectives” (Hawkins and Wells 2006).

Arrowsmith (1995) in an earlier submission agreed that governments across the globe have resorted to the use of public procurement as a tool for the achievement of social outcomes. She stated two ways through which this was done, namely; – through the promotion of industrial development by exercising enormous influence on the market given the enormity of the size of government and secondly through the use of regulatory organs to support social objectives for the welfare of its citizenry.

Khan (2005) opines that “participation enhances ownership of the facilities by the user community, ensuring more extensive and efficient use of the facilities, better maintenance and more reliable operations”. She further argues that the community empowerment and participation, job creation, economically and environmentally sustainable procurement processes would normally lead to the successful delivery of an infrastructural facility (Khan 2005). Macfarlane and Cook (2002) state that, in developed societies such as the UK, every instance of public expenditure would derive benefits for the host community in particular and the entire country in general. Mawdesley et al. (2005) also makes the case for the addition of the social criteria in the project selection process for most public projects. They maintain that the social evaluation, which comprises of issues such as community development and welfare, provision of basic needs and economic impacts of the project on the society, remained imperative within the project selection realm and should be adequately catered for by every procuring authority (Mawdesley et al. 2005). They also identified main variables for consideration before and during project selection arrangements namely; – inflation; economic stability of a country; environmental consciousness; income level; ecosystem equilibrium (Mawdesley et al. 2005). In Nigeria, most publicly owned projects are procured for reasons ranging from political to ethnic reasons without any consideration to these variables mentioned in Mawdesley et al. (2005) and consultation with the communities whom these projects are meant to serve (Oyegoke 2010). This could be a likely cause of the attendant lack of transparency in the public/private procurement process in the country. Rwelamila et al. (2000) in condemning the inability of Africa procurement experts to evolve an Afro-centric procurement system capable of solving local problems, solicits for the development or indigenization of procurement systems before they are put to use within African societies. They opine that until this is done, the available procurement systems would always be failing to meet the goals of the clients (Rwelamila et al. 2000).

DISCUSSION AND CONCLUSIONS

This study was able to discover diverse suggestions which have been proffered towards resolving the infrastructure deficit imbroglio being experienced in Nigeria. These suggestions range from the development of project management competence within the public sector for effective project monitoring and control (Gidado 2010; Akintoye et al. 2003), the adoption of PPPs as viable procurement systems (Akintoye et al. 2003; Okonjo-Iweala and Osafo-Kwaako 2007; Estache 2004; Briceno-Garmendia et al. 2008), the need for Project Management Offices within PPPs for effective governance (Nyagwachi et al 2009), need for the adoption of more transparent and corruption-free public procurement procedures alongside the presence of strong financial markets and regulatory organs (Gidado 2010; Estache 2004; Kirkpartrick et al. 2006) and community participation in the procurement process with the inherent social outcomes obtainable from this participation (Macfarlane and Cook 2002; Macfarlane and Cook 2002; Oyegoke 2010; Khan 2005).

Unfortunately, it has been noted that none of the above cited literature made recourse to the fact that viable infrastructural delivery systems in developing countries needed salient factors such as the presence of an integrated project delivery system with proper regulatory and control functions exerted by the client, improved public sector capacity, reasonable supply of project management skills within the public and private sector, skilled manpower within the local construction industry to thrive. There has also not been any singular mention of the impact of the adversarial relationships within the Nigerian construction industry and its capacity to undermine the successful delivery of infrastructure. Issues concerning the impact and management of the diverse culture of the industry participants experienced within the project environment of large construction sites have also been left unattended to within the body of literature existing on Nigeria. It should be worthy to note that these factors might have led to the unsuccessful nature of

the traditional infrastructure delivery systems in the country and not the incessant lamentation about the capital inadequacy and corruption as Nigeria remains a resource rich country capable of procuring and maintaining its own infrastructure.

This study set out to identify the hindrances to the successful delivery of infrastructure in Nigeria. It renders an overview of the state of infrastructure in the country and employs a review of literature to establish the numerous flaws. It also looks at the infrastructure delivery modes in the UK and highlights the plan for future infrastructure improvement in the UK. It defines the concept of viable infrastructure delivery systems and procurement systems as delivery systems. Instances of preferential public procurement and its benefits were also mentioned.

Summarily, this study concludes with the view that the concept of viable infrastructure delivery systems, especially within the comity of developing economies, should be given worthy consideration by the construction industry in the future as success for this set of societies transcends the iron triangle and the adoption of private finance but rather lies within the ambit of local socio-economic benefits.

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INFLUENCE OF CONTRACTORS' CHARACTERISTICS IN THEIR BIDDING MARK UP SIZE DECISION

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Competitive bidding is a common practice in business, especially in Saudi Arabia where the majority of revenues generated by contractors come from projects obtained through a bidding process. The aim of this research is to investigate how contractors' characteristics affect the bidding mark up size decision in competitive situation. Contractors' characteristics considered in this research include their size, main client type, percentage of work obtained through competitive bidding and main type of work. Data have been collected through semi-structured interviews and questionnaires. The findings (based on 396 responses) have been used to establish a ranking order of factors in terms of their influence on bidding decisions, based on contractors' characteristics. The results of the research have led to the important discovery that a contractor's characteristics influence the factors they consider when determining their bid mark up and so contractors do not behave homogeneously when determining bidding mark up size in competitive bidding.

Keywords: bidding factors, decision making, mark up size

INTRODUCTION

The majority of revenues generated by construction contractors come from open bidding projects (Wanous et al., 2000). To be successful in a competitive bidding situation, a contractor needs to set a mark up high enough to gain a reasonable profit and low enough to win the contract. When bidding, bidding efficiency is the key to success. Bidding efficiency can be defined as the ratio of actual profits to the amount which can be gained by maximising potential profit when defeating all of the competition at the lowest competitor's price. Although competitive bidding is an area in which application of a strategy should be implemented, bidding strategy success is based on management judgment more than any other single factor. It has been proven that many businesses fail because of poor management judgment and poor business strategy (Park and Chapin, 1992).

Improving the bidding process in terms of determining bidding mark up size requires identification of factors that influence the decision of determining mark up size. The decision of determining bidding mark up size is important in the bidding process, as well as the decision to bid or not to bid, because these decisions affect both day to day operations and long term organization performance (Ahmad, 1990).

Previous research identifying factors that influence bid mark up size decisions in different construction industries has mostly relied on the prominent study conducted by Ahmad and Minkarah (1988). However, there are some factors presented in some studies that are not presented in others. Moreover, the level of importance given to factors differs from one study to another. This has given an opportunity to the present researcher to re-explore and re-examine these factors in order to establish an importance index for factors that influence bidding mark up size decisions in Saudi Arabia's construction environment.

The aim is to explore factors that influence bid mark up size and establish a ranking order based on the level of importance of these factors, which is influenced by the characteristics of contractors.

LITERATURE REVIEW

According to Wanous et al. (2000), bidding strategy can be defined as a contractor's long term objectives and goals in terms of selecting which projects to bid for, determining mark up size, and preparing bidding documents. This research focuses on contractors' bidding strategy aimed at determining the proper mark up size in a competitive bidding situation, and, in order to understand how proper mark up size is set, an investigation into the factors influencing bidding mark up size has been conducted.

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Ahmad and Minkarah (1988) tried to answer the question 'How are bid decisions made?'. In their research they argued that input from the construction sector was important in order to develop a meaningful bidding decision model. However, a comprehensive answer to this question was not easily found because bid decisions are made based on experience, judgment and perception. Therefore, researchers undertaking a project to explore factors that affect the bidding decision process must do so by looking at two aspects: the bid / no bid decision, and the bid mark up size decision.

The initial part of Ahmad and Minkarah's research (1988) involved implementing a questionnaire in order to evaluate the level of importance of 31 factors that could affect the bidding decision, and question the policies and practices of firms that affect the bidding process. The important findings of the research can be summarized as follows:

1. Competition and profitability are not the only factors that are important when making bidding process decisions.
2. Experience, judgment and subjective assessment are used by contractors in the bidding decision process. However, statistical or mathematical tools are not utilized.
3. The level of importance of factors differ when it comes to bid / no bid decisions and bid mark up size decisions.

Their study found that degree of hazard, degree of difficulty and type of job are the most important factors that influencing bidding mark up size decision. These findings provided the researchers with new information for identifying the factors that affect the bidding decision process, which helped them to develop a system to help contractors in making bid decisions. The system was based on a multi attribute utility model, whereby the bidder provides judgement input to the system in order to make better decisions in the bidding process (Ahmad and Minkarah, 1988).

In 1993 a further study to identify factors that affect bid / no bid decisions and bid mark up size decisions was conducted in the UK by Ali Shash. The research also used a questionnaire method in order to collect data. The questionnaire was similar to the questionnaire used by Ahmad and Minkarah in 1988. However, 55 factors were presented. The findings of this research can be summarized as follows:

1. Top contractors based on annual turnover rely on their judgement and perception when making bidding decisions.
2. The use of statistical or mathematical models is not common among top contractors.
3. Top contractors are comfortable with their way of making bidding decisions.

Most of these findings are in agreement with the findings of Ahmad and Minkarah (1988) with the most important factors that influence bidding mark up size decision being the need for work, number of competitors tendering and experience in such projects. Nevertheless, the findings of the research provide a foundation for other researchers wanting to develop realistic bidding models (Shash, 1993).

Regarding factors influencing bidding decisions in Saudi Arabia, a study was conducted by Ali Shash and Nader Abdel Hadi in order to determine the factors that affect bidding mark up size in the bidding process and to test if the level of importance of these factors differed according to the size of the contractor. The research identified 37 factors, classified into 5 groups. These groups were project characteristics, project documents, company characteristics, bidding situation and economic situation. The study used a questionnaire method in the form of a modified version of the questionnaire used by Ahmad and Minkarah in 1988. The study highlighted the factors that affect mark up size decisions in the bidding process in the Saudi Arabian environment and laid the foundation for other researchers to develop an expert system to help contractors determine the right mark up size in their bidding process (Shash and Abdel Hadi, 1993).

Another study conducted in Saudi Arabia was that of Abdulrahman Bageis in 2008. Their study's objective was to identify factors that affect the bid / no bid decision in order to develop a bid decision aid tool that would help contractors make their bid / no bid decision. The main finding of this research was that the level of importance of these factors is affected by the characteristics of the contractor and their main clients. Due to this, the model proposed in their research for making bid / no bid decisions considered the contract type and the characteristics of the main client in order to determine the level of importance of factors that affect bid / no bid decisions (Bageis, 2008).

Other studies have been conducted in different regions of the world, such as the study conducted by Dulaimi and Shan. Their study covered the construction industry in Singapore. Based on the literature review, they were able to identify 40 common factors that influence bidding mark up size. They found that these factors differed between medium and large size contractors. Also, they found that large size contractors were more concerned about degree of difficulty, availability of work and identity of competitors, whereas medium size contractors were more concerned about the availability of work, need for work and establishing long relationship with client. Their study can be seen as a starting point for developing a bidding strategy model (Dulaimi and Shan, 2002).

Aminah Fayek (1998) carried out a study that identified 90 factors that influence the bidding decision in terms of setting mark up size which Fayek referred to as margin size. The study used fuzzy set theory to develop a competitive bidding strategy model which improved the quality of the decision making process used in setting margins (Fayek, 1998).

Yng Ling and Liu (2005) identified the factors affecting mark up decisions of a profitable contractor in Singapore. They investigated 52 factors and found that 21 of these factors were significant in terms of their influence on the bidding mark up decision (Yng Ling and Liu, 2005).

Egemena and Mohamed (2007) identified key factors which helped a contracting organization reach the correct bid or no bid decision, as well as mark up size decision. The study confirmed that factors relating to strategic consideration had a significant role in both these decisions. Also, in their study they found that small size contractors were more concerned about the possible number of competitors passing the eligibility requirement, risk due to the inflation rate of tender currency and payment conditions of the project creating risk during project execution, whereas medium size contractors were more concerned about the possible number of competitors passing the eligibility requirement, current workload, availability of other projects in the market and risk due to the inflation rate of tender currency. The study provided a framework for development of a knowledge based system model (Egemena and Mohamed, 2007).

DATA COLLECTION

The data were collected from construction contractors in Saudi Arabia with the support from Saudi Council of Engineers, using an online questionnaire. The respondents were project managers and other managers who are involved in determining bidding decision mark up size. The questionnaire was developed from the results of eight semi-structured interviews with project managers, general managers and owners, with questions focusing on key factors influencing bidding decision in term of setting mark up size, supplemented by those factors obtained from the literature review, specifically the factors used by Ahmad and Minkarah (1988), Shash (1993), Fayek (1998), and Egemen and Mohamed (2007), resulting in a total of 60 factors that can potentially influence the mark up size decision in competitive bidding. The questionnaire was divided into two sections. The first section was introductory, covering organization and respondent profiles. The second section presented the 60 factors and asked respondents to rate each factor on a scale of 1 to 6, where 1 represented the lowest level of importance and 6 represented the highest level of importance.

DATA ANALYSIS AND RESULTS

RESEARCH METHODS

The total number of questionnaire distributed was 1000 and 396 questionnaires were returned, giving a response rate of approximately 40%. 242 of the respondents were small / medium size contractors while the other 154 were large size contractors. In the first section of the questionnaire the contractors were asked to answer questions in order to identify their characteristics (size of contractor, contractor's main client type, contractor's main type of work, contractor's percentage of work obtained through competitive bidding). The size of contractor was based on the annual turnover and number of employees. The large size contractor category was defined as a contractor which annual turnover is over 500 Million Saudi Riyals (about 133 millions dollars) and total number of staff over 1000 employees. Figure 1 summarizes the characteristics of the contractors who responded to the questionnaire.

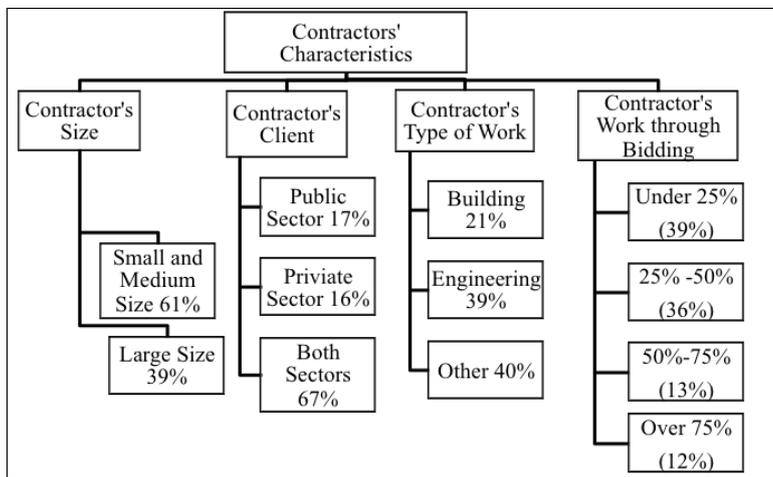


Figure 1 Contractor Respondents' Characteristics

The second part of the questionnaire aimed to understand which factors influence contractors' bidding mark up decisions. The level of importance of those factors that influence bidding mark up decisions has been identified using the scores given by contractors for each factor. The data collected from the questionnaire were processed to give the level of importance and hence rank of each factor. The importance index used in this research is defined as:

$$\text{Importance index} = \sum ax * 100/6$$

Where a is the weight given to each response and x is n/N where n is the frequency of the response and N is the total number of responses.

RESULTS

The main focus of the questionnaire was to ensure that the findings of previous literature reviews of factors that influence bidding mark up size is similar in the Saudi Arabia construction industry and to explore if these factors are influenced by the characteristics of contractors. In this research the size of contractors has been examined as one of characteristics of contractors that can influence the bidding mark up size decisions, so the questionnaire aimed to explore if there is a significant difference between factors that influence large contractors and small / medium contractors.

Table 1: Top twenty factors' ranking order for large contractors

LARGE CONTRACTOR		
FACTORS	IMPORTANCE INDEX	RANK
Size of job	84.42%	1
Clarity of the work and specifications	81.39%	2
Reliability of company cost estimate	81.39%	3
Type of job	80.84%	4
The history of client's payments in past projects	80.74%	5
Project cash flow	79.65%	6
Return of investment	79.52%	7
The client's requirements	79.44%	8
Project duration	79.44%	9
The project is matching the company strategy and future	79.22%	10
Design quality	79.00%	11
The current financial capability of the client	78.90%	12
Owner / Client	78.68%	13
Size of client	77.49%	14
Risk in fluctuation in material prices	77.38%	15
Equipment requirement	77.27%	16
Contract conditions	77.06%	17
Strength of the firm	77.06%	18
Management of similar size projects in the past	76.95%	19
Project terms of payment (monthly/quarterly)	76.62%	20

Table 1 shows the ranking of the first twenty factors which influence bidding mark up size for large contractors and which can be considered as important factors for large Saudi Arabian contractors. The results also show that return of investment is considered as one of top factors that influences the bidding mark up size decision in Saudi Arabia, whereas in many other previous study (such as Ahmad and Minkarah's 1988 study) it is not one of the highest importance factors.

The results of Table 2 present the first twenty factors' ranking order which influence bidding mark up size for small / medium contractors and so which can be considered as important factors for small / medium Saudi Arabian contractors. Table 1 and Table 2 show that project is matching the company strategy and return of investment are considered as important factors influencing the bidding mark up size decision for large contractors in Saudi Arabia, which are of less importance for small / medium contractors in Saudi Arabia.

The result of questionnaire validates the finding of literature review; there are common importance factors between previous studies and the findings of this research, demonstrated by the importance of the factors presented in Table 1 for larger contractors and Table 2 for small / medium contractors in Saudi Arabia. At the same time, the level of importance given to these factors in this research differ that found in other research. Also, the results of the questionnaire emphasise the importance of these factors for Saudi Arabian contractors.

Table 2: First twenty factors' ranking order for small/medium contractors

SMALL / MEDIUM CONTRACTOR		
FACTORS	IMPORTANCE INDEX	RANK
Clarity of the work and specifications	82.78%	1
Size of job	81.68%	2
Project cash flow	80.79%	3
Type of job	79.89%	4
Project terms of payment (monthly/quarterly)	79.41%	5
Project duration	79.34%	6
The history of client's payments in past projects	78.86%	7
Competition	78.24%	8
The current financial capability of the client	78.24%	9
Labour requirement	77.69%	10
Reliability of company cost estimate	77.48%	11
The client's requirements	77.41%	12
Strength of the firm	77.07%	13
Owner / Client	76.86%	14
Design quality	76.45%	15
Risk in fluctuation in material prices	76.24%	16
Capital requirement	75.55%	17
Warranty issues, which might possibly create risks	75.34%	18
Contract conditions	75.21%	19
Return of investment	75.00%	20

The results have shown that there is a different level of importance in factors that influence bidding mark up size between large and small / medium contractors. However, in order to investigate if the difference is significant, a one way ANOVA test has been conducted and it was found that there is a significant difference for 7 of the 60 factors; those 7 factors (which scored less than .05) are shown in Table 3.

Table 3: Factors which are significantly different between different size contractors

ANOVA	SIG.	SMALL / MEDIUM	LARGE CONTRACTOR
		RANK	RANK
Contractor involvement in the design phase	.000	57	43
The project is matching the company strategy and future	.006	28	10
Market's direction (whether it is declining, expanding, etc.)	.011	46	34
Need for work	.030	29	43
Uncertainty in estimate	.035	50	45
The ratio of your firm's current market share to the expected or aimed share	.035	54	50
Return of investment	.040	20	7

This result shows that small / medium contractors respond differently compared to large contractors. The main factors that are significantly different are the involvement in the design phase, project matching company strategy and market direction. Larger contractors in Saudi Arabia consider these factors are more highly ranked in influencing their bidding mark up size decision, compared to small / medium contractors in Saudi Arabia.

CONCLUSIONS

Factors influencing bidding mark up size decision is an attractive topic for researchers, but the area of utilizing these factors to develop a bidding decision model to determine the proper mark up size in competitive situation has not been well researched. Further empirical research is needed to develop a bidding mark up size model for Saudi contractors, utilizing the findings of this research.

The results of the analysis of the questionnaire have established that there are benefits for Saudi Arabian contractors from recognizing and understanding the factors that influence bidding mark up size in the Saudi Arabian environment. Also, the research determines the ranking order for factors influencing bidding mark up size and their level of importance. The research proves that the levels of importance of factors are affected by the size of the contractors and this should be considered when building a bidding mark up size model.

Most of the findings of this research are in agreement with the findings of other previous study such as Ahmad and Minkarah (1988) and Shash (1993). However, the level of importance of factors influencing the bidding mark up size are different from other studies and this is in line with the finding of other previous study. However, there are common factors between this study and previous research but also there are factors introduced in this study as top importance factors that influence bidding mark up size for Saudi Arabian contractors.

Finally, an examination of other contractors' characteristics, such as main client type, main type of work and percentage of work obtained through competitive bidding is needed in order to understand if other contractors' characteristics are affecting a contractor's bidding mark up size decision.

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CORRUPTION IN THE SUPPLY CHAIN: SOUTH AFRICAN CONSTRUCTION MANAGERS' EXPERIENCES

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Using an online survey, construction managers' experiences of corruption in the supply chain of the South African construction industry is investigated. A majority of respondents considers that corruption is widespread in the sector. Kickbacks, conflict of interest, tender rigging, and fronting are considered the most prevalent forms of corruption, with the first three reported as the forms most experienced by construction managers. Government officials (as clients), sub-contractors, and fellow contractors are perceived to be the most involved in corrupt activities. Contractors engage in the submission of inflated claims as a negotiation margin, in collusive tendering, and in the employment of illegal workers. Sub-contractors are reportedly involved in the provision of sub-standard work, the employment of illegal workers, and collusive tendering. Corruption is most prevalent during the bid evaluation and tendering phases. Factors seen to facilitate corruption include a lack of transparency in the awarding of contracts, the private opening of tenders facilitating the manipulation of tender results, and the operating environment of the industry. Barriers to the reporting of corruption include a belief that no action will be taken, a lack of confidence in anti-corruption agencies and the judicial system, plus the fear of being stigmatized as a 'whistle blower'. Combatting corruption in the construction industry requires a more forensic approach to detecting it, better reporting channels, and measures for protecting informants. More education and training in ethical standards would help to develop a better business culture and higher moral values in the business environment.

Keywords: corruption, construction industry, contractors, construction managers, South Africa

INTRODUCTION

Corruption is commonly defined as rottenness, willingness to take bribes, and moral evil. To the extent that it has moral connotations, un-ethical behavior is synonymous with corruption.

Corruption is seen as a growing challenge for businesses and society (Transparency International, 2009). Citing World Bank estimates, Ostermann and Staudinger (2008) indicate that corruption represents 5% of the world economy; translating into some US\$1.5 trillion per year¹. Corruption is reported to increase income inequality and poverty (Gupta et al., 2002). The International Monetary Fund (IMF) (1996), Dreher et al. (2007), and Sohail and Cavill (2008) provide a comprehensive overview of the causes and consequences of corruption. Dreher et al. (2007) identify the impact of corruption on the world economy as contributing to low economic growth, stifled investment, increased inequality, and the inhibited provision of services. The construction industry has been identified as the most corrupt sector in the world (de Jong et al., 2009). Transparency International (2005) describes it as an industry possessing characteristics that render it particularly susceptible to corruption. These characteristics include the size, complexity and uniqueness of projects, the number of contractual links, the lack of frequency of projects, and the culture of secrecy.

The study reported here explores the perceptions and experiences of construction managers with regard to corruption in the supply chain of the South African construction industry. A web-based, online survey questionnaire was used to collect data. The paper commences with a background review of corruption in the construction industry, followed by a description of the survey design and administration. The findings of the survey response data are then presented and discussed. Finally, conclusions are drawn and recommendations are made.

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BACKGROUND TO THE STUDY

A number of studies have addressed the issues of un-ethical behavior and corruption in the construction industry. More specifically, May *et al.* (2001) examined the nature of bid-cutting in construction tendering in Queensland from economic, legal, ethical and management perspectives. Fan *et al.* (2001) investigated the ethical behaviour of quantity surveyors in the Hong Kong construction industry, finding a relationship between age and ethical standpoint.

Zarkada-Fraser and Skitmore (2000) studied the attitudes and behavioural intent towards collusive tendering of key individuals in the tendering process of the Australian construction industry. They conclude that collusive tendering is a result of a decision with moral content, and that there is a minority of tenderers that would consider participating in collusive tendering under specific circumstances. This particular group presented a distinct demographic and decision-making profile. Vee and Skitmore (2003) found that project managers, architects and building contractors surveyed had all experienced or witnessed some degree of corrupt practice. A survey of construction industry ethical practices in the USA (FMI/CMAA, 2004) found that 84% of the responding building owners, architects, building services firms, construction managers, contractors and subcontractors had been exposed to unethical practices. CIOB (2006:23) reports on corruption in the UK construction industry, concluding that “*corruption is present in most aspects of the UK construction industry*”.

Sohail and Cavil (2008) highlight the risks that corruption poses to construction and engineering companies themselves, and advocate the role of accountability in combatting corruption. Sichombo *et al.* (2009) describe the benefits of technical auditing in the Zambian construction industry. Corruption in the Malawian construction industry is investigated by Shakantu and Chiocha (2009). Forms of corruption were found to include bribery, fraud, collusion, price fixing, kickbacks, and negligence. They conclude that the nature of the industry renders it susceptible to corruption, and that local conditions and procurement systems shape the form and extent of corruption.

Conflict of interest fits less easily into the canon of corruption outlined above, since at first sight it appears more remote from the criminal connotation of corrupt activities. We tend to regard it as a minor concern, to be avoided if possible, but occurring almost by accident and rarely leading to serious consequences. Provis (2008) suggests that conflict of interest can be compared to the Chinese business concept of ‘*guanxi*’, the nature of business relationships and the way in which they are developed and used. It is more than this, however, since business processes, in addition to relationships, may involve conflicting obligations; conflicting roles; and conflicting opinions, attitudes and beliefs – all of which may arise intra- as well as inter-personally. All of these entail decision-making in terms of identifying conflicts, prioritizing interests, exploring options, choosing whether or not to act and whether or not to declare the interest or conceal it. It is within the realm of conscious decision-making about conflict of interest that its more serious and potentially corrupt and criminal consequences are born. Furthermore, since conflict of interest is closely aligned with un-ethical conduct and the moral associations of the latter, the link with corruption cannot be denied. According to Cressey (1973), cited in Wilson (2004), economic crime such as embezzlement derives from three juxtaposed elements: opportunity, pressure (motivation), and rationalization (moral justification). From this perspective, the implications of conflict of interest for corruption are thus more fully understood.

The impact of corruption on the construction sector worldwide is significant, estimated at some US\$340 billion each year (Sohail and Cavill, 2008). The implications of all this are that corruption is widespread in the global construction industry, and that its effect, on the industry itself and upon national economies, is significant. However, there is a dearth of literature relating to the nature and extent of corruption in the South African construction industry. What exists is limited in depth and scope. The research described here is intended to address that shortcoming.

QUESTIONNAIRE DESIGN AND METHOD OF DATA COLLECTION

Drawing on the work of Zarkada-Fraser and Skitmore (2000), Vee and Skitmore (2003), CIOB (2006), Bowen *et al.* (2007), and Shakantu and Chiocha (2009), a sectioned questionnaire was drawn up, utilizing a mixture of closed, dichotomous, declarative and multiple-choice questions. Using a four-part structure, the survey questionnaire sought demographic, cultural and professional background information from respondents; explored the extent of personal exposure to corruption and the prevalence of corrupt activities; investigated contractors’, subcontractors’ and suppliers’ experiences of corruption; and examined perceptions of the causes of, and barriers to, corrupt practices. The reporting of corruption was also explored. A web-based, online questionnaire survey (see

Wright, 2005; Fielding *et al.*, 2008) was adopted to collect data from registered construction managers in South Africa. Advantages of this method of data collection include: access to unique populations, savings in time, and cost effectiveness (see Wright, 2005). Registered construction managers were emailed by the Council for the Construction Project and Construction Management Professions (SACPCMP), given a URL where the questionnaire could be accessed online, and asked to participate. Disregarding notified email rejection messages ('bounces'), the response rate is 7.2% ($n=50$; $N=696$). Further qualitative research, using a case-based 'long interview' approach is intended to enhance the validity of the findings by permitting triangulation of data.

ANALYSIS OF THE DATA

The data have been analysed using the IBM Statistical Package for the Social Sciences (IBM SPSS V19.0 for Mac) software application. Percentages stated relate to the responses to individual questions.

SAMPLE PROFILE

The majority of the participating construction managers are male (89%), 'White'² (92%), aged 40 years or older (81%), and possess at least a Bachelors and/or Honours degree (68%). Proportionately more respondents (74%) are employed in larger organisations (>100 employees). Only 20% report working in firms with 50 or less employees. Most construction managers (47%) report high levels of work (exceeding R500m turnover value per annum). Respondents work in Gauteng (41%), KwaZulu-Natal (15%) and the Western Cape (13%); the three most populous and economically-active provinces (out of nine) in South Africa. The construction managers who participated in the survey may generally be described as well-educated, experienced persons, 'White', and male.

NATURE AND EXTENT OF CORRUPTION AND PARTICIPATION IN CORRUPT ACTIVITIES

Using a 5-point Likert scale (1=strongly agree; 5=strongly disagree), respondents were asked to indicate their assessment of whether or not corruption is widespread in the South African construction industry. Seventy-five percent (75%) respondents concurred that it is. Respondents' *personal experiences* ('Yes/No') of the various forms of corruption being examined, namely, fraud, tender rigging and collusion, embezzlement, fronting (the substitution of a sham organization for the real one to circumvent regulations), bribery, kickbacks and extortion, and conflicts of interest, were sought. Tender rigging and collusion is the form of corruption most experienced by respondents (65%), followed by kickbacks (64%), conflict of interest (61%), and fronting (55%).

Using 5-point Likert scales (1=very frequently; 5=very seldom), the *prevalence* of the various forms of corruption, as well as the *degree of the involvement* of various industry stakeholders in corruption, were explored. Respondents view kickbacks (67%) as the most prevalent form of corruption, followed by conflict of interest (63%), tender rigging (61%), and fronting (61%). Government officials (as clients) are reportedly the most frequently involved in corruption (83%) compared to the other respondent groups, followed by sub-contractors (64%), and fellow contractors (58%). Engineers, architects and quantity surveyors are reportedly the least corrupt professional groupings.

Respondents' experiences regarding the forms of corruption most associated with the various industry stakeholders indicates that government officials (as clients) are most associated with bribery, kickbacks, and conflicts of interest. Architects, engineers and quantity surveyors are most associated with conflict of interest, kickbacks and tender rigging; whilst contractors are involved with tender rigging, bribery, and fronting. Corruption by the contracting fraternity is explored more fully below.

NATURE AND EXTENT OF SPECIFIC FORMS OF CORRUPT ACTIVITIES UNDERTAKEN BY CONTRACTORS, SUB-CONTRACTORS AND SUPPLIERS

A majority of survey respondents (62%) report that fellow contractors engage in the submission of inflated claims as a 'negotiation margin'. A third (34%) state that collusive tendering by contractors is widespread, as is the employment of illegal workers (29%). Some 31% of respondents report that contractors engage in the extortion of payments from sub-contractors or suppliers in return for work.

When the activities of sub-contractors are examined, the following forms of corruption are reported as being the most widespread: the employment of illegal workers (59%); the provision of lower quality work than that required in terms of the contract specification (56%); and collusive tendering (46%). Other types of corrupt activities by sub-contractors include: the submission of fraudulent time sheets (36%), and the submission of fraudulent invoices (35%).

Fewer respondents see material suppliers as engaging (at least 'frequently') in all the listed types of corruption. A notable exception is in the case of collusive pricing, where 56% of all respondent contractors claim that this practice is widespread. Suppliers are also

perceived by respondents (41%) to provide lower quality materials than that specified in the contract documents. Other forms of corruption reportedly undertaken by suppliers include: bribery to secure a supply contract, the provision of lower quantities of materials than originally ordered, and the submission of fraudulent invoices. Responding construction managers indicate overwhelmingly that the two most prominent phases for corrupt activities are the bid evaluation and tendering stages.

FACILITATION OF CORRUPTION AND BARRIERS TO REPORTING IT

Survey respondents were requested to provide information relating to factors which can facilitate corruption within the industry; and barriers to the reporting of corruption. Chief amongst facilitation factors (86% of survey respondents) are a lack of transparency in the awarding of contracts, and the private opening of tenders; the latter reportedly being used to as an opportunity to modify the bid results during the tender evaluation period. The operating environment of construction projects is also seen as a complicating factor by 81% of respondents.

Upon corruption being detected, the most widespread responses of survey participants are that it is either reported to their superior or the organization (90%), or to the client and the professional consultants (77%). However, 57% of respondents report that corruption is sometimes never reported. Based on their experiences, respondents cite the following barriers to reporting corruption: belief that no action will be forthcoming (85%); lack of confidence in the relevant anti-corruption agency and the judicial system (83%); fear of being stigmatized as a 'whistle blower' (72%), and a concern that the Protected Disclosures Act (RSA, 2000) does not adequately protect 'whistle blowers' in South Africa (70%). Other barriers cited by participants include fear of retaliation and physical harm to self or family, fear of an occupational penalty (e.g. dismissal) by the employer, and being unaware of the reporting channels to be followed.

DISCUSSION OF THE RESULTS

Three out of four of the construction managers responding to the survey agree that corruption (in various forms) is widespread in the construction industry in South Africa. There is thus no high moral ground for South Africa to occupy in this matter. Most respondents came to their opinion through personal experience, although the survey did not ask them to distinguish between encountering corrupt activities and being involved with them. In their experiences, tender rigging and bid collusion feature frequently. This justifies the current situation, where the Competition Commission of South Africa is probing alleged bid-rigging and anti-competitive conduct associated with construction projects involving new spectator facilities and transport infrastructure improvements for the 2010 FIFA Soccer World Cup. The enquiry covers some 70 projects (located throughout the nation) valued at ZAR29bn. Many of the major construction companies in South Africa are allegedly implicated. Some have already applied to the Commission for corporate leniency in the form of reduced penalties in return for cooperation and disclosure. The outcomes of the enquiry are almost certain to include recommendations for more rigorous procurement processes for public works (particularly in the early phases encompassing bid enquiry and contract award), more precautions in the tender process and greater scrutiny and evaluation of bids. The often-cited quotation (usually attributed to Thomas Jefferson) about "*the price of peace is eternal vigilance*" is apposite here. More severe penalties are also likely to be imposed. While all this is laudable, a strong 'trickle down' effect will be necessary to reduce other forms of corruption such as 'kickbacks' and 'fronting'. Ways will also have to be found to address similar corruption activities inevitably occurring in private sector construction projects, as well as reaching out to the sub-contractor and supplier actors in the construction supply chain.

Sichombo *et al.* (2009) suggest that all this can be accomplished by adopting technical auditing processes, a term usually understood to describe the work of professional quantity surveyors, and certainly this must be used to combat forms of corruption such as false claims, over-pricing, and over-invoicing. However, 'forensic auditing' might be a more appropriate term to represent a different, more 'arm's length' independent approach needed to deal with tender rigging and collusion. For example, forensic data analysis systems now enable tax authorities to interrogate and cross-match financial data to expose anomalies and pursue miscreants. Similarly, software applications are used by most universities to detect plagiarism in student work. These forensic applications are risk-based, reporting on the likelihood that tax evasion or plagiarism has occurred, as well as their extent. Both types of detection systems are accretively knowledge-based to improve their consistency and reliability. Companies failing to satisfy such forensic analysis might be called upon to demonstrate conclusively how they have not engaged in corrupt activity

Not surprisingly, perhaps, the construction managers reported contractors as being the industry stakeholders most frequently involved with bid collusion. Exclusion from participation in public sector tenders might be an effective sanction available to counter this, but this does not address private sector concerns. Furthermore, the potential effect on competitiveness (fewer tenderers; less competition) must be considered, although this could be countered to some extent by creating easier access for new and smaller contracting companies.

Of particular concern is the survey finding reporting the extent of involvement of government officials in various forms of corruption. Survey participants overwhelmingly pointed to them, in their roles as public service employees active in the building procurement process, as being far more frequently involved in corruption than all other stakeholder groups.

It is possible that exposure to education and training in ethical standards is less consistent and less frequently provided (through their vocational studies) to public servants and employees in contracting, sub-contracting and supplier companies; compared to that in the *curricula* of qualifying degree studies mandated for professional construction disciplines such as architecture, engineering and quantity surveying. Construction management degrees should at least match them in this regard. Ideally, however, ethics should be introduced early and widely across the younger section of the population, preferably before entry to secondary education, so that a more appropriate ethical culture can be encouraged to develop in society. Prescriptive, penalising legislation cannot achieve this outcome effectively or alone, and a positive shift in moral values is needed in the context of business practices.

The survey findings also support the call of Sichombo *et al.* (2009) for greater protective measures for whistle-blowers in the construction industry. Knowledge of appropriate reporting channels needs to be far more widely communicated throughout the industry.

At this stage, the research findings partly support the 'fraud triangle' theory of Cressey (1973). In terms of the *opportunity* leg of the theory, support can be clearly detected in terms of the corrupt activities associated with the processes of building procurement (pre-construction tender rigging; bid collusion; kickbacks), and in the status and roles of actors (government officials; contractors; sub-contractors; suppliers). The *pressure* aspect of Cressey's theory is evident in the highly competitive commercial environment of the construction industry. However, support for the essential *rationalisation* component of the theory does not emerge clearly from the research findings, as survey participants were not asked directly to suggest why corrupt activities occurred, nor how they might be justified.

CONCLUSIONS

It is clear that corruption is considered to be widespread in the South African construction industry, and this must be regarded as unacceptable for all stakeholders (a party engaging in corruption will almost certainly also become a victim of it through other links in the supply chain).

The *opportunity* aspect presents the most obvious target for action, through the established processes of building procurement. An urgent focus of attention should be upon the tendering and bid evaluation phases, since these are likely to be where the most serious instances of corruption occur, but no stage can be entirely ignored, nor can anyone in the whole process be regarded as above suspicion.

The *pressure* component of corruption may be a more difficult issue to address, since competition is the cornerstone of free-market economies. A deeper understanding of the *rationalisation* of corruption is needed before the socio-pathological nature of this aspect can be countered. That understanding will have to be derived from exploration of the incremental downward journey of corruption: from minor breaches of rules, to conflicts of interest, and thence to criminal acts.

Measures to combat corruption, and to facilitate its detection and reporting, are likely to embrace modern ICT-based technologies and software applications with a forensic capacity surpassing that already practiced among the professional disciplines engaged in the construction industry. Shifts in the culture and moral values of business are also needed.

Deeper investigation of the issues raised by the survey findings (particularly into the rationalisation aspect), and more detailed exploration of counter-measures to corruption, is intended through follow-up case-based research.

NOTES

1. Currency exchange rate as at 11th October 2011: ZA Rands 12.31 = Pound Sterling 1.00; ZA Rands 7.88 = US\$1.00
2. In terms of *apartheid* legislation, people in South Africa were racially classified as 'White', 'Black', 'Coloured', or 'Asian'. For the purposes of enforcing *apartheid*, people were generally categorised as either 'White' or 'Non-White'. While the latter term has some pejorative

connotations, it remains a useful label for categorizing several groups of people who were formerly disadvantaged because of their ethnicity. It has been solely used in that capacity in this research. Post-*apartheid* South Africa has seen the introduction of ‘*positive discrimination*’ or ‘*affirmative action*’ as a vehicle to assist previously disadvantaged persons (PDIs) – who are mainly recognized as ‘Non-whites’ and women (RSA, 1996). Affirmative procurement policies are examples of mechanisms developed and implemented by the public sector to facilitate change. Within the context of the construction industry, affirmative action has, for example, taken the form of preferential procurement in the award of building contracts and the appointment of professional consultants.

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A FIRST STAGE TEST OF DUNNING'S FRAMEWORK ON MULTINATIONAL CONTRACTING INTO AUSTRALIA: REVIEWING SECONDARY DATA

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In response to the need to leverage private finance and the lack of competition in some parts of the Australian public sector infrastructure market, especially in the very large economic infrastructure sector procured using Public Private Partnerships, the Australian Federal government has demonstrated its desire to attract new sources of in-bound foreign direct investment (FDI). This paper aims to report on progress towards an investigation into the determinants of multinational contractors' willingness to bid for Australian public sector major infrastructure projects. This research deploys Dunning's eclectic theory for the first time in terms of in-bound FDI by multinational contractors into Australia. Elsewhere, the authors have developed Dunning's principal hypothesis to suit the context of this research and to address a weakness arising in this hypothesis that is based on a nominal approach to the factors in Dunning's eclectic framework and which fails to speak to the relative explanatory power of these factors. In this paper, a first stage test of the authors' development of Dunning's hypothesis is presented by way of an initial review of secondary data vis-à-vis the selected sector (roads and bridges) in Australia (as the host location) and with respect to four selected home countries (China; Japan; Spain; and US). In doing so, the next stage in the research method concerning sampling and case studies is also further developed and described in this paper. In conclusion, the extent to which the initial review of secondary data suggests the relative importance of the factors in the eclectic framework is considered. It is noted that more robust conclusions are expected following the future planned stages of the research including primary data from the case studies and a global survey of the world's largest contractors and which is briefly previewed. Finally, and beyond theoretical contributions expected from the overall approach taken to developing and testing Dunning's framework, other expected contributions concerning research method and practical implications are mentioned.

Keywords: Dunning's eclectic paradigm, multinational contracting, secondary data, research method

INTRODUCTION

Before the Global Financial Crisis (GFC), Runeson and de Valence (2008) observed the emergence of a two-tiered construction market comprising the more traditional local/national market and a new global construction industry based on high technology and a business strategy revolving more around value for money throughout the project's life cycle and fuelled to a significant extent by procurement modes like Public-Private partnerships (PPP). Runeson and de Valence (2008) consider that this market is limited in terms of competition and it seems reasonable to suspect that this market may have become even less competitive, perhaps towards a duopoly in some sectors and locations – amidst and in the wake of the GFC. Indeed and in Australia for example, there is an example of a major toll road project in 2009 that was switched from a proposed PPP to a more traditional funded project due to a lack of expressions of interest from PPP consortia. The Federal Australian government has noted its desire to see new foreign construction entrants into the Australian public sector major infrastructure market (Infrastructure Australia 2011). And in pursuance of this, is developing a number of initiatives including trade-delegation style meetings and reforms to PPP procurement practice to reduce bid costs (Hepworth 2010; Cameron 2008). Based on this background, an investigation into the determinants of multinational contractors' willingness to bid for Australian public sector infrastructure projects appears important from both the perspectives of government and multinational contractors.

In pursuance of explaining the determinants of multinational contractors' willingness to bid for Australian public sector infrastructure projects, the authors (Rahman, Bridge and Rowlinson 2010; Rahman et al. 2011a; Rahman et al. 2011b) summarize the relevance of Dunning's eclectic paradigm of internationalisation. In doing so, the authors more clearly articulate Dunning's principal hypothesis and generalised predications within the context of multinational contracting to reflect a lack of in-bound Foreign Direct Investment (FDI) (reverse of Dunning's original stated hypothesis and predications), as follows:

- Condition 1: The extent to which it (the multinational contractor outside Australia) possesses unique and sustainable ownership

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- (O) advantages vis-à-vis other multinational contractors outside and domiciled in Australia, in servicing the Australian market...
- Condition 2: Assuming that condition (1) is satisfied, the extent to which the multinational contractor outside Australia perceive it to be in their best interest to add value to their O advantages than to sell them, or their right of use, to independent foreign firms (these advantages are called market internalisation or I advantages)...
 - Condition 3: Assuming that conditions (1) and (2) are satisfied, the extent to which the global interest of the multinational contractor outside Australia is served by creating, accessing or utilizing, their O advantages in Australia (Location or L advantages)...
 - Condition 4: Given the configuration of the OLI advantages facing a multinational contractor outside Australia, the extent to which this multinational contractor believes that foreign production in Australia is consistent with the long-term objectives of its stakeholders and instructions underpinning its managerial and organizational strategic.
 - In terms of the corresponding generalised predictions, again these are given in reverse terms to reflect a lack of in-bound FDI into Australia follows: the more Australian-based multinational contractors relative to other multinational contractors possess desirable O advantages, the lesser the incentive other multinational contractors have to internalize rather than externalize their use (I disadvantages), the less other multinational contractors find it in their interest to access or exploit them in Australia (L disadvantages), then the less Australia is likely to attract in-bound investment by multinational contractors.

Furthermore, the authors (Rahman, Bridge and Rowlinson 2010; Rahman et al. 2011a; Rahman et al. 2011b) proceed to justify discounting the I factor (Condition 2) given the nature of the dependent variable in this research. That is, Dunning (2002) relies on orthodox internalisation theory to explain internalisation associated with FDI and which pertains to vertical integration and the firm's entry mode decision. In contrast, the basis of the nature of the dependent variable in this research is upstream of the entry mode decision and concerns horizontal integration. Such that, the issue is not so much if internalisation occurs but how much internalisation occurs. More specifically, in this research, the multinational contractor bids as lead or head contractor for new public sector infrastructure projects and given the immobile nature of construction, needs to have on-the-spot interactions with the client, co-consortium members and subcontractors and suppliers. As such, the authors (Rahman, Bridge and Rowlinson 2010; Rahman et al. 2011a; Rahman et al. 2011b) focus on the O and L factors (Conditions 1 and 3 respectively) in order develop three propositions designed to address a weakness arising in Dunning's principal hypothesis. That is, although both these factors may be necessary conditions to explain FDI, logically, there may be cases in which both factors may not need to be present to the same degree to explain FDI. Table 1 illustrates this at the margins (Cases 2 and 3) in terms of the effects of O and L factors on FDI.

Table 1: Effects of the O and L factors at the margins (MNC = Multinational Contractor)

CASE	O FACTOR	L FACTOR	FDI (LEVEL OF ATTRACTIVENESS)
MNC 1	Advantages	Advantages	Yes/(Highest)
MNC 2	Advantages	Marginal Advantage	?
MNC 3	Marginal Advantage	Advantages	?
MNC 4	Disadvantages	Disadvantages	No (Lowest)

As it currently stands, Dunning's hypothesis and "generalised" predications are stated in broad terms and most directly targets Case 1 and Case 4 in Table 1. Thus, relying on Dunning's hypothesis, it's not possible to be specific in terms of predicting which multinational contractors in Cases 2 or 3 will undertake FDI/be more or less attracted to a market and which fall between the upper level of FDI/highly attractive market depicted by Case 1 multinational contractor and the lower level of FDI/least attractive market that is Case 4 multinational contractor. The notion that the O and L factors can display different levels of explanatory power can be expected to be seen most clearly in the extreme circumstances in which multinational contractors have similar O attributes or multinational contractors are from the same location such that the L and O factors would be expected to dominate respectively.

In brief, whilst there is evidence in the context of multinational contracting that demonstrates the significance of the O and L factors on the FDI decision (including Cuervo and Pheng 2003a and b), logic suggests that there are cases in which either of these factors plays a substantially more important role in explaining FDI. And given an absence of research that reveals the relative importance of these factors with respect to a specific industry sector in a particular host country, then this provides a significant research opportunity to refine and develop Dunning's hypothesis to more clearly address differential explanatory power across the O and L factors and to more fully account for a wider range of cases.

In order to explore the relative explanatory power of the O and L factors and extend Dunning's hypothesis, the authors (Rahman, Bridge and Rowlinson 2010; Rahman et al. 2011a; Rahman et al. 2011b) develop a number of propositions. The first two propositions concern exploring the extreme cases, first, in which multinational contractors have similar O attributes and, second, multinational

contractors are from the same location. Together these propositions seek to establish the position that either the O or L factor may essentially be doing the substantive explanatory work. Consistent with this, the third proposition concerns the more generalised notion of differential explanatory power across the O and L factors towards addressing cases at the margin.

Table 2 uses a facial symbol to reflect similarities/differences in O attributes and illustrates the outcomes from the first two propositions. That is, by adopting extreme positions and observing differences in the range of the reported level of overall attractiveness in the focal market down the four columns of multinational contractors with dissimilar O attributes in the same home country/location (Proposition 1) and in contrast to the range of the reported level of overall attractiveness in the focal market across each of the three rows/groups of multinational contractors with similar O attributes but in different home countries/locations (Proposition 2), evidence is generated to indicate the relative importance of O and L factors vis-à-vis a particular sector and in the host market (and in this research – road and bridges in Australia). Such that, if a greater range in the reported level of overall attractiveness in the focal market is observed down the columns than across the rows, then this indicates that the O factor is more important and has more explanatory power than the L factor vis-à-vis the sector concerned in the host market and vice versa. In terms of helping to reveal the relative importance of O and L factors, it is expected that the relative strength of the correlation/level of statistical significance of the O and/or L factors/dimensions generated from a final Proposition 3 will be consistent with the outcomes from Propositions 1 and 2, again vis-à-vis the sector concerned in the host market.

In summary, Dunning’s hypothesis is developed across three propositions in pursuance of developing and refining the explanatory power of the O and L factors (Dunning’s conditions 1 and 3) – contingent on the firm’s motivation (Dunning’s condition 4) and having discounted the I factor (Dunning’s condition 2). The research method is designed to collect data to test the three propositions and has been outlined by the authors (Rahman, Bridge and Rowlinson 2010; Rahman et al. 2011 a; Rahman et al. 2011b). The research plan comprises three stages (secondary data; case studies; and survey) in each of four home countries, namely China; Japan; Spain; and US vis-à-vis the infrastructure sector selected (roads and bridges over AUD50 million) in Australia – as the host market. Each stage seeks to surface corroborating evidence concerning ownership advantages; location advantages; and business motivation to test the propositions.

Table 2: Propositions 1 and 2

Roads and Bridges in Australia (AUD>50million)	Home country China	Home country Japan	Home country Spain	Home country US
Operating/expressing an interest in Australia Group 1	☺	☺	☺	☺
Not Operating/expressing an interest in Australia Group 2	☹	☹	☹	☹
Not Operating/expressing an interest in Australia Group 3	☹	☹	☹	☹

Key

- ☺ = O advantages in comparison to contractors of other nationalities/local contractors in serving the Australian market
- ☹ = O advantages and disadvantages in comparison to contractors of other nationalities/local contractors in serving the Australian market
- ☹ = O disadvantages in comparison to contractors of other nationalities/local contractors in serving the Australian market

The aim of this paper is present a first stage test of the authors’ development of Dunning’s hypothesis by way of an initial review of secondary data vis-à-vis the selected sector (roads and bridges) in Australia (as the host location) and with respect to four selected home countries (China; Japan; Spain; and US). In doing so, the next stage in the research method concerning sampling and the ownership advantages component in the case studies is also further developed and described in this paper.

SAMPLING

FROM POPULATION TO SAMPLING FRAME

Of the population/all the multinational contractors in the world, Engineering News Record's (ENR) top 225 contractors is used as the basis of creating the sampling frame. That is, there are 155 multinational contractors noted in the ENR (2010) list in terms of operating in the transport sector. Upon checking the homepage for all of the 225 contractors, 163 of these contractors advise that they operate in roads and bridges. Some of the 155 contractors in the ENR list do not appear in the 163 contractors identified from the website search and some of the contractors from this website search do not appear in 155 contractors listed the transport sector in ENR and so accounting for this, the eventual sampling frame may be up to 188 contractors. These 188 contractors will then be invited to participate in the stage 3 survey used to generalise findings beyond the secondary data and case studies findings.

NON-PROBABILITY SAMPLING

With regard to the stage 1 secondary data review presented in this paper and the next stage 2 case studies, this section summarises a non-probability, or purposive, approach to identifying the case studies and which deploys the logic in Table 2. In order to allow the effect of variations in location advantages on the overall attractiveness of the Australian market to be most effectively observed (looking across the rows in the Table 2), two of the home countries are selected from Australia's region (China and Japan), whilst the other two home countries are from outside Australia's region (Spain and US). The pair of countries within Australia's region and the pair of countries outside of Australia's region are selected as having contrasting construction industries and which are likely to create greater home-host induced differences arising from cultural; administrative; geographic and economic distances/differences. These differences generate investment and set-up costs/risks and which is one of the two dimensions in the L factor. The other L factor concerns perceptions of return (once the multinational contractor is at full operating effectiveness/efficiency and beyond the set-up costs) available in the sector in Australia and which all contractors face – in terms of pipeline and the extant market structure/level of competitiveness in the sector but which is then perceived differently by contractors from different home locations due to the relative returns/size in their home and other host markets available to these contractors from different home locations.

In order to create the greatest opportunity to observe deviations in ownership advantages (denoted by the facial symbol) and to assess the effect of variations in ownership advantages on the overall attractiveness of the Australian market (looking down the columns in Table 2), three groups of contractors will be sought. All contractors case studied will remain anonymous.

The four contractors in Group 1 (one from each home location) are selected on the basis of having the highest levels of overseas revenue in roads and bridges and the highest level of connection to Australia – in terms of the following six bands:

- Band 1: Majority ownership of a contractor (subsidiary) in the NPS;
- Band 2: Less than 50 percent current ownership of a contractor in the NPS;
- Band 3: Expressing an interest in Australia in last 12 months;
- Band 4: Majority ownership of a contractor (subsidiary) domiciled in Australia in last five years;
- Band 5: Less than 50 percent ownership of a contractor domiciled in Australia in last five years;
- Band 6: Expressed an interest in Australia in last 5 years.

In contrast, Groups 2 and 3 comprise the most successful (amongst the top half) and least successful (amongst the bottom half) of multinational contractors again with reference to overseas revenue in the sector in each of the four home locations but not operating in Australia (middle and bottom rows in Table 2). These multinational contractors in Groups 2 and 3 not operating in Australia are defined as contractors from the four home locations not in any of the Bands 1-6.

OWNERSHIP ADVANTAGES (CASE STUDY DESIGN)

As noted in the key to Table 2, the facial symbols are relative to other contractors serving the Australian market. The contractors may or may not be wholly located in Australia. In order to create a reference point for comparison purposes, six contractors from Australia's National Prequalification System (NPS) for Civil Construction, Road and Bridge are selected and assessed in terms of their ownership advantages. More specifically, two of Australia's leading NPS contractors (in terms of market share in the sector) in the highest financial level (AUD 150million plus) in the NPS will be selected along with two other contractors in the bottom half of this financial level, again in terms of market share. Two further NPS contractors will be selected in the financial level (AUD 100 million). Contractors in this level are assessed as capable of undertaking a maximum value of \$100million and which approximately

corresponds to the other extreme in terms of the value parameter in the sector selected and which is road and bridges greater than AUD 50million.

In the context of this research, an ownership/O advantage is a resource/attribute that gives a multinational contractor a competitive advantage and promotes the multinational contractor in terms of successfully bidding for a new project and is a resource that is not possessed by all competitors in the sector comprising roads and bridges over \$50million in Australia. As part of the review of secondary data, including the NPS criteria and a review of all the websites from the 32 contractors in the NPS financial levels AUD100million to AUD 150 million plus was undertaken along with a review of all the websites of contractors in the home countries falling in Bands 1 to 6.

This review focused on identifying keywords/phrases pertaining to the strengths of the contractors and as an initial indication of firm specific O advantages. The range of these advantages or attributes is shown in Figure 1 and which is an indicative sketch, for illustrative purposes, of a radar map for two NPS contractors in the financial level AUD 150million plus.

To create an accurate reference radar map reflecting the six NPS contractors and by which to compare Group 1, 2 and 3 contractors from home countries, an objective set of measures will be developed relating the scope of attributes shown in Figure 1. On each attribute and on the basis of scores recorded from the two leading NPS contractors in the highest NPS financial level AUD150 million plus (termed upper Tier 1 contractors from this point); the two contractors in the bottom half of the highest NPS financial level AUD150 million plus (termed lower Tier 1 contractors from this point); and the two contractors in the NPS financial level AUD 100million (termed Tier 2 contractors from this point) the three pairs of contractors will be ranked and a score of 7 awarded to the pair of best scoring contractors, a score of 1 awarded to the worst scoring pair of contractors and a score of 4 awarded to the mid-placed pair of contractors.

Having obtained objective measurements of the highest point 7; the mid-point 4 and lowest point 1 on each attribute, then the remaining points 2 to 3 and 5 to 6 will be interpolated. Such that, an entire 7-point scale will be operationalised for each attribute, for comparative purposes. Finally, a consolidated radar map will be created for the 3 pairs of NPS contractors. That is, a map showing three NPS lines: an Upper Tier 1 line; a lower Tier 1 line; and a Tier 2 line will be developed.

Group 1, 2 and 3 contractors in each of the four home locations will then be assessed using the same objective measures for each attribute and their results mapped relative to the three NPS lines. In all cases, only the lines will be published, with the responses to objective measures on each attribute remaining confidential. Once the radar map for each of the home country contractors in each of the three groups is established, the symbol J is given to a home contractor whose radar map falls mostly above the lower Tier 1 map and the symbol K is assigned to a home contractor whose radar map falls mostly between the lower Tier 1 map and the Tier 2 map. The symbol L is given to a home contractor who scores below Point-1 on any attribute pertaining to the NPS criteria. This contractor is effectively being assessed as unlikely to achieve prequalification and win any road and bridge project greater than \$50 million in Australia. The approach taken to selecting the three groups of contractors from each of the four home countries, described above, is designed to aim to create the pattern of facial symbols shown in Tables 2 and, in doing so, facilitate the testing of the propositions.

Having reviewed the secondary data pertaining to O advantages and which comprise mainly contractors' websites and including company reports and financial statements, it's clear that this source of data is, on its own, insufficient to develop clear reference and comparative maps of NPS contractors' and home contractors' O advantages. At the same time, a survey approach is also unlikely to surface this rich information. Hence, the creation of the radar maps will rely heavily on the planned case studies. The case studies will also generate perceptual data concerning L advantages, business motivation and the dependent variable concerning the overall attractiveness of the sector in Australia. That said, the review of secondary data has played an essential role in the further design and approach to be taken in the cases described in this paper.

The review of secondary data will also be extended to include consideration of the broader environment surrounding the road and bridges sector in each of the four home countries, or the home related O advantages and which will corroborate and give a background explanation to the profile of the radar maps for the home country contractors relative to the reference NPS contractors' radar maps. Here, Porter's (1990) diamond model will be used and in doing so, factor conditions; demand conditions; related and supporting industries; and strategy, structure and rivalry will be considered and which have at least relevance to the road and bridges sector in each of the four home locations.

In brief, Porter's model will help explain the scores to be observed on each attribute in terms of the home related factors that are

able to be accessed and mobilised by the home contractor and potentially expressed as a more competitive/desirable bid (across cost and/or benefits perceived to be important by the client). Moreover, the review of secondary data has also at least started to talk to the relative importance of O versus L factors. In so far as, there are number of contractors from the home countries (for example, Acciona from Spain and Fluor from US), that have subsidiaries in the sector in Australia but which are not amongst the leading few contractors in their home country (ENR 2010). This suggests that there are other contractors from these home countries that are capable of winning road and bridge projects in Australia and that factors other than O advantages, could be more important.

Finally, the strength of the contribution of secondary data, relative to primary data from the planned case studies and survey, will be indicated more clearly in the next section concerning L advantages.

O-Advantage

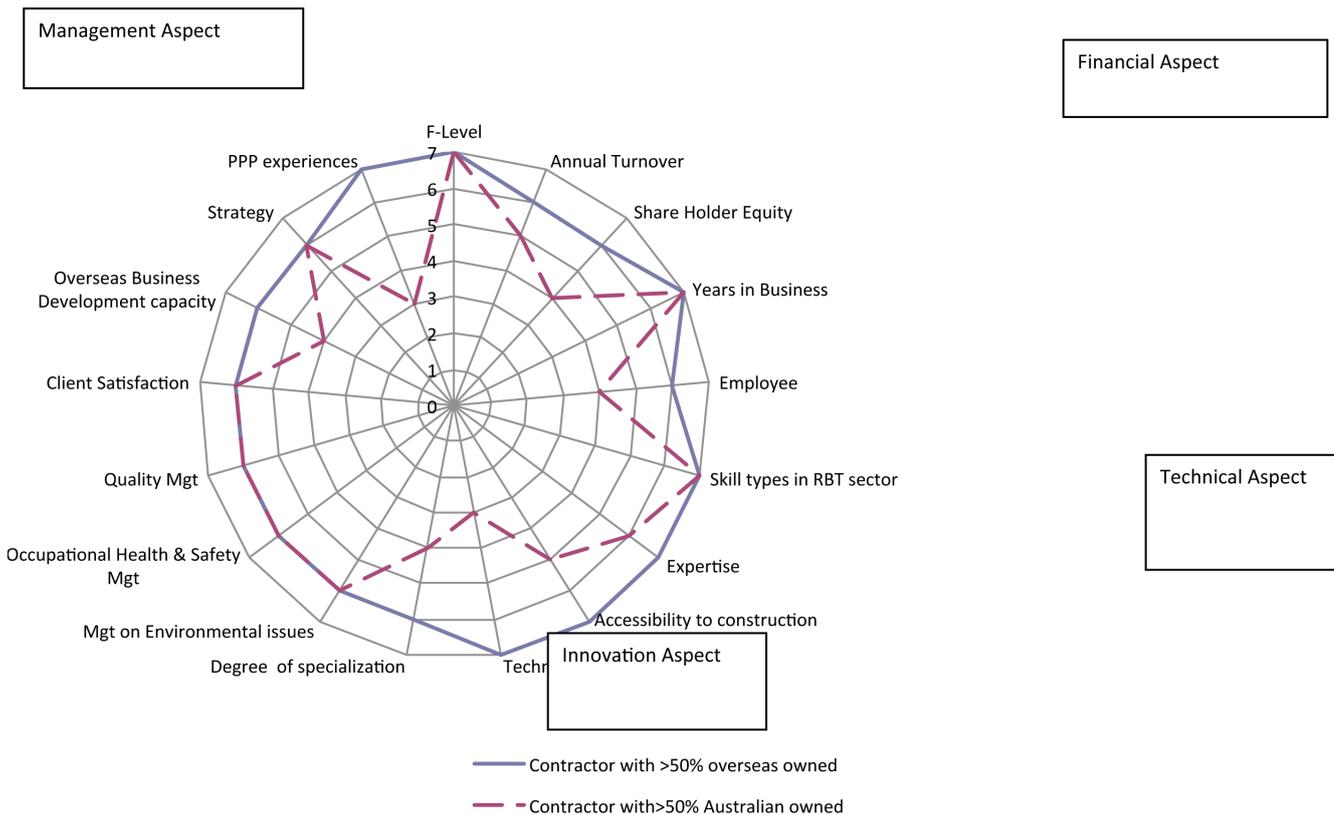


Figure 1: Map of ownership advantages

LOCATION ADVANTAGES

Secondary data in relation to the roads and bridges sector is generated to help assess the two dimensions associated with L advantages and which concern return and risk. With respect to the return envisaged by the L factor, this concerns perceptions of normal profit/expected industry returns in the host market, given the level of extant competition and excluding set-up costs, and these perceptions of host market return are affected and relative to returns available in the home market and other competing host markets. To surface background factors that indicate the level of competition and the level of potential profit and which can corroborate the perceptions of the host market returns (to be generated in the case studies), Porter’s (1985) five forces model analysis is used.

This model focuses on internal rivalry; entry; substitutes and complements; supplier power; and buyer power. Deploying this model in roads and bridges over AUD 50 million in Australia surfaces three distinct further sectors/sub-sectors comprising: road and bridges between AUD 50 million and AUD 800 million; road and bridges over AUD 800 million; and roads and bridges procured using PPPs. These three sub-sectors will be used as a background and having identified the key sub-sector (preferred project value range and procurement) within road and bridges for the home country contractor (in the case study setting) and as a means of

more accurately understanding their perceptions of the return component in the L factor. To complete the picture concerning the perception of returns from a home contractor, secondary data will again be used in deploying Porter's model but this time in terms of the sub-sector selected in the home country and in the key overseas locations (other than Australia) for the home country contractor. Such that, the overall perceptions of return in the selected sub-sector for the home contractor but in Australia can be explained and corroborated as a function of the outcomes of a five forces analysis of the selected sub-sector in the host country relative to home country; and key overseas locations for the home contractor. As a further and more fundamental check of the overall perceptions of return in the selected sub-sector in Australia, the size of demand in these various locations is also generated via secondary data.

In terms of the risk dimension envisaged by the L factor, this relates to country specific investment set-up costs/risks and arise out of home-host induced distances/differences. Rugman and Verbke (2005) explain that Transaction Cost Economics (TCE) logic and variables (asset specificity; uncertainty; and frequency) can be used to reflect the influence of country specific investments. Here, asset specificity can be measured using secondary data in terms of the cultural; administrative; geographic; and economic (CAGE) differences created between each of the home locations and the host location/Australia and are summarised (as ranked differences) in Table 3. That is, Hofstede's (2001) model is used to reflect the cultural distance between Australia and each of the four home locations and computed as follows: China at 4.66; Japan at 2.72; Spain at 1.62; and US at 0.02. Hence, China is ranked 4 (greatest distance/difference relative to Australia) and US ranked 1 (least distance/difference relative to Australia).

Business Monitor International (BMI, 2011) is used to assess administrative risk between Australia and the four home countries in this research and with particular respect to legal/regulatory risks and political risk. With regard to geographic distances, account is made of the relative communications technology between Australia and the four countries in mitigating issues and costs associated with physical distance. On the economic differences, again BMI (2011) scores concerning economic/financial risk are used, along with Euromoney country risk (ECR, 2011) report and other macroeconomic indicators including GDP. In order to pick-up TCE's uncertainty dimension towards capturing country specific investment, once again BMI (2011) is used and this time the Business Environment Rating scores. Finally, with regard to TCE's frequency dimension, assessment is made of the relative difference between the nature and size of the roads and bridges sector in each of the home countries versus Australia and including differences in total revenue; average size of project; and popular approaches to procuring projects in the sector. This assessment of the TCE's frequency dimension is relevant in terms of affecting perceptions amongst contractors of the scope to recover and justify country specific investments.

Table 3: Country specific investments (risk) relative to Australia

Home Country	Culture	Admin	Geographic	Economic	Uncertainty	Frequency
China	4	4	2	3	4	3
Japan	3	2	1	2	2	1
Spain	2	3	3	1	3	1
US	1	1	4	4	1	4

China and US account for all of the "4s" in Table 3 and which suggests contractors from these countries may face higher country specific investments (risks) in setting-up operations/take a much dimmer view of these set-up costs/risks than contractors from Japan or Spain. This analysis of secondary data pertaining to the risk dimension in the L advantages factor seems to be highly relevant given the much lower incidence of Chinese and US contractors in the Australian roads and bridges market and especially as China and US account for largest number of contractors in the 188 contractors that make-up the previously described sample frame in this study.

CONCLUSIONS

This paper has reported on progress towards an investigation into the determinants of multinational contractors' willingness to bid for Australian public sector major infrastructure projects and which is designed to give an improved understanding of matters surrounding FDI into Australian roads and bridges over AUD 50million. More specifically, this paper has presented a first stage test of the authors' development of Dunning's hypothesis by way of an initial review of secondary data vis-à-vis the selected sector (roads and bridges) in Australia (as the host location) and with respect to four selected home countries (China; Japan; Spain; and US). In doing so, the next stage in the research method concerning sampling and the ownership advantages component in the case studies has also been further developed and described in this paper, and beyond that outlined elsewhere by the authors (Rahman, Bridge and Rowlinson 2010; Rahman et al. 2011a; Rahman et al. 2011b).

In terms of the contribution of this initial review of secondary data and towards speaking to the relative importance of O advantages versus L advantages in explaining the current extent of FDI/expressions of interest in Australia from contractors in the four home countries, some very tentative conclusions can be drawn at this stage. That is, this secondary data seems to suggest, that L advantages may have more explanatory power than O Advantages. This is on the basis that a number of top-tier contractors from the selected home locations are present in the Australian sector concerned and some of these contractors are not amongst the top few leading contractors in their home country. This may suggest that other contractors from these home countries are at least capable of winning and delivering projects in the selected sector in Australia. In this sense, the knowledge and skills required for the management of the construction of a major road and bridge projects may be reasonably widely and globally dispersed (suggesting lesser opportunities for competitive advantages arising from O advantages). At the same time, Table 3 (concerning L advantages) indicates that contractors from US and China may face much greater country specific risks/take a much dimmer view of these set-up costs/risks – at least in comparison to contractors from Japan or Spain. And, indeed, there is/has been in last few years a much greater presence of contractors from Japan and Spain, than from China and US, in Australia in the sector concerned. The much larger size/potential size of both the markets in China and US, along with the higher number of Chinese and US contractors in the sample frame developed for this research is also consistent with both of the above points.

Once again, these are very tentative conclusions at this stage and robust conclusions are only likely to be forthcoming having completed primary data collection from the planned case studies and survey. The case studies and survey will also seek to comprehensively test the propositions in this paper and further investigate the relative importance of O advantages versus L advantages in explaining the current extent of FDI/expressions of interest from contractors in the four home countries. Such that, harnessing the relative strengths of the completed analysis of secondary data; cases studies and survey and triangulating the outcomes these methods, will provide strong evidence upon which to conclude the relative of importance of O advantages versus L advantages in the context of this research and which is progress that Seymour (1987) indicated would be very valuable and difficult to achieve. And in total, this answers Seymour's call to seek to significantly advance the OLI framework and increase our understanding of the FDI decision. That is, this research will not only increase the explanatory power of Dunning's framework by revealing the relative importance of the O and L factors, it will also extend the scope of Dunning's framework to the issue of in-bound FDI to Australia and in the context of multinational contracting. Finally, the research will also contribute to method. To the authors' knowledge, this will be the first operationalisation, in this context, of the Resource-Based Theory in terms of O advantages in the planned case studies and TCE on the issue of risk as part of the L factor in the review of secondary data presented in this paper. Furthermore, the research will yield some very important practical contributions including a global map of the relative attractiveness of the Australian market and, within this map, indications of the relative competitiveness and productivity of indigenous contractors. Finally, the research will identify aspects of the location factor that can be influenced by government, as well as surfacing any misconceptions of the Australian market.

ACKNOWLEDGEMENTS

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RESILIENCE OF TRADITIONAL PROCUREMENT APPROACH IN SOUTH AFRICAN CONSTRUCTION

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Advocates of performance improvement have continued to amplify the need for use of innovative procurement approaches in the international construction management literature in a bid to address poor project performance in the industry. A common subject in the literature is the uninspiring performance associated with projects procured through the traditional / conventional approach. To this end, South African construction has embraced a number of procurement approaches so as to ensure that performance issues are addressed at project inception stage. Through the survey of related literature and a quantitative survey, this paper reports on an aspect, namely procurement of research conducted with the overall aim of identifying issues contributing to performance impediments, and their effects in South African construction. The survey was conducted among general contractor (GC) members of the South African Federation of Civil Engineering Contractors (SAFCEC), consulting engineer members of Consulting Engineers South Africa (CESA), and selected public sector clients. Selected findings include: in terms of the procurement of infrastructure in South Africa, 72.2% of the respondents have participated in projects procured through design by employer (traditional); 64.8% have participated in projects procured through construction management; 48.1% have participated in design and build (D&B) projects; and 33.3% have participated in Public Private Partnerships (PPP) projects. In effect, the findings indicate that the traditional approach dominates the type of procurement route used for procuring projects in the public sector in South Africa. However, there appears to be major scope for improvement if project stakeholders (most importantly clients) can proactively create awareness with respect to the merits of other procurement approaches, and demerits of the traditional approach.

Keywords: construction, infrastructure, procurement, South Africa

BACKGROUND

A survey that addressed performance measures in Japan, the United Kingdom (UK), and the United States of America (USA) indicates that Japanese contractors' performance related to quality is superior to that of western contractors as western contractors tend to attach more importance to cost and time (Xiao and Proverbs, 2002). Regardless of the discrepancy, a project may not meet its performance targets if these indicators fail to measure up to required expectations. This situation is said to eventuate whenever the industry is characterised by high competition and low performance. According to Kashiwagi and Savicky (2002a), the high level of competition and emphasis on low price in the current construction industry is such that designers, construction managers, and inspectors using specifications and the low-bid system tend to put owners at risk of poor performance. The current business process of low bid construction and control by managers is so inefficient that it has been argued that it is impossible to ensure continuous performance improvement in the industry (Kashiwagi and Savicky, 2002a).

In particular, design related scope changes, variation in cost estimation, and over design, tend to marginalise optimal performance in construction (Kashiwagi and Savicky, 2002a; 2002b). For example, reported Construction Industry Development Board (cidb) Construction Industry Indicators (CII) indicates that a number of performance related lapses are occurring in South Africa. As indicated in Table 1, clients' neutrality / dissatisfaction with respect to contractor performance, level of defects recorded in projects, and construction schedule have consistently occurred on projects surveyed in 2007, 2008, and 2009; and though improvement can be seen in clients neutrality / dissatisfaction relative to quality of works delivered, the improvement is however marginal between 2008 and 2009 (cidb 2008; 2009; 2010).

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Table 1: Areas of concern in the performance of South African construction

KEY FOCUS AREAS	RESPONSE (%)		
	2007	2008	2009
Clients were neutral / dissatisfied with contractor performance	24.0	21.0	18.0
Clients were neutral / dissatisfied with quality of works delivered	33.0	20.0	19.0
Clients were neutral / dissatisfied with level of defects in projects	24.0	18.0	12.0
Clients were neutral / dissatisfied with construction schedule	24.0	22.0	21.0

Source: cidb (2008; 2009; 2010)

As a result of the reported performance shortcomings and other performance related impediments in construction, procurement methods / strategies used for project delivery have increasingly come under close scrutiny. In order to deliver value to clients and society, the cidb (2003) postulates that principles governing the conduct of parties to a contract should include:

- behaviour that is equitable, honest and transparent;
- discharging of duties and obligations timeously and with integrity;
- complying with all applicable legislation and associated regulations;
- satisfying of all relevant requirements established in procurement documents; avoid conflict of interest, and
- not maliciously or recklessly injuring or attempting to injure the reputation of another party.

These principles pertain to all parties to a contract in South Africa regardless of the procurement method. The principles enshrined in the ‘code of conduct for all parties engaged in construction procurement’ were made public partly to address a range of performance problems in the industry (cidb, 2003). Challenges within the South African public sector that have been identified as impeding effective delivery of infrastructure, *inter-alia*, include the lack of infrastructure delivery management skills; lack of appropriately skilled resources; inefficient / inappropriate systems and processes; and inconsistent procurement procedures (cidb, 2006a). Thus, a toolkit that provides guidelines for infrastructure delivery and procurement so as to facilitate a uniform approach to infrastructure delivery and procurement management was published by the cidb in 2006. The toolkit among other items identified major procurement methods currently in use in South Africa. The toolkit noted that there are a number of procurement methods that can be used to deliver engineering and construction works. As indicated in the toolkit, the most encountered procurement method is the so called ‘design by employer’ in which the contractor undertakes only the construction on the basis of full designs and specifications issued by the employer. The employer either carries out the design ‘in house’ or appoints consultants to carry out the design functions on behalf of the employer.

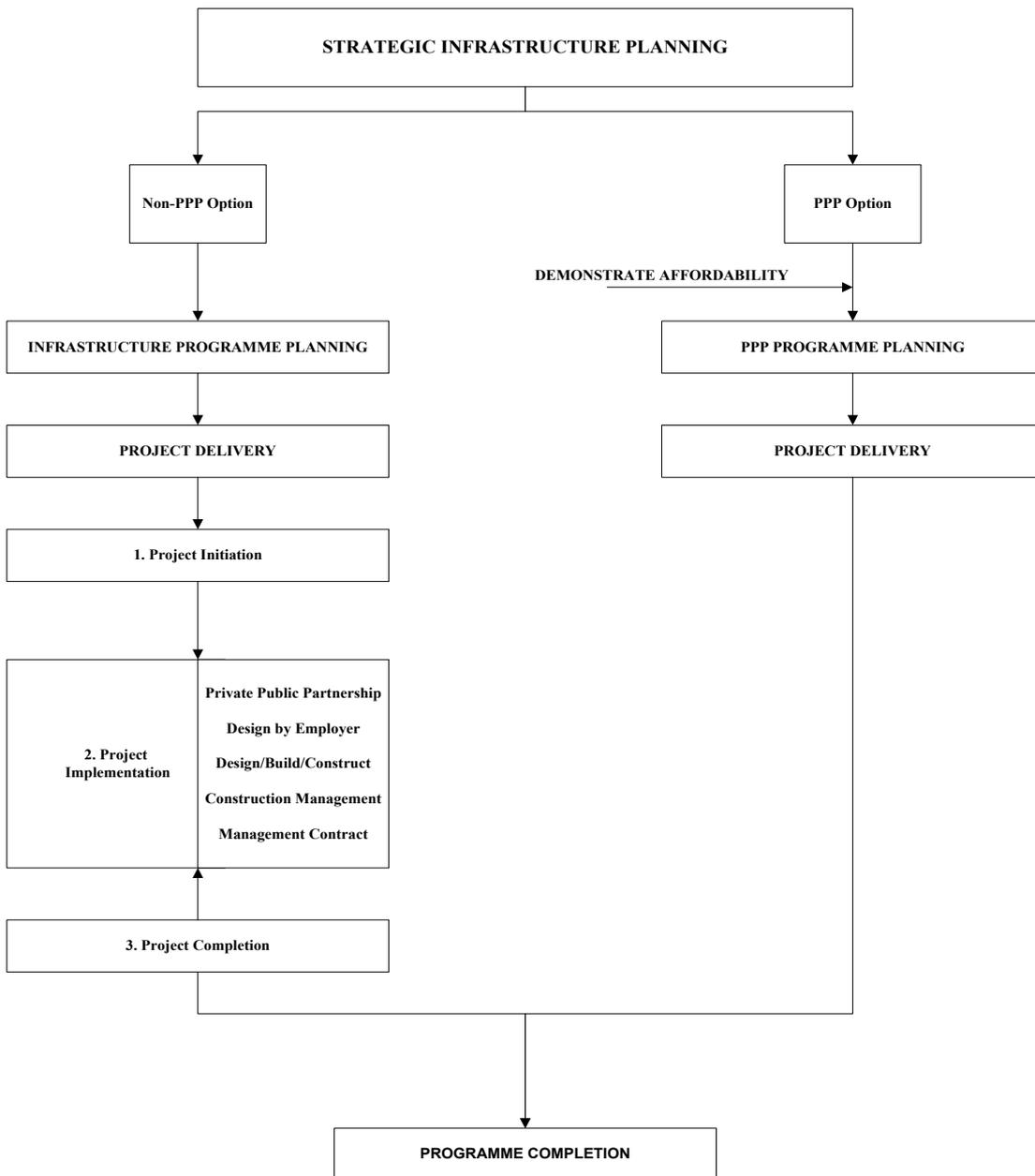


Figure 1 Core processes indicating PPP option (adapted from cidb, 2006a: 18)

Apart from the design by employer method, the toolkit also noted design and build, construction management, develop and construct, management contract, and the public private partnership (PPP) options (cidb, 2006a). To be succinct, the toolkit provided guidelines related to how to use each option and also indicated with a flow chart when to choose the PPP option as indicated in Figure 1.

However, anecdotal evidence in South Africa suggests that in spite of the availability of tools and information that could accelerate the proliferation of the use of alternative procurement methods such as PPP, industry stakeholders prefer the use of the traditional path for infrastructure delivery. This assumption invariably led to the discourse presented in this paper. The aim of this paper is therefore to report on an investigation that was undertaken with the intention of determining the preferred method used for procuring infrastructure projects in South Africa.

THE RESEARCH

The mixed-mode quantitative survey was used to elicit information from respondents through a structured questionnaire that, inter-alia, requested information relative to contract strategies used for procurement, and the type of infrastructure projects that the

respondents have undertaken in South Africa. The survey instrument was designed with closed ended questions so that respondents can identify procurement methods that are prevalent in the South African infrastructure sector. Respondents were also able to identify types of infrastructure projects that they have undertaken in the past in South Africa.

Upon completion of the questionnaire design, the survey, which constitutes a phase of a large empirical study, was conducted among GC members of SAFCEC, consulting engineer members of CESA, and selected public sector clients. One hundred and fifty-four (154) questionnaires were posted to the sample stratum and thereafter e-mailed in an attempt to enhance the response. At the end of the survey period that spanned approximately twelve weeks, only fifty-four (54) valid responses were received, which equates to a response rate of 35.1%. As indicated in Table 2, the perceptions of consulting engineers dominate the views expressed (51.9%), while the difference in terms of quantity between that of clients and GCs can be considered to be marginal. The aggregate percentage column was computed by dividing each respondent group by the total responses received. For example, in the case of the public sector clients, the 11 response received constituted only 20.4% of the total $((11/54)*100)$.

Table 2 Response rate relative to the survey

RESPONDENT GROUP	SAMPLE (NO.)	RESPONSE (NO.)	RESPONSE RATE (%)	AGGREGATE (%)
Public sector clients	42	11	26.2	20.4
SAFCEC	56	15	26.8	27.8
CESA	56	28	50.0	51.9
Total	154	54	35.1	100.0

THE FINDINGS

Given that the majority (79.6%) of the respondents have participated in more than twenty projects in the industry (Table 3), and that the majority have more than 20 years of industry experience (64.8%) (Table 4), it can be argued that the views expressed by the respondents may be considered to be reliable.

Table 3 Number of projects respondents have undertaken in the industry

RANGE	≤ 5	6 – 10	11 – 15	16 – 20	> 20
YES (%)	1.9	7.4	5.6	5.6	79.6

Table 4 Length of construction industry experience of respondents

RANGE	≤ 5 YEARS	6 – 10 YEARS	11 – 15 YEARS	16 – 20 YEARS	> 20 YEARS
YES (%)	0.0	7.4	14.8	13.0	64.8

In particular, Table 5 indicates that the majority (72.2%) of the respondents have undertaken transport related projects; 64.8% other non-residential construction projects; 61.1% water related projects; and 16.7% power related construction projects in the South African infrastructure sector. Therefore, it can be assumed that all the respondents have experience in the South African infrastructure sector. The mean percentage contribution column indicates that power related projects constituted 55.0% of respondents' project portfolio, 45.7% transport related projects, 45.6% other non-residential construction such as public works buildings, and 35.6% water related projects.

Table 5 Types of infrastructure projects undertaken by respondents

PROJECT CATEGORY	YES (%)	% CONTRIBUTION
Transport (roads, port, harbour)	72.2	45.7
Power (dam, gas, coal)	16.7	55.0
Water (storm water, treatment plant)	61.1	35.6
Other non-residential construction	64.8	45.6

Table 6 indicates the type of procurement method used for securing the projects the respondents have undertaken in their respective organisations. The table indicates that 72.2% secured their projects through design by employer (traditional), 64.8% through construction management, 48.1% through design and build, and 33.3% through for each of management contracting and public private partnerships (PPP) projects.

The mean percentage contribution indicated in the table reveal that ‘design by employer’ type of contract constituted 67.9% of respondents’ project portfolio, construction management 38.3%, design and build 25.9%, management contracting 23.2%, and PPP, only 12.4%. In effect, it can be argued that the survey of these 54 respondents suggests that transport projects and design by employer procurement method dominate in terms of their industry experience.

Table 6 Types of procurement method used for infrastructure projects

Project category	Yes (%)	% contribution
Construction Management	64.8	38.3
Design and Build	48.1	25.9
Design by Employer (traditional)	72.2	67.9
Management Contracting	33.3	23.2
Public Private Partnerships (PPP)	33.3	12.4

DISCUSSION

In order to gain more insight into the findings of the survey in terms of procurement methods that are seemingly dominant in the South African infrastructure sector, awarded civil engineering projects that are documented in the cidb online database were analysed. Using the search terms of civil engineering, start date of 1 March 2007 and end date of February 2011 led to the identification of PPP and non-PPP projects awarded within this period. In specific terms, projects were categorised by asking the question ‘is the funding source for this project a public private partnership’ and ‘does this project fall under the expanded public works programme (EPWP)’. As indicated in Table 7, only 10 PPP civil engineering projects were awarded from Grade 4 upwards within this period. This constitutes a mere 1.8% of the projects awarded as non-PPP civil engineering projects at 98.2% dominate the sector. Out of the 546 project awards, only 37 qualified to be considered as EPWP projects. In effect, it can be argued that procurement methods that are often used for infrastructure delivery in South Africa include design by employer, design and build, construction management, and management contracting. The PPP procurement method and its variants can therefore be said to be making a rather slower in-road into the South African infrastructure sector.

Table 7 Previous awards of PPP and non-PPP civil engineering projects

cidb Grade	Maximum Tender value (Rm)	Non-PPP	EPWP	PPP	Total
4	4	108	17	2	110
5	6,5	99	6	0	99
6	13	99	6	4	103
7	40	122	6	3	125
8	130	73	0	1	74
9	No Limit	35	2	0	35
Total		536	37	10	546
Percentage		98.2		1.8	

Source: <https://registers.cidb.org.za/rop/i-tender/AwardsSearch.asp>

These findings are supported by the work of Love et al. (2008), which determined that the traditional lump sum (TLS) method is still the preferred procurement path in the public sector of Western Australia (WA) even though alternative forms such as PPP could optimise project outcome. The study also determined that the TLS path is commonly used to procure projects by a WA agency in the last ten years. When asked why this is the case during a focus group session, employees of the agency noted that they would only contemplate an alternative procurement method when:

- circumstances were perceived to be “abnormal”, for instance to obtain something beyond their budgetary constraint;
- a Minister, the WA Department of Treasury or the like, suggested a system of procurement other than the default TLS. For instance, when treasury introduced a new PPP process, or
- in association with non-standard or non-profile projects where the procurement options would be discussed or negotiated with clients of the agency; sometime using a recently launched “business case navigator” as a referral tool.

Even in the sub-Saharan African context, a study conducted in Lagos, Nigeria revealed that 48.08% of construction projects are executed using variants of traditional procurement method; 32.69% are executed through variants of PPP; while only 19.24% are executed through design and build (Babatunde et al., 2010). These results suggest that though both traditional and non-conventional procurement methods are currently embraced in the Nigerian construction industry, the traditional approach dominates. These findings are against the backdrop of a number of publications that advocate the use of alternative procurement paths. For instance, Hawkins and Wells (2006) contend that greater flexibility is needed in identifying a procurement strategy / method as the 'one size fits all' approach creates an inflexible system that is not appropriate for all projects. They say in developing countries such as Nigeria and Kenya, a move away from the lowest cost approach is needed so that a more flexible path by clients and donors would improve the delivery of projects that engenders the achievement of social objectives.

However, the ascendancy of the traditional path has been attributed to the long age existence of the approach (Babatunde et al., 2010). The ascendancy could also be ascribed to policy: ability to deal effectively with risk related to cost, time, and quality; familiarity and acceptance within the local industry; satisfies public accountability; provides maximum client control over the project's outcome; and provides cost certainty (Love et al., 2008). In addition, further explanations for the dominance of the traditional method in South Africa may be found in the work of Bowen et al. (1999), which determined that respondents to some extent prefer to use the conventional (traditional) procurement methods for their projects. Bowen et al. (1999) reveal issues about procurement systems in South Africa based on the perceptions of clients, consultants, and contractors. Their findings determined that clients exhibit some ambivalence in terms of knowing which system / approach to use for procurement; and consultants exhibit selectivity about informing clients of alternative procurement system and are under-informed about some of these routes. Therefore, this lack of knowledge may explain a misplaced preference for the traditional approach over other procurement methods (Bowen et al., 1999). Even the perceptions pertaining to the extent that the marketplace can embrace alternative forms of procurement methods due to lack of experience may engender continuous use of the traditional approach (Love et al., 2008).

CONCLUSIONS

The discourse thus far has reported on the findings of an empirical study conducted among key stakeholders in the South African infrastructure sector in order to, inter alia, determine the procurement method commonly used for project delivery. The literature reviewed and the empirical findings indicate that non-PPP procurement methods dominate the sector. Among the non-PPP procurement methods, the traditional path that is otherwise referred to as 'design by employer' dominates the South African infrastructure landscape. And among the types of infrastructure projects that are executed in the country, the respondents perceive that transport related construction projects dominate the sector.

In other words, it can be argued that in spite of numerous procurement guides and empirical findings that advocate the benefits of alternative methods in which PPP is a principal option, the South African infrastructure sector is still primarily reliant on the traditional approach. Therefore, the resilience of the traditional procurement approach in South African construction may have been aided by the lack of knowledge and experience of alternative approaches in the industry, and perhaps, the prevalence of relatively small projects in terms of maximum tender value in the industry could have contributed significantly to the status quo. This is because as indicated in the literature, budgetary constraints are always the overriding criterion for the use of alternative procurement approach such as the PPP approach.

However, given the limited nature of the sample size and response rate that provided the basis for the findings presented in this paper, it is important to note that the resultant findings can only be considered to be insightful. Nevertheless, there appears to be a major scope for improvement if project stakeholders, most especially clients in all tiers of government, can proactively create awareness concerning the merits of alternative procurement methods, and the demerits of the traditional approach.

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PERCEPTIONS OF SMEs ON THE USE OF FRAMEWORK AGREEMENTS IN THE UK CONSTRUCTION INDUSTRY

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Following the Latham and Egan reports, Framework Agreements (FAs) came into the limelight in the UK construction industry as a means of reversing the adversarial nature of construction procurement. While the use of FAs has since been growing rapidly in the industry, it is generally believed that they favour larger firms over SMEs. The aim of this study therefore was to investigate the views of SMEs on the use of FAs and to identify and evaluate the barriers to the participation of SMEs in FAs in the UK construction industry. Data obtained from 56 SMEs in a questionnaire survey in Northwest England were analysed using percentage scores, relative important indices and Pearson's Chi-square significance test with the aid of the SPSS software. The findings showed that most SMEs regarded FAs as a "closed system" barring new entrants into the market. The results also showed that the most and least significant barriers to SMEs' participation in FAs were excessive product/service aggregation and the inability of SMEs to understand tender information in FAs respectively. These findings indicate that SMEs which constitute about 90% of the construction industry still consider themselves as disadvantaged by the use FAs due mainly to their limited resources in relation to larger firms.

Keywords: framework agreements, procurement, SMEs, United Kingdom

INTRODUCTION

The UK construction industry has experienced strategic changes as a result of the Latham (1994) and Egan (1998) reports. These reports made far-reaching recommendations to promote innovation in construction procurement. According to Oyegoke *et al.* (2009), the recommendations of these reports for an integrated team building approach to procurement have contributed to the increasing use partnering in procurement in the UK construction industry. The need for such integration has been a key issue in the construction industry since the 1980s (Faisal *et al.*, 2006). According to Khalfan and McDermott (2006), the government-sponsored Latham (1994) and Egan (1998) reports have provided the impetus for change and innovation to improve the delivery and procurement of construction projects. The Egan Report stated categorically that it did not wish the industry to look at what it already did and improve on it but to start doing things entirely differently (Egan, 1998). This in effect required the industry to change the way it delivered projects. One aspect of this change would be for client and contractor organisations to work together as a unified team, instead of being a disparate collection of separate organisations (Briscoe and Dainty, 2005).

The use of partnering in construction procurement has been on the rise in recent times. This is because partnering and other forms of collaboration have been seen as a means to reduce the fragmentation and lack of integration which have been blamed for poor project performance in the construction industry over the years (Bresnen and Marshall, 2000). Smyth (1999) identifies framework agreements (FAs) as one of the main types of partnering. According to Arnek (2004), the use of FAs has been on the increase in public sector procurement in the EU as a means to lower purchase prices by reducing transaction costs.

Opinions differ on the ability of SMEs to compete for and secure FAs. Smith and Hobbs (2001) have reported that FAs and other partnering arrangements generally do not favour SMEs. This view is supported by Bakker and Walker (2008) whose study on collaborative procurement in local government in the UK showed that FAs tend to exclude SMEs. However, Arnek (2004) believes that the FAs do not necessarily constitute barriers to SMEs' participation, as many SMEs have successfully competed for FAs. The aim of this study was to highlight the current level of participation of SMEs in FAs in the UK construction industry and to identify and assess barriers to their participation.

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THE CONCEPT AND ORIGIN OF FRAMEWORK AGREEMENTS

Article 32 of the EU Public Sector Procurement Directive (Directive 2004/18/EC, 31 March 04) includes a provision for framework agreements. The Directive defines a framework agreement as

“an agreement with suppliers, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and quantity”.

According to Wright Hassall LLP (2011), the corresponding UK Regulations which implement Directive 2004/18/EC came into force on 31 January 2006. The UK regulations are:

- Public Contracts Regulations SI 2006 No 5
- Utilities Contracts Regulations SI 2006 No 6
- Regulatory Impact Assessment – Public Contracts Regulations 2006
- Regulatory Impact Assessment – Utilities Contracts Regulations 2006

Prior to Directive 2004/18/EC, the EU enacted a number of Directives in the early 1990s to further enhance and define public services, supplies, works and utilities. Among these directives were:

- Directive 92/50/EEC. Co-ordination of Procedures for the Award of Public Services Contracts (OJEU, 1992);
- Directive 93/36/EEC. Co-ordinating Procedures for the Award of Public Supply Contracts (OJEU, 1993a);
- Directive 93/37/EEC. Co-ordination of Procedures for the Award of Public Works Contracts (OJEU, 1993b); and,
- Directive 93/38/EEC. Co-ordinating the Procurement Procedures of Entities Operating in the Water, Energy, Transport and Telecommunications Sectors (better known as the ‘Utilities’ Directive) (OJEU, 1993c).

Directive 93/38/EEC was of significant importance. It was the only Directive out of the four mentioned above to contain provisions for framework agreements. Article 1 (5) of this Directive defined framework agreements as ‘an agreement between one of the contracting entities and one or more suppliers, contractors or service providers the purpose of which is to establish the terms, in particular with regard to the prices and, where appropriate, the quality envisaged, governing the contracts to be awarded during a given period’. Articles 5 (1) to 5(4) of the Directive laid down the procedures to guide contracting entities in construing a framework agreement as a contract under the terms of the Directive. Article 5 (4) stated that contracting entities must not use framework agreements ‘in order to hinder, limit or distort competition’.

A framework agreement does not necessarily constitute a contract. It is merely an agreement of the terms and conditions to apply in any contract to be placed under the agreement. Specific purchases (call-offs) are made under the terms set out in the agreement (Constructing Excellence, 2005). Arnek (2004) also makes a distinction between a framework agreement (FA) and a framework contract (FC). FCs involve agreements between service providers and service purchasers which oblige the purchasers to source from the suppliers concerned. Both the price and product/service specifications are always fixed. On the other hand, FAs do not oblige the purchaser to source from the supplier and the purchaser can conclude agreements with several suppliers as shown in Figure 1.

In contrast with Amek’s (2004) distinction, Oyegoke *et al.* (2009) also classify FAs into binding and non-binding. They call the binding “Framework Agreement” and the non-binding “Framework Arrangement”. The framework arrangement is used where the parties do not wish to enter into a legally binding agreement but wish to create a collaborative working environment.

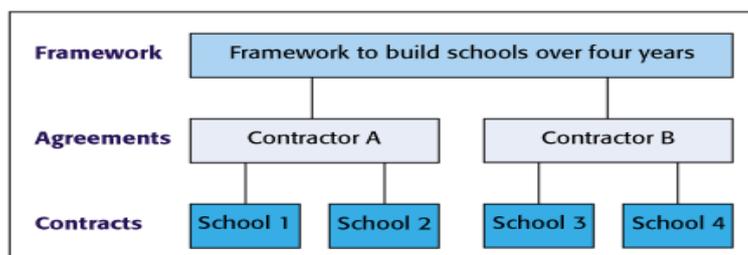


Figure 1: The framework, the agreement and the contract (Adapted from Constructing Excellence, 2005)

The FA changes the way services and products are procured from one-off contracts to a stream of similar contracts. According to Khalfan and McDermott (2007a), this has moved the client-contractor relationship from short term to long term with a continuous flow of similar projects. It has also changed the traditional project-based organisational structure of project teams to a set of long-term partnering relationships in an integrated supply chain.

THE PREVALENCE AND BENEFITS OF FRAMEWORK AGREEMENTS

Although framework agreements were in existence pre-Latham and Egan, they were infrequently used. The reasons for this include the ‘uncertainty over the permitted types of framework agreements’ (Arrowsmith, 2005, p.670). Framework agreements came into the limelight post-Latham and Egan as a means of reversing the traditionally adversarial nature of construction procurement, and as a means of moving away from acceptance of lowest price tenders to ones which afford better value for money. In fact, the Local Government Task Force Report (cited in Oyegoke *et al.*, 2009) recognises construction frameworks as an implementation of the partnering principles advocated by the Latham (1994) and Egan (1998) reports.

According to Oyegoke *et al.* (2009), partnering, including framework agreements and other forms of social integrative devices, is a temporary arrangement which is generally dictated by market forces. In this regard, it is their view that a framework agreement is one of the responses to market demands for an integrated supply chain. It is therefore not surprising that the use of FAs in public sector procurement of goods and services in the EU seems to be increasing. This, according to Arnek (2004), is driven by the need to reduce transaction costs and lower purchase prices to achieve cuts in public spending. In the UK, for example, FAs have been used by many local government authorities and government departments (Khalfan and McDermott, 2007b; Glover, 2008; Oyegoke *et al.*, 2009). Available data provided by Gruneberg and Hughes (2004) shows that FAs accounted for 2% of all projects in 2001. This increasing popularity of FAs is reinforced by the fact that both the Joint Contracts Tribunal (JCT) and the New Engineering Contracts (NEC) forms of contract have recently issued standard form framework agreements as supplements (Glover, 2008).

The benefits of using FAs in construction procurement can be considered in terms of general benefits, benefits to the client and benefits to the contractor. The general benefits, according to Arnek (2004), Bresnen and Marshall (2002), Khalfan *et al.* (2006) and Goodier *et al.* (2006), include:

- Less waste and duplication
- Reduced transaction costs
- Savings on tendering costs
- Building of trusting, long term relationships
- Bringing of all “project knowledge” together at the inception of a project.

Khalfan *et al.* (2006) have identified the following among the benefits to the client:

- Improved design and delivery
- Greater cost certainty and better whole life costing
- Improved project quality

The benefits to the contractor include:

- The security of long term work programmes (Abbot *et al.*, 2006; Bresnen and Marshall, 2002)
- Improved cost recovery and relatively secure margins (Bresnen and Marshall, 2002; Khalfan and McDermott, 2006)

Framework agreements are not without their disadvantages. Among those identified by Arnek (2004) are:

- The large contract sizes often involved in FAs favour large suppliers over small, new ones
- There is normally no guarantee that the supplier with the most advantageous bid will be able to sell the most, and this may discourage companies from tendering
- In multiple FAs where purchase volumes are not defined at the time when the agreements are signed with the suppliers, suppliers may refrain from submitting tenders

SMEs AND FRAMEWORK AGREEMENTS IN THE CONSTRUCTION INDUSTRY

Micro, Small and Medium enterprises (SMEs) are generally defined by their number of employees (headcount) and their turnover or balance sheet total. The EU defines a micro enterprise with a headcount of less than 10 and a turnover or balance sheet total of not more than €2m, a small enterprise with a headcount of less than 50 and a turnover or balance sheet total of not more than €10m, and medium enterprise with a headcount of less than 250 and a turnover of not more than €50 million or a balance sheet total of not more than €43 million (European Commission, 2003). SMEs are of particular importance to the economy as they represent around

99.79% of all European enterprises (Burgi, 2007), providing in the region of 65 million jobs. In construction, SMEs account for 90% of the industry (Erridge, 1998).

O'Brien (1993) has stated that SMEs' share of public procurement contracts is not commensurate with their share of the economy. This may be due to the observations that:

- several factors concerning size, resources and ownership limit them in aspiring to radical product or process innovations (Ahedo, 2010), and
- they do not have enough absorptive capacity to apply new techniques or technology, or the necessary human resources to innovate (Olazaran et al., 2008 cited in Ahedo, 2010).

Instead of innovating, SMEs engage in other forms of creative and improving activities such as imitation, copying, small-scale experimentation, strategic relations with clients, etc., many of which may be regarded as a learning process towards innovation (Ahedo, 2010).

POTENTIAL BARRIERS TO THE PARTICIPATION OF SMES IN FRAMEWORK AGREEMENTS

It has been observed by Erridge (1998) that even though SMEs represent around 90% of the construction industry, they have only 15% share of the public procurement market. O'Brien (1993), Erridge (1998), Arnek (2004), Dutra *et al.* (2006) and Williams (2008) have identified and explained the effects of several key obstacles to SME participation in framework agreements. Among the obstacles are:

- the relatively large sizes of most FA contracts which are beyond the capacity of most SMEs,
- the time available in which to properly prepare bids,
- the inability of SMEs to obtain adequate information,
- the cost of preparing bids,
- financial problems, including delays in payment, and
- FAs over 4 years favour large well established firms over SMEs

Against these odds, it seems the best chance that SMEs have to increase their participation in FAs will be as sub-contractors to the large, established contractors.

RESEARCH METHODOLOGY AND DATA ANALYSIS

A total of 75 questionnaires were sent out via e-mail and another 17 hand-delivered to construction and consulting firms in Northwest England in February 2011. Sixty-five (65) questionnaires were returned, 48 via e-mail and 17 returned by hand. Nine (9) out of the 65 firms which responded were found not to belong to the SME category which the study covered. Thus responses from 56 SMEs, representing a response rate of 60.9%, were used for the analysis. This is a very good response rate, as according to Elhag and Boussabaine (1999) and Idrus and Newman (2002), a response rate of 30% is good enough in construction research. Over 73% of the respondents had more than 10 years working experience in the construction industry. Also, over 73% were aware of UK legislation on public procurement while over 41% were aware of the appropriate article on FAs in the EU Directives and 75% had experience working on projects involving FAs. This, overall, indicates that their responses could be relied upon.

The data were analysed with the Statistical Package for Social Sciences (SPSS) software using percentage scores, relative importance index (RII) and Pearson's Chi-square test of significance methods. The relative importance index is given by the formula:

$$RII = \frac{1}{5n} \left[\sum_{i=1}^{i=5} W_i x f_i \right], \dots\dots\dots Eqn. 1,$$

where W_i is weight given to i^{th} rating; $i= 1, 2, 3, 4$ or 5 , $f_i =$ response frequency of the i^{th} rating; and $n =$ total number of responses.

Table 1 shows that the sizes of the firms were fairly evenly distributed between micro (28.6%), small (26.8%) and medium (44.6%) enterprises.

Table 1: The distribution of the firms by size

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Micro	16	28.6	28.6	28.6
	Small	15	26.8	26.8	55.4
	Medium	25	44.6	44.6	100.0
Total		56	100.0	100.0	

The businesses of the firms were also almost equally distributed between contracting (51.8%) and consulting (48.2%) as shown in Table 2.

Table 2: The distribution of the firms by type of business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Contractor	29	51.8	51.8	51.8
	Consultant	27	48.2	48.2	100.0
Total		56	100.0	100.0	

PERCEPTIONS OF THE USE OF FRAMEWORK AGREEMENTS.

The respondents were asked to express their views on some positive and negative attributes of FAs on a scale ranging from “Strongly agree” to “Strongly disagree”. Their ratings of the attributes were ranked using the Relative Importance Index (RII) given in Eqn. 1. The results are shown in Table 3. The rankings in Table 3 indicate that the most important positive attribute (advantage) is that FAs result in deeper, long-term relationship between the contracting parties which obviously benefits both parties. The most negative attribute is that FAs are viewed as barring new entrants into the construction market.

A comparison of the results in Table 3 between construction and consultancy firms using a Chi-Square test of significance gave Pearson Chi-Square significance values of less than 0.10 for only 3 of the 9 factors. For the other 6 factors the values ranged from 0.125 to 0.895. This means that, at the 10% level of significance, there was no significant difference between the opinions of contractors and the consultants on a majority (67%) of the factors.

Table 3: Ranking of some attributes of framework agreements

ATTRIBUTES OF FAS	FREQUENCY OF RESPONSE					RII	Rank
	5	4	3	2	1		
Framework agreements.....							
do not promote competitive bidding	3	30	8	10	5	0.657	7
Result in deeper, long-term relationships between the client and contractor	9	35	7	4	1	0.768	2
result in fewer losses to the contractor	6	15	18	16	1	0.632	9
provide cost savings through supply chain relationships	5	21	19	11	0	0.671	5
provide clear and committed commercial structures	2	32	15	7	0	0.704	4
carry less risk than other procurement methods	6	19	12	17	2	0.636	8
deliver continuous improvement agenda	3	19	27	6	1	0.661	6
present barriers to new market entrants as they are 'closed systems'	16	29	8	2	1	0.804	1
lead to contractors building in a 'risk' premium for the uncertainty where anticipated levels of work are uncertain	7	27	13	8	1	0.711	3

1-Strongly disagree 2-Disagree 3-Neither agree nor disagree 4-Agree 5-Strongly agree

Table 4 shows the respondents ranking of 8 factors considered as barriers to the participation of SMEs in FAs. The most significant barrier is the fact that “Projects using FAs are often too large for SMEs to tender for”, while the least is that “SMEs rarely understand what information is required in tenders involving FAs”. A comparison of the results in Table 4 between construction and consultancy firms using a Chi-square test of significance gave Pearson Chi-Square significance values of more than 0.10 for all the 8 barriers. This shows there was no significant difference between contractors and consultants in their ranking of all the barriers.

Table 4: Ranking of some barriers to the participation of SMEs in Framework Agreements

BARRIER TO SMEs	FREQUENCY OF RESPONSE					RII	RANK
	5	4	3	2	1		
Projects using FAs are often too large for SMEs to tender for	16	27	7	5	1	0.786	1
Adequate/relevant information on FAs is not always readily available to SMEs	7	27	14	8	0	0.718	5
Time given for tender submission is insufficient for SMEs to properly and thoroughly prepare a bid	7	23	12	13	1	0.679	6
The cost of preparing bids is too high for SMEs to carry	15	25	7	7	2	0.757	3
SMEs often fail to obtain the necessary Quality Assurance & Standards required for jobs using FAs	14	26	7	7	2	0.754	4
The cost incurred by UK SMEs in achieving credibility for FAs in other EU countries is too high	15	19	21	1	0	0.771	2
SMEs rarely understand what information is required in tenders involving FAs	7	17	13	16	3	0.632	8
Other financial issues, such as delays in payment and late payment by clients prevent SMEs from bidding for such jobs	7	19	15	12	3	0.654	7

1-Strongly disagree

2-Disagree

3-Neither agree nor disagree

4-Agree

5-Strongly agree

CONCLUSION

The study examined the views of SMEs on the use of FAs in the UK construction industry. The findings showed that there was agreement between the contractors and consultants on the perceived advantages and disadvantages of FAs as well as the barriers to SMEs’ participation in FAs. Most of the firms surveyed regarded FAs as a “closed system” barring small, new entrants into the market. The results also showed that the most significant barrier to SMEs’ participation in FAs was excessive product/service aggregation while the inability of SMEs to understand tender information in FAs was the least. These findings indicate that SMEs which constitute about 90% of the construction industry in the EU still consider themselves as disadvantaged by the use FAs due mainly to their limited resources in relation to larger firms.

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KEY CONSTRAINTS TO IMPROVING THE AFFORDABLE HOUSING DELIVERY PROCESS IN THE SYRIAN MARKET: THE POTENTIAL OF PROCUREMENT EFFICIENCY

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The need to significantly improve procurement efficiency as a mechanism to increase affordable housing supply in Syrian cities has become an important issue, due to many reasons. On the demand side these include the natural increase rates of the Syrian population, including in urban areas, the acceleration of urbanization due to rural-to-urban migration; as well as the emergence of the 'buy-to-let' phenomenon in an emerging Syrian housing market. On the supply side the growing shortfalls and delays in the state housing implementation plan provision can be attributed to different constraints represented by planning system and policy, land allocation for residential use, inadequate public investment, bureaucracy as well as the lack of coordination between different players. However, a key issue affecting supply is the cumbersome procurement system used for state support to affordable housing supply; this is the focus of this study. The main aim of this paper is to assess the constraints to improving affordable housing supply processes in Syria in the context of government regulations and policy. Interview surveys were used as the main method to conduct this research. The qualitative interviews with key actors (stakeholders) offered insight into the main issues concerning 'the procurement process of affordable housing provision in the Syrian market' in seven separate categories. The level of constraints encountered in every category was investigated and ranked according to the interview results. The results show that the key challenge for improving the affordable housing delivery process is represented by wide range of constraints located at two basic levels that are called housing system design and housing system implementation. The findings could be used to improve the procurement efficiency of affordable housing delivery process in Syria in order to decrease the shortage of housing mainly for low-income people.

Keywords: affordable housing, efficiency improvement, procurement process, Syria

INTRODUCTION

Housing has a great impact upon peoples' daily activities. Housing is also an important element of the built environment due to its influence on health, education, economy, and environment, as well as its influence on political and social life (Sinha 1978). Governments all around the world have tried to address the problem of providing adequate, affordable and sustainable housing to their nations over the last three decades (Ong 2003). The South African Government, more recently, has planned to increase housing delivery on a sustainable basis to a peak level of 350,000 new units per annum for a number of years (National Department of Housing 2003). However, the progress is slow and the problem of large informal settlements still exists and is growing (UNCHS, 1996). In order to reduce the South African housing backlog, the government has established a number of Social Housing Institutions (SHI), but still its social housing provision has not lived up to the promise. This phenomenon has become evident particularly throughout Africa (Knight 2001) and major Asian countries especially with growing urbanization, low levels of income, and limited opportunities for employment. This cannot be attributed to only the social, economic and political aspects of levels of development, but also to other institutional issues which hinder governments in developing countries as they strive to fulfil their goals to appropriately support provision of new affordable houses.

Syria is one of these developing countries that suffers from the shortage of housing for low-income families in urban area, in particular. The natural increase rate of its population (Raphaeli 2007) has caused an increase in housing demand in addition to the acceleration of urbanization due to rural-to-urban migration (Sabbagh 2001). This form of migration mainly represents people who are trying to improve their quality of life including getting access to improved social services, and others who seek employment in cities, but cannot afford normal market-supplied accommodation in the cities. This has led to the formation of informal settlements around urban areas (Hammal et al. 2005), and more importantly, has increased the pressure upon the government to provide affordable houses to

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new arrivals, or assist with supply through the market. Furthermore, the emergence of the so-called 'buy-to-let'ⁱⁱ phenomenon in the Syrian market has kept a large number of new residential units out of occupation. Alsafadi (2009) stated that in Syria the lack of residential units is a result of both unbalanced demand and supply issues aggravated by speculation.

This housing crisis has worsened as the government has been consistently unable to appropriately fulfil its own future plans to meet the increased demand for housing. This can be attributed to different issues represented by the complicity of planning system and housing policy, the lack of land set aside for residential use (The General Company of Housing 2009), inadequate public investment levels, and complex bureaucratic routines as well as the lack of coordination between different actors (Sarraf 2005). All these reasons together play an explicit role in aggravating the mounting housing crisis in the Syrian market, and have made the need for adequate provision of affordable units for low-income groups in urban areas an important concern of the Syrian government, especially in key cities such as Aleppo and Damascus.

AN OVERVIEW OF THE HOUSING CONDITIONS OVER THE PAST FOUR DECADES

Housing is a basic need and in Syria the provision of adequate housing has been considered an important social agenda, not only reflected in the announcements made by political leaders, but also in the government's annual budget and development plans since the 1960s. In 1960, the current Central Planning Apparatus had been set up, with the Supreme Planning Council, consisting of the Prime Minister and the various ministers and heads of general organizations, responsible for the plan's design and implementation (Winckler 1999). The Syrian Government established its first five-year development plan (1960-1965), which included an aim to reduce the housing shortage in the whole country. The government was determined to build 60,000 residential units in the main central cities in Syria in this plan; however the number of accomplished units did not exceed 12,000 units in reality (Ibid).

Within the framework of the second five-year development plan (1965-1970) 163,000 residential units were targeted, but the shortage of residential units was estimated to be 159,000 units (The Central Bureau of Statistics 2001). This was attributed to the weak combined performance of the public, cooperative and private sectors in providing the adequate numbers of houses. Housing supply has received the same criticism concerning the subsequent third, fourth and fifth five-year development plans. One of the key issues associated with the shortfall of providing adequate housing was the use of very traditional approaches in the production process. These approaches were represented by the use of raw, semi-processed, and processed materials that are provided by relatively unsophisticated domestic sources and by basic industries such as cement and steel manufacturing (Alsafadi 2009).

With the growth of the urban population, due to national in-migration to urban areas, and also foreign migration and natural increase rate of population, housing programmes in urban areas were further accelerated with particular emphasis given to affordable housing in subsequent Syrian plans. This coincided with the establishment of the General Company of Housing in 1982 with a remit to provide affordable housing for low-income groups in the central cities (The General Company of Housing 2004). During the sixth five-year development plan (1985-1990) and seventh five-year development plans (1990-1995) the government concentrated on affordable housing projects (i.e. Social Housing Programmes) in particular in urban areas. These two national plans were drawn up with the objective of increasing the number of houses especially for low-income groups, as well as dealing with the emerging backlog resulting from previous plans. Despite continuing efforts being made to set out quantitative targets with adequate investment allocations, these two plans can be characterised as only indicative rather than instructive in nature. Subsequently, the Government intensified efforts to boost affordable housing provision through drawing in the Company of Military Housing, which was previously responsible for providing residential units for military personnel, to participate in providing general affordable houses alongside the General Company of Housing. In doing so, the likelihood of achieving successful results in the housing sector was expected to be high, especially with allocated funds targeted to new affordable projects (i.e. the Youth Housing programme). In addition the state supported a cooperative housing sector, but this also failed to provide the sufficient number of residential units as projected in the eighth five-year development plan (1995-2000) although the cooperative contribution in provision was estimated at 20-25 % of the actual supply (The Syrian Economic Centre 2007). In contrast to the various failures of the state and state-supported cooperative sectors, the private sector, on the other hand, was increasingly active in developing properties however these were unaffordable by the lower income majority.

ii. - The buy-to-let phenomenon emerged recently in the Syrian market where some investors and/or private entrepreneurs started to buy properties just to increase the number of their possessions, or to trade in the housing market (Dibo 2008) because they were convinced that this process will keep their capital growing (Alsafadi 2009).

Most recently, the housing sector has witnessed a relative boom in the period of the ninth five-year development plan (2000-2005) in terms of the formation of financial institutions that offer housing finance packages such as housing loan schemes to civil servants, and providing other capital allocated for affordable housing schemes. However, once again, this enhancement was inadequate to cover the shortfall in the market supply. This was attributed to a lack of land available for residential use for low income housing; a lack of coordination between the different stakeholders involved; overall shortage of funds; and a lack of adequate labour, material and plant. The results of the tenth five-year development plan for the years (2005-2010) have not appeared as yet. However, this plan is once again supposed to be responding to the relentlessly increasing demand for new affordable houses in the market (The Syrian Economic Centre 2007).

This paper aims to assess the constraints of improving affordable housing supply process in Syria in the context of government regulations and policy.

METHODOLOGICAL APPROACH

A general interview guide approach (semi-structured interviews) (Patton 2002) was used as a basis for this paper. It was carried out during 2010 by interviewing key informants from different disciplines:

- Policy makers working in the Ministry of Housing Development.
- Officials working in the governmental and public companies.
- Professionals working in Engineering Syndicate.
- Academics working in Architectural and Engineering Faculties, and working in housing schemes.
- Relevant personnel working in the Cooperative sector represented by the Housing Associations.

The qualitative interviews with key actors, added a unique perspective to the research and offered insight into the main form of the study concerning 'the procurement process of affordable housing provision in the Syrian market' in seven separate categories namely 'legal and governmental procedures,' 'institutional arrangements of providing affordable housing,' 'land acquisition for residential use,' 'affordable housing design process,' 'affordable housing construction process,' 'fund allocation and government subsidies,' and 'the real estate market'.

The interviews were conducted with 19 interviewees from the different disciplines identified. The selection of the interviewees was a result of a pilot study held in 2009. The samples were chosen according to three criteria: the practicality of getting proper access to respondents, type of respondents in terms of their position and expertise, and the willingness to give information by the respondents. With regard to the nature of the Syrian context, we think that the number of the chosen samples is compatible with Bertaux (1981) who argued that fifteen is the smallest acceptable sample size in qualitative research. Moreover, we think that the saturation has been achieved by the number of the collected data from the interviewees (Ryan and Bernard 2004) whereby more fine-grained themes have been sought. The total number of the interviews was 25 (some respondents were interviewed twice due to having broader knowledge and good expertise in the research area). The interviews were performed in Aleppo city and lasted for 90 to 120 minutes. Each interview was not audio recorded because a large number of respondents opted not to have the interviews recorded although they were told that the research is conducted in accordance with ethical issues in terms of confidentiality and anonymity of all interviews names and positions (Lofland et al. 2006; Corbin and Strauss 2008). Accordingly, field notes (Bryman and Bell 2007) were taken in order to capture what was said before and after the interview as well as the initial reflections during the interviews.

A qualitative approach was chosen for the interviews, allowing respondents to freely answer a number of questions concerning their view on what is the current procurement process of affordable housing delivery in the Syrian market in order to understand the current practice of affordable housing delivery process. Furthermore, the respondents were asked to identify the key constraints of improving affordable housing supply process. The collected data through the interviews were rich, and the depth and detail of actual experiences and feelings of the respondents revealed in the interviews were very helpful for this paper.

DATA ANALYSIS

The theoretical framework that drawn from the literature review serves here as a basis for underlining the main categories used for analysing the data collected from the interviews. The analysis of the key constraints of improving affordable housing delivery

process was undertaken over a period of four months and involved repeated iterations of the data into clusters and groups. All interview transcripts were manually coded to capture data on underlying issues and recurrent themes (Bryman 2004; Creswell 2003). Subsequently, the level of constraints encountered in every category was investigated and ranked in tables according to the number of responses received during the interviews. The impact of every constraint was classified into three groups (high, moderate, and low).

RESULTS AND DISCUSSION

RESPONDENTS' VIEWS ON LOW-INCOME GROUPS AND AFFORDABLE HOUSING DEFINITIONS

Since the Syrian government has been working on providing affordable housing for low-income groups since the 1980s, it was really important to investigate how these two issues are defined in the Syrian context. Respondents were asked to freely identify low-income groups and affordable housing. Surprisingly, the interviews results showed that the perception of affordable housing definition varied between all respondents, and there is no proper definition for it.

The interviews also revealed that the criteria on which people are classified as low-income groups are not formally identified. Actually, the absence of any form of education or training courses to promote the theoretical concepts of affordable housing and lower income groups was notable. In that case, there is underlying emphasis on the importance of developing an affordable housing definition and reviewing the income eligibility for low-cost by studying income growth and expenditure patterns in order to establish the amount, which the lower income households can afford in housing.

KEY CONSTRAINTS ENCOUNTERED IN THE PROCUREMENT OF AFFORDABLE HOUSING DELIVERY PROCESS

Legal and governmental procedures

In this section, the respondents primarily pointed towards the Masterplan preparation as the most essential problem. It was clear that the Masterplan was not fully prepared to respond the need for appropriately allocated land parcels for residential use. This was attributed to the long official procedures of issuing new Masterplans by the government. This issue was most of the time followed by increase demand for both new affordable units and land parcels to build on. It was clear that the level of demand was beyond the supply scope of the government and the public sector companies (the General Company of Housing and the Company of Military Housing).

The complexity and the poor drafting of laws and legislation were often emphasised during the interviews. When respondents were asked about the effectiveness of various housing plans and programmes prepared by the government, a large number stated that housing plans and programmes are weak and inefficient due to a lack of proper methodology to respond to the actual needs in the market. This issue is linked to a lack of skilful and experienced individuals who are responsible for preparing these plans and programmes and may also be linked to a lack of coordination between stakeholders as well as inaction and lack of initiative.

Furthermore, the routine and bureaucracy arising from legislation administered independently by the national and local government agencies were highlighted as indirect issues that affect affordable housing development. Allegations of corruption were also acknowledged during the interviews, due to a lack of enforcement in the housing market in Syria. Corruption in the property industry maybe more rampant than in other industries due to numerous levels of applications and approvals required in order to undertake housing developments. Clearly, over time, these aspects, with others like the centralization of decision making processes have had a negative impact on the efficiency of the official procedures made by the government in order to meet national housing targets.

Institutional arrangements of providing affordable housing

Although affordable housing was supposed to be provided by two sectors (the public and cooperative sectors), this issue was not initially the case in reality. The interviews showed that the public sector bears the burden of providing affordable housing for low-income groups in a way that exceeds its ability to do so. This was attributed to a lack of the following:

- Funds, professionals and manpower.
- Coordination between actors working in different positions, and the confrontational attitude taken by stakeholders.
- Data and information.
- Systematic and orderly education.
- Team work approach and sense of belonging.
- Transparency in the allocation system as in affordable units; they are actually being allocated and eventually bought or inhabited by ineligible buyers who are not qualified by the income criteria.

Unexpectedly, during interview discussion it became clear that the cooperative sector is not currently taking part in this provision. On the one hand, the quest for capital increase was relatively the sole concern of the cooperative sector represented by housing associations. This was not achieved by procuring affordable projects, and its revenues are relatively less than other projects. On the other hand, a large number of individuals have allegedly been deceived by some bogus housing associations that stole their money (Alghben 2010). As a consequence, individuals are no longer applying to get properties from this sector since they do not trust it anymore. In view of this, the percentage of affordable housing, which was implemented during the Syrian plans, was reduced due to the absence of the cooperative sector from the process of affordable housing delivery.

Land acquisition for residential use

In Syria, both planning and land supply functions are mainly municipal responsibilities. As a result, the market for development land is in practice a narrow one, since municipalities are the main, and in some cases the only possible, buyer. Land acquired by Syrian municipals for residential use, requires the use of compulsory purchase powers through using land laws which enforce land owners to sell their land to the municipal. However, the interviews clarified that there is a lack of land available for residential use in the market. Furthermore, the official procedures of getting land parcels for residential use from the municipalities, and transferring land ownership from the municipalities to the public sector interest were not time and cost effective. As a consequence, both the inception and completion dates of affordable housing schemes were delayed. These delays are known to cause losses to clients/contractors and to the entire industry because construction has an important influence on the economy.

Affordable housing design process

The affordable housing design process is divided into two stages. The first stage, which is related to housing plans and programme preparation, has been discussed in the 'legal and governmental procedures' section where responses were received regarding the future plans and housing programmes prepared by the government and its inefficiencies. In connection with the second stage, the respondents were asked questions about who prepares affordable housing plans, and how long they take to be ready. The interviews showed that the public sector companies (the General Company of Housing and the Company of Military Housing) have departments that are responsible for preparing affordable housing plans. However, it is worth stating that there are other managerial departments in every company that are responsible for housing studies and housing project preparation.

It was reported that the duration of preparing project plans is varied from six months up to one year. This was attributed to a lack of collaboration and coordination between departments. The minimum design standards for affordable housing projects were highlighted during the interviews, and the duration of getting plan endorsements from municipalities was considered time-consuming and costly. This in turn has had indirect impact on the inception date of affordable projects implemented by each of these two companies. Thus, the lack of affordable units was highly recognized in the market.

Affordable housing construction process

In Syria, for housing development, it is the legal responsibility of the municipalities to ensure that infrastructure is provided into land parcels for residential use. However, this does not mean that municipality provides all infrastructures. It comes from a mix of public and private sector sources, although by whatever means, it is ultimately a municipal responsibility.

In this section, a set of constraints were highlighted regarding this issue. Problems began to arise early in the infrastructure implementation process, a lack of skilled labour and sufficient plant required to implement infrastructure were highly emphasised during the interviews. This in turn has affected the performance and the inability of municipalities to completely deliver their part of the infrastructure on time. Subsequently, the unwillingness to admit mistakes and inaction were reported as a reason for such delays. With regard to the construction phase, the respondents stated that affordable housing projects, which are provided by the public sector companies, are executed by the private sector (contractors and sub-contractors). This has been attributed to the ability of the private sector to fully secure the required material, labour, and plant much easier and faster than the public sector. However, a large number of respondents admitted that the private sector, who is procuring the public affordable housing projects, was and still is, using the traditional method of construction. Furthermore, unexpected circumstances, escalating price of building materials, wastage of materials, and a high incidence of accidents; as well as absence of job security, poor quality and productivity, poor management, low wages for high-risk jobs, and lack of opportunity for career development were regarded as initial constraints that affect improving construction efficiency.

Fund allocation and government subsidies

The interviews showed that the public sector has financial problems either by getting governmental subsidies for affordable housing schemes, or by collecting monthly payments from subscribers who had applied to get affordable housing. The latter can be attributed

to the inability of subscribers to pay monthly instalments that exceed their monthly salaries, and the difficulty in obtaining housing loans from financial institutions because loan packages available in the market are very limited and inflexible in terms of high interest rates and fixed mortgage structures.

The real estate market

The role of the private sector in providing affordable housing alongside the public sector was highly recommended by the respondents. Especially, the Real Estate Development Law, which was issued in 2008, supports the involvement of the private sector in providing affordable housing, and requires private developers to set aside up to 20% of new developments for affordable housing. However, in reality, the application of this law has not achieved fruitful outcomes due to delays in obtaining various approvals of plans from government agencies, and high interest rates imposed by the banks; as well as the complexity of legislation that allows foreign developers to procure projects that include massive capital and high revenues. The increased demand for new affordable housing in the market was heavily emphasized by respondents. This issue was attributed to the absence of the private sector from delivering its role of providing new affordable units alongside the public sector. It was also attributed to real estate speculations that are driven mainly by private developers and contractors in the market.

Key constraints summarized

As all of the 19 respondents identified the key constraints encountered in affordable housing delivery process, a total of 50 constraints were collected of which many were mentioned multiple times. Each constraint was given a ranking position in every category according to the number of responses received from respondents.

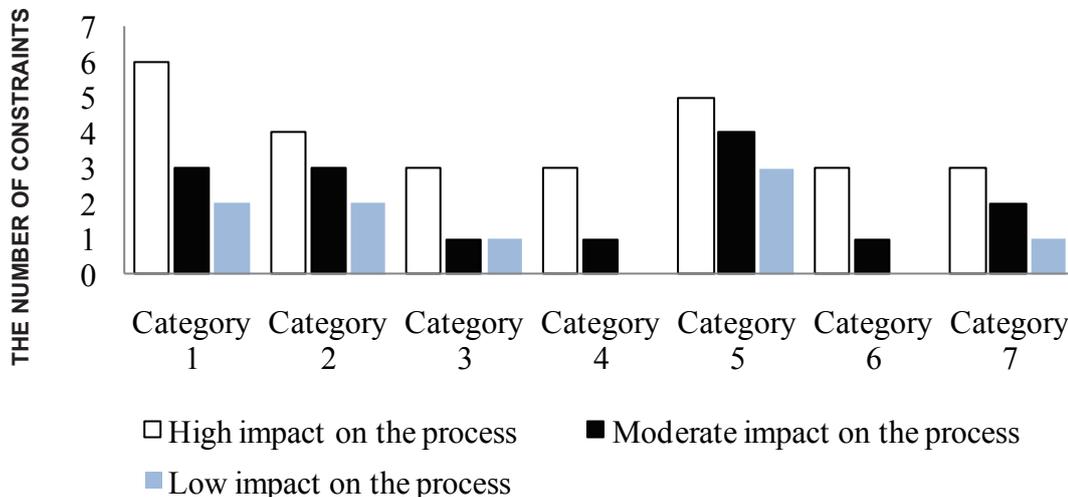
The interview results showed that the key challenges for improving affordable housing delivery process are represented by wide-ranging constraints where most of them have been identified in the previous paragraphs. These constraints are located at two basic levels related to housing system design (this includes national housing plans preparation, affordable housing programmes, planning system, and so on) and housing system implementation (this includes land acquisition, infrastructure implementation, construction process, and so on). The total numbers of constraints encountered in seven categories were grouped according to the aforementioned levels, and their impacts on the effectiveness of affordable housing delivery process were categorised in three stages (high, moderate, and low). The rule of this categorisation is based upon identifying three groups of numbers in order to incorporate the impact of each constraint underneath the proper group. Numbers between 1-6 represent constraints that have a low impact, while numbers between 7-12 represent constraints that have a moderate impact, and then numbers between 13-19 represent constraints that have a high impact. Table 1 is an example of how the constraints identified in the first category were ranked according to their impact on the process. The same method has been applied to the remaining categories.

Table 1: Key constraints encountered in category 1 and their impact

WEAKNESS POINTS	RANKING POSITION	THE NUMBER OF RESPONSES	LEVEL OF IMPACT
The masterplan is not fully prepared to respond to the urgent need of providing more land parcels for residential use	1	19	High
The laws and legislations are complex and not fully explained due to a lack of proper drafting	2	18	High
The weakness of future plans and housing programmes prepared by the Government	3	16	High
The long official procedures of issuing the Master Plan	4	15	High
Long official procedures of processing the actions and distributing the tasks	5	14	High
The prevalence of routine and bureaucracy	6	13	High
Corruption and bribery	7	10	Moderate
Lack of coordination and collaboration between stakeholders	8	8	Moderate
Inaction and lack of initiative	9	7	Moderate
The absence of sense of responsibility	10	3	Low
The centralization of decision making process	11	1	Low

Figure 1 illustrates the final result of the classification. The vertical numbers represent the number of constraints that were given

a specific colour for their impact in every category. Clearly, the legal and governmental procedures, institutional arrangements of providing affordable housing, and affordable housing construction process are the main categories that highly affect any type of improvement in the process of affordable housing provision. This is followed by the impact of the real estate market and different laws related to land acquisition for residential use. Then the impact of the two remaining categories, fund allocation and government subsidies and affordable housing design process, where they have the same effect upon the process efficiency.



- Category 1: Legal and governmental procedures.
- Category 2: Institutional arrangements of providing affordable housing.
- Category 3: Land acquisition for residential use.
- Category 4: Affordable housing design process.
- Category 5: Affordable housing construction process.
- Category 6: Fund allocation and government subsidies.
- Category 7: The real estate market.

Figure 1: The impact of key constraints on improving affordable housing delivery process

CONCLUSIONS

In Syria, long gestation periods of the housing development process in general, and affordable housing delivery process in particular has led to the mismatch between theoretical studies and practice. Traditional ways of providing and procuring affordable housing faced unprecedented constraints. These constraints are located at different stages in the process. They represent a key challenge for improving the affordable housing delivery process. At housing system design level, the problem started by the absence of any form of education or training courses to promote particularly the theoretical concepts of affordable housing and lower income groups. As a consequence, the planning system and national housing policy were not developed adequately in a way that responds to demand for and development of, various types of residential properties, especially with regards to affordable housing as home ownership patterns and social structures are changing over time. Moreover, poor drafting of laws and legislations have affected, over time, the streamline of affordable housing delivery process alongside routine and bureaucracy prevailed in public sector organisations and agencies.

While at housing system implementation level, a use of traditional methods of construction and primitive procedures of bidding and contracting, on the other hand, were seen as one of constraints hindering the progress of the affordable housing construction process.

Affordable housing delivery processes, sooner or later, have to adopt new operational and productivity instruments so as to respond the increased demand for new affordable housing for low-income groups in the Syrian market. The promotion of developed mechanisms, sophisticated procurement strategies, and new relationships between the Government, private developers and the local community in the housing sector could be an alternative way of providing shelter to the lower income group in the near future. The author is still working on examining the potential for procurement efficiency to improve the process of affordable housing supply in Syria.

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PUBLIC PROCUREMENT LIMITATIONS TO INTEGRATED DESIGN APPROACHES IN SOCIAL HOUSING RENOVATION PROJECTS

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Integrated design models are starting to be used in the renovation of social housing. The public procurement rules and the specific characteristics of social housing renovation limit the use of integrated models known from other sectors. Research was done to identify the key limitations and possible disadvantages of integrated models applied to the renovation of social housing. Research methods comprised a literature review on European public procurement legislation and integrated design models, complemented by expert interviews and participation in discussions. The findings show that only the competitive dialogue can be used as tendering procedure to apply integrated models, creating a bilateral relation between client and consortium. General contractors can take a dominant position in this type of consortiums, limiting the independent advice for the client by architects and pushing SMEs to participate only as subcontractors. The configuration of consortiums applying for this type of contracts require further research to avoid the possible dangers highlighted.

Keywords: competitive dialogue, design and build, energy performance contracting, public procurement

INTRODUCTION

The building sector accounts for 40% of EU energy use and 36% of EU CO₂ emissions (European Parliament 2010). Therefore, European authorities have addressed good part of their efforts in energy savings and CO₂ emissions reduction in this sector. Raising the energy efficiency standards of new construction has been the approach applied during the last ten years. Nevertheless, as the yearly new constructed buildings represent only 1% of the building stock (E2ATP 2010) it will take several years to achieve the energy savings targeted by the European authorities (Commission of the European Communities 2008). Therefore, the current focus on energy savings in the building sector is switching to the existing building stock and renovation and maintenance.

Social Housing Organisations (SHOs) have a privileged position to implement changes in the quality of the housing stock, as they are the owners of a large quantity of dwellings that are mainly operated by professional management. Unfortunately, the financial capacity of these entities is rather small limiting considerably their opportunities to improve the quality of their existing dwellings. Moreover, as they offer a public service, the majority of SHOs must follow public procurement regulations (Tackobst 2009). Being unfamiliar with the new possibilities of the public procurement rules and new construction processes, SHOs keep on applying traditional construction processes and awarding the lowest bid of contractors: Design-Bid-Construct, for their new building construction and renovation projects.

The inconvenient of applying traditional construction models has been extensively covered in the existing literature; alternatives for Design-Bid-Construct have been already being used since the 60's (Bennet and Jayes 1995; Hellard 1995; Ronco and Ronco 1996; Stephenson 1996;), when the American construction sector adapted the LEAN methodology. From applying this approach new construction models were created, as LEAN Design and Construct or Integrated Project Delivery (Jackson 2011). These new models have in common that the client, the designer and the constructor work together during the design phase; therefore they are known as integrated models. Integrated models claim to be able to reduce conflicts, to reduce costs, to shorten delivery times and to improve performance. These claims has been already demonstrated in large projects (Bennet 2006). Nevertheless, the suitability in smaller and/or housing renovation projects is still uncertain.

Previous research done in the framework of the European SHELTER project, promoting collaboration in European social housing energy renovations, has highlighted the problem areas of the current renovation models used by SHOs when aiming for high energy savings (Salcedo et al. 2011). The research consisted of a deep analysis of the current renovation processes applied by six SHOs from five different European countries. The study concludes that one of the possible improvements is early involvement of responsible

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actors for construction, maintenance and e.g. energy advice during the design phase. However, public procurement legislation limits the possibilities to involve these parties during the design phase. In what extent these limitations exist, is generally unknown.

The aim of the research is to analyse the legal limitations and possibilities in the current public procurement framework to apply integrated models for the renovation of social housing and highlight possible unwanted consequences. Specially attention is being addressed to Energy Performance Contracting (EPC), promoted by the European authorities to improve the energy performance of their building stock, that currently facilitates the application of integrated models in the renovation of social housing. Section 2 presents the research methodology. Section 3, draws the main characteristics of renovation in social housing and section 4 gives a brief description of the delivery methods used by integrated models. Section 5 digs into the public procurement European directive and highlights the articles referred to the application of integrated models. Section 6 gives some examples of public projects that have made use of competitive dialogue. Section 7 gives first impressions about the use of Energy Performance Contract by SHOs and section 8 concludes appointing key limitations of integrated models applied to renovations in social housing.

RESEARCH METHODOLOGY

In order to fill the identified gap a literature review has been done about European public procurement legislation applied to social housing organisations, integrated construction models and energy performance contracting. Moreover, two interviews were carried out with construction law experts involved in competitive dialogue procedures for infrastructure projects in the Netherlands.

Also information has been gathered through the participation in two discussions about the limitations of public procurement legislation applied in the construction sector. One discussion was held with the SHELTER members: six housing associations from Belgium, Bulgaria, France, Italy and UK and three European federations; the Architects Council of Europe (ACE), the European Builders Confederation (EBC), and the federation of SHOs (CECODHAS). The other discussion session was focusing on the position of architects, hosted by the G30 association of architects, with the participation of members of the European parliament involved in the redaction of the “Green Paper on the modernisation of the EU public procurement”.

CHARACTERISTICS OF RENOVATIONS IN SHOS

The main aim of SHOs is to offer affordable housing to people who cannot get access to the open housing market (Czischke and Pittini 2007). SHOs own and manage a large rented dwelling stock and are responsible for its maintenance. However, SHOs’ own financial capacities limit their possibilities for renovation and they are quite dependent on subsidies and other financial mechanisms offered by public authorities.

The refurbishment of a dwelling is considered to be a renovation when there is an extension of the service life of the building. In previous research done in the framework of the European SHELTER project two types of renovation strategies applied by SHOs were identified: major renovations and planned maintenance. Planned maintenance can be considered to be a major renovation when after execution of the works listed in a long-term maintenance plan the condition status of the effected building components are the same than after a major renovation. However, in planned maintenance the different interventions are done independently in different moments of time, standard technical solutions are applied and commonly designers are not involved in the process (Salcedo et al. 2011).

SHOs using planned maintenance as the only renovation strategy can thus not apply integrated models and limit their refurbishments to different standardised measures without taking into account the benefits of possible interactions to improve the energy efficiency of the dwellings.

National and European authorities have related their subsidies for renovation in social housing to energy efficiency measures applied. These measures in addition to the already needed renovation measures will raise the needed investment. Therefore, the benefit of interactions between renovation measures and the benefit of applying specific solutions adapted to the specificities of the building is especially important. The decisions taken in the design phase arise as a key matter to achieve the desired energetic performance without compromising the investment cost.

INTEGRATED CONSTRUCTION DELIVERY METHODS

In order to improve coordination, cooperation, and sharing of responsibilities and risk, several alternative construction models have been implemented in different countries since the 60's. The main characteristics of these models is that the client, the designer and the constructor(s) participate in the design phase, commonly known as 'integrated'. There are different types of integrated construction models, as it could be: LEAN construction and design, NEC or Integrated project delivery among others (Jackson 2011). Every one of these models can apply one or more different types of delivery methods:

- Design-Build;
- Design-Build-Maintain;
- Design-Build-Maintain-Operate;
- Design-Build-Maintain- Finance;
- and Design-Build-Maintain-Operate-Finance.

In the case of the renovation of social housing a whole life cycle approach is especially interesting to achieve high-energy savings (Straub 2009). Therefore, Design-Build-Maintain and Design-Build-Maintain-Finance are the most suitable types of delivery methods.

PUBLIC PROCUREMENT REGULATIONS APPLIED TO DESIGN-BUILD DELIVERY METHODS

European Social Housing Organisations are public, private or semi-private entities (Czischke and Pittini 2007). However, as the majority are partially or totally funded by public funds, or are partially or totally managed by public authorities most part of them are considered as 'body governed by public law' (CECODHAS 2011) and public procurement regulations apply to them (Directive 2004/18/EC A.1 p.9).

The main legislative document in European public procurement is the European Directive 2004/18/EC. The directive is applicable to all public contracts over a certain threshold, see Table 1. Every state member transposes this directive into their own public procurement law, therefore, there are variations among them and there is a considerable delay in some countries in implementing some of the new tendering procedures as for example the competitive dialogue (Mars 2011).

Under the specified thresholds the state members are not forced to apply the directive, however, public procurement regulations of the different states apply in most part of the cases similar procedures as the ones proposed in the directive under the specified threshold (Global Legal Group 2011).

Table 1: European thresholds for work, supplies and services contracts

Works	€ 4,845,000	Threshold applies to Government departments and offices, local and regional authorities and other public bodies.
Supplies and Services	€ 193,000	Threshold applies to local and regional authorities and public bodies outside the utilities sector.
	€ 125,000	Threshold applies to Government departments and offices.

The directive covers the award of public works, public supply and public services contracts defining as its principles (Directive 2004/18/EC p.2): "(...) the principle of equal treatment, the principle of non discrimination, the principle of mutual recognition, the principle of proportionality and the principle of transparency"(...).

Currently the directive is under revision. A commission of the European parliament is in charge of a consultation process to propose changes to it, the so-called "Green Paper on the modernisation of EU public procurement policy". However, changes are related to the main lines of the directive are not expected:

"The green paper propose an evolution not a revolution"

Heide Rühle European Parliament's rapporteur on the Green Paper. Brussels, 18th October 2011.

TYPES OF AWARDING PROCEDURE

Three different types of public contracts are thus defined. Design of construction works is considered a service contract and execution of construction works is considered a works contract. In case that the contract contains design and execution it is considered a works contract (Directive 2004/18/EC A.1 p.2 b,d).

Contracts can be awarded by the contracting authorities by five different procedures:

- Open procedure
- Restricted procedure
- Competitive dialogue
- Negotiated procedure
- and Design contest

The common award procedures are the open procedure, in which all interested companies can submit a tender, and the restricted procedure, in which all the invited companies can submit a tender (Directive 2004/18/EC A.2 p.11 a,b). In both cases the companies submitting a tender answer to the technical specifications defined by the contracting authority (Directive 2004/18/EC A.23 p.1).

The technical specifications can be descriptive, performance based or a mix of both (Directive 2004/18/EC A.23 p.1). Commonly the contracting authorities contract the design and the execution of construction works separately. First they award the design as a service contract in order to obtain the technical specifications needed to award the execution of the works as a works contract. This procedure is not suitable for integrated models as the constructor is not involved in the design phase.

However, it is possible to award design and works in a single contract. The contractors applying for this tender will reply with a design proposal for a defined price. In this case constructor and designer work together on the design, but the client is not involved. Therefore, it is not suitable for integrated models.

The design contest is not useful neither for awarding design and execution works together as it can be only used to award service contracts (Directive 2004/18/EC A.2 p.11 e). The negotiated procedure, where the contracting authorities negotiate directly with companies of their choice can only be used in exceptional cases (Directive 2004/18/EC A.2 p.11 d); as for example for works performed only with a research purpose and not with the aim of being economically profitable (Directive 2004/18/EC A.30 p.1 d). Therefore, it is not a viable standard option to award integrated contracts.

The competitive dialogue is reserved for 'particularly complex' projects, defining as 'particularly complex' when the contracting authority can not define in advance the technical specifications (Directive 2004/18/EC A.2 p.11 c). Therefore, it is the only type of procedure available that allows client, designer and constructor to participate in the design phase. The definition of 'particularly complex' projects, used in the directive can bring some doubts about the suitability of this procedure for construction projects in social housing. However, article 34 "Public works contracts: particular rules on subsidised housing schemes" makes clear that in the particular case of social housing applying design and construct processes a "special" award procedure may be adopted (Directive 2004/18/EC A.34).

COMPETITIVE DIALOGUE

The competitive dialogue procedure involves several steps. The first one, the selection of candidates to be invited to the dialogue phase, is similar to the restricted procedure. The contracting authority publishes a contract notice, containing the selection instructions, objectives and scope of the project (Directive 2004/18/EC A.29 p.2) and selects a minimum of three candidates (Directive 2004/18/EC A.44 p.3) making use of selection criteria (Directive 2004/18/EC A.29 p.3).

The aim of the dialogue phase is to identify the solutions that best suit to the needs of the contracting authority. Moreover, in this phase all the aspects of the contract can be discussed. The contracting authority must assure equality of treatment during the whole procedure. Therefore, must provide the same information to all candidates but can not share solutions proposed, or other confidential information, communicated by one of the candidates with the other participants (Directive 2004/18/EC A.29 p.3).

The dialogue must take place with a defined strategy to target all the issues of the project; nevertheless, as many meetings as needed can be arranged with the candidates (Directive 2004/18/EC A.29 P.4, p.5). At the end of the dialogue phase the candidates submit the definitive tender that will be assessed by pre-defined award criteria (Directive 2004/18/EC A.29 P.6, p.7). As the dialogue phase supposes a considerable workload for the candidates the contracting authority may specify payments to the candidates of their participation in the dialogue phase (Directive 2004/18/EC A.29 p.8).

PREVIOUS EXPERIENCES WITH INTEGRATED MODELS IN THE PUBLIC SECTOR

Integrated models have been already successfully implemented in the public sector for office buildings and for infrastructure projects (Blanken and Dewulf 2009). In the Netherlands, three of the ministries have published a co-joint guide about competitive dialogue used in awarding Design-Build-Maintain-Finance-(Operate) DBMF(O) contracts (Nagelkerke et al. 2009). From the analysis of this document and an interview with one of the authors, a list of key elements in this type of contracts has been identified: the consortium, the dialogue phase and the time span of the contract.

THE CONSORTIUM

A single company can act as tenderer in a competitive dialogue procedure. However, as the tasks within the DBMF(O) contract are from a different nature and the risks are often too big for a single company, in the vast majority of the projects a consortium acts as the tenderer. The design and construction tasks are commonly performed by a group of companies. The design group would commonly be composed by an architecture office, engineering offices and other types of consultancy companies. The architecture office acts as the coordinator and the others companies can be subcontracted by the architecture office or can be independent actors.

The construction group is commonly composed by a general construction contractor and specialized construction companies. The general construction contractor acts as the coordinator, the specialized construction companies can be independent actors, however, in most part of the cases they are subcontracted by the general construction contractor. In traditional approaches, in large construction projects, the general contractor already has a leading role, as is the one assuming the largest risk. In integrated processes with a general contractor acting as coordinator of the consortium the leading role is even stronger and can damage the independent advisor qualities of the architect, being in DBMF(O) contracts part of the same team. Obviously, the configuration of the consortium is a key element for assuring balanced relations among the companies participating in DBMF(O) contracts.

DIALOGUE PHASE

The main characteristic of integrated processes is that client, designer and constructor(s) participate in the design phase. This is achieved in the public sector in the dialogue phase. The biggest part of the success about finishing in time and in budget can be computed to the successful definition of needs that take place in the discussions between tenderers and contracting authority during the dialogue phase. The better the tenderer knows about the needs of the client, the better the solutions he proposes. However, the level of collaboration achieved during the dialogue phase is finished at the moment the contract is awarded. From that moment on, the relations between client, designer and contractor go back to business as usual.

LONG TIME INVOLVEMENT

Apart from the better design achieved by the collaboration of designer and constructor with the client during the dialogue phase, DBMF(O) contracts have another important advantage for the contracting authority. The risks are fully taken by the contractor. As the contractual relation is over a large time span, the contractor must assure that services agreed are offered during the period the contract has validity. The risks are high and commonly can only be taken by large companies. Moreover, often it is needed to have the collaboration of a financial company on the side of the contractor.

INTEGRATED MODELS IN THE RENOVATION OF SOCIAL HOUSING

Integrated design models have been recently implemented in the renovation of social housing with pilot experiences in Austria (Bleyl et al. 2007) and France (Bullier et al. 2011). However, its implementation has been motivated for the need of a financing scheme to cover part of the costs by the energy savings expected and not for the need of a better collaboration among the actors involved in the renovation (Singh 2010). The financing scheme is implemented by the use of Energy Performance Contracting (EPC). This type of contract was created in the 90's and has been successfully implemented in government buildings in Canada, USA and Germany among other countries (Schonder et al. 2010). EPC uses cost savings from reduced energy consumption to repay the costs of energy saving measures applied. In order to assure the results, it encompasses a long-term involvement of the contractor; performance parameters are used as conditions for success achievement.

EPC requires energy performance specifications and long-time involvement, as in DBMF(O) contracts. Nevertheless, the use of EPC does not imply the implementation of an integrated model because it can be used without the participation of the client too. EPC can be awarded with an open or restricted procedure.

Nowadays only a few social housing renovation projects have applied an integrated model, thus is too early to have a general perception of the success rate of this type of approach. However, it is possible to foresee the probable risks of this type of processes for renovation of social housing.

SME AND CONSORTIUMS

Using the traditional model some SHOs contract the works in a single contract to a general contractor who subcontracts part of the works to SMEs, but some of them divide the contract in lots and contract different SMEs. In Design-Build-Maintain it is not possible to divide the contract in lots. Therefore, if SMEs still would like to act as a contractor in place of being subcontracted, it is needed that they participate in the consortium. Thus in order to maintain the amount of SMEs directly involved in renovation of social housing when using Design- Build-Maintain, it will be necessary to facilitate the creation of consortiums among this type of companies. And it will be necessary to develop a methodology to facilitate the management of this type of entities formed by several companies sharing risks and profits without a clear leader.

FOCUS ON THE FINANCE AND NOT IN THE COOPERATION

Energy Performing Contracting brings the possibility to use a finance scheme to cover part of the cost of the renovation. That is an attractive characteristic; however, it is not the principal benefit. The main benefit of Energy Performing Contracting is the guarantee that the energy performance parameters defined as project requirements are accomplished. To achieve this objective an active collaboration among the actors involved is necessary.

Real collaboration among the different actors involved in a renovation process: design companies, construction companies and maintenance companies it is not an easy achievable goal. Therefore, special efforts to facilitate the collaboration will be needed and the experience from DBMF(O) contracts applied in other sectors can be a useful guide.

CONCLUSIONS

There is room for an integrated construction model under public procurement regulations. However, the only procedure available to achieve this, the competitive dialogue, is rigid and define a series of constrains. The delivery methods awarded by a competitive dialogue procedure go from a Design-Build to Design-Build-Maintain-Finance-Operate and all the other options in between. It is only awarded in a single contract between the contracting authority and the contractor; being the contractor in most part of the cases a construction consortium. Therefore, the consortium becomes the main element of this type of model. Consortiums can be created grouping all types of companies that share risks and benefits. However, consortiums favour the participation and leading role of general construction contractors, for this causing two main possible unwanted consequences:

- SMEs can only play a role as subcontracted companies
- the architect loses its role as an independent advisor of the client

This type of consortium organisation could be necessary for big construction projects. Nevertheless, in the case of renovation of social housing the participation of a consortium led by a general contractor must be a choice and not an imposition for the contracting authority.

Further research needs to address the insights of construction consortiums to facilitate the balanced participation and cooperation among different actors involved in renovation projects of social housing.

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SESSION 7

SUSTAINABLE FACILITIES MANAGEMENT

ADDING VALUE AND SUSTAINABILITY BY INVOLVING FACILITY MANAGERS IN DESIGN PHASE. A PRELIMINARY STUDY OF NORWEGIAN PILOT PROJECTS OF ENERGY EFFICIENT BUILDINGS

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Improving long term value and sustainability in built assets are among the challenges facing the construction industry. Integrating facility management in early planning of new construction projects has the potential of adding value to the result. This is a preliminary project exploring the issue for further studies as part of a doctoral thesis. The research material is interviews with informants from three case studies in Norway. Two of the cases are especially ambitious regarding energy efficiency. The material is explored and analyzed in relation to a literature review. We found involvement of facility managers in the design process have a positive effect on the energy performance of the building. Early involvement and system integration are among the identified key success factors. Finally the paper explores the knowledge management approach regarding this issue.

Keywords: involvement, environment, energy use, organizational learning

INTRODUCTION

One of the challenges facing the construction industry is the challenge of improving long-term value and sustainability of built assets. Analysis of life cycle costs and benefits from buildings have gained new interest due to focus on energy and environment implications of manmade infrastructure. In search for potential improvements, clients are turning to facility management, to include operation and maintenance in planning of construction and rehabilitation projects.

VALUE OF FM KNOWLEDGE

Gradually more investors and clients plead the importance of incorporating knowledge on maintenance and operation in early design. Building projects often have a clear distinction between the project phase (design and construction) and the user phase (management, operation and maintenance). Over the life cycle of the facility expenses for operation and maintenance may far exceed the initial costs. Decisions made at an early stage in the project strongly affect the operation of the building and the life cycle costs. Incorporating knowledge on maintenance and operation at an early stage will therefore make a difference on the long run (Dahl et al. 2005). Analysis of money flows indicates that even small efforts to improve operation conditions have implications for the total result (Due, 2011).

VALUE OF EARLY INVOLVEMENT

There are a variety of suggestions on how knowledge on operation, cleaning and maintenance can be taken into consideration at an early stage in construction projects. In Norway the discussion has been fuelled by reports of nationwide insufficient maintenance on public infrastructures (RIF, 2009). The growing interests for green building have led to methods evaluate the impact of design features in the perspective of the life cycle of a facility. Energy modelling and Life cycle cost (LCC) analysis are among the methods (Dahl et al. 2005).

KNOWLEDGE MANAGEMENT

Facility managers are about to become recognized as key competence holders. Their expertise is gaining new interest for the purpose of green construction and maintenance. However there is still some way to go for this knowledge to be recognised. A study reveals that knowledge and specialization is high among FM personnel. However there is a lack of formal training opportunities (Damgaard & Erichsen, 2009). In a knowledge management perspective FM knowledge is recognized as being at infant stage of development. It still needs greater internal and external coherence to many organizations; it has few secure methods of its own to underpin good practice and is insufficiently supported by an adequate knowledge base (Baharum & Pitt, 2009). It is expected that knowledge management within FM will develop following the FM maturity stages; recognition of importance, formulation of strategy, implementation of techniques, and evaluation of performance (Baharum & Pitt, 2009)

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STRUCTURE OF THE PAPER

This paper presents a preliminary study exploring value and methods for including facility management in design planning. The purpose is to develop fruitful research questions for a doctoral study on how the construction industry learn and develop towards a more sustainable practice. Our hypothesis is that project owners experience positive effects of FM involvement to the design and performance of the buildings. Our research question is how do FM involvements improve the results, especially energy efficiency. The paper presents findings from interviews with key informants from pilot projects. The material is analyzed in relation to international literature. The final section is a discussion summing up findings on how FM involvement affects energy and environment issues in construction projects. We also add the organizational learning perspective as a potential theoretical approach to explore for further studies on this subject.

MATERIAL AND METHODS

Three construction projectsⁱⁱ are included in the material (see Table 1). Project 1 is an office buildings in an industrial development site in Trondheim located close to the technical university and a major traffic route to the town centre. This is the third step in the development plan at the site by the same owner over a ten years period. Project 2 is localized in central Trondheim and includes an historical building. The owner has high ambitions for innovative solutions on heating and ventilation. Project 3 is localized in one of the new suburbs in Trondheim. The project is initiated by an ambitious local athlete club, who organize most of the activities using the facility. It became a prestige project for local politicians, and the national sports confederation that is among the funders. All project owners have separate FM departments. The facility management department were represented in the project planning teams on Project 1 and 2, but not in Project 3.

Table 1: Construction projects

	Project 1	Project 2	Project 3
Owner	Investment and real estate company	Regional bank	Municipality
Purpose of facility	Offices and meeting facilities for tenants. "The green building"	Offices, conference facilities for bank head quarter. Offices and shopping space for tenants.	Athlete sports hall
Total cost	235 mil NOK	550 mil NOK	64 mil NOK
Energy consumption	Total net energy consumption: 114 kWh/m2 pr year. Including: Heating and ventilation 9 Cooling 8 Lighting 25 Technical equipment 34 Total imported energy: 94 kWh/m2 pr year	Total net energy consumption: 89 kWh/m2 pr year. Including: Heating 6 Cooling 8 Ventilation 4 Technical equipment 57	(Numbers not available)
Energy improvements	Area efficiency Automation Extra insulation Energy saving equipment Thermic mass Re-using heat Passive solar heating	Low leaking shell Thermic mass Re-using heat	Extra insulation Low window areas Low leaking shell Low volume
Sustainability improvements	Balanced ventilation Diffusion open construction Humidity regulating materials Low emitting materials Facilities for pedestrians and bikers	Balanced ventilation Building integrated ventilation Humidity regulating materials "Clean house" construction process Reusing desposing materials	Flexible interior solutions Deposit of polluted ground masses
Comments	Pilot project supported by ENOVA ¹ . New construction	Partly new, partly rehabilitation	The first specialized sports facility of its kind in the country. New construction.

ii. Here we focus on the characteristics of the projects without identifying them individually. This is due to confidentiality to our informants.

Our informants include partly representatives for facility management and partly representatives for the main construction company (see Table 2). FM informants were part of the planning team for project 1 and 2. For all projects they are in charge for daily operation and energy measuring. Informants from the construction companies were respectively project manager and design managers of the construction projects.

Table 2: Informants

	FM representatives	Construction company representatives
Project 1	1 informant	2 informants
Project 2	1 informant	2 informants
Project 3	2 informants	2 informants

The interviews were partly performed face to face and partly on telephone. Construction company representatives were interviewed together for each project while FM representatives were interviewed individually. Interviews were performed following an interview guide covering the main issues of the study and lasted for 30-60 minutes each. Data were collected partly January 2011 and partly September-October 2011.

The interview guide includes the following variables:

- Organization of design phase
- Role of involved FM representative
- Means to reach energy ambitions
- Experiences and recommendations

Other additional material that has been studied is written project documents, presentations and reports, guided tours and oral presentations of the projects. This includes facts on energy, environmental and performance ambitions, construction concepts, materials and energy solutions, and also measured energy performance.

FINDINGS

Here we present findings from the interviews. At this explorative stage of the study, we focus on the spectre of criteria our informants are concerned about. Here we present the types of arguments in use, first from the group of FM representatives, and then from the group of construction company representatives. Some arguments are shared among the informants while others vary among projects and informants. Possible reasons for this will be explored in the discussion section.

FACILITY MANAGEMENT REPRESENTATIVES

Purpose and priorities of the projects

The overall purpose for project owners and the FM representatives can be summarized as quality. This includes functionality, comfort and flexibility for the users of the buildings. Good indoor environment has first priority for the two office buildings. Similarly good performance facilities are crucial for the sports facility. This has implications for choice of materials, design plan, light, ventilation and heating/cooling. The challenging part of the projects has been to find solutions integrating all these elements. One of the elements is energy efficiency. In all projects the ambition was to set a new standard regarding energy efficiency. Another element is choosing materials with a long service life, low operation costs and also with low emissions. All projects are using architectural elements to signal harmony with the surroundings. It'll be wood on facades and interior walls, zinc and copper that will change colour due to surface oxidation, and windows that allow all rooms to have visible contact with natural light and the outdoor view. Finally, the economical aspect has set the limits for quality ambitions and alternative solutions. The three projects illustrate in practice the triple bottom line principle for sustainability (Savitz & Weber, 2006), by balancing environmental considerations, responsibility to the society and healthy long term economy for the facilities.

One of the consequences is the focus on space efficiency in the projectsⁱⁱⁱ. The owners have considered how indoor space can be used for multi-purposes, such as removable sport facilities and stages in the sports hall. Space for offices and shops can easily be prepared for new tenants. Parking space is reduced in favour of space for outdoor sports activities, parking for bicycles and easy entrance to public transport. This is solutions that reduce environmental footprint, meets new standards of urban planning and have positive effect for the project budget.

The design process

The FM informants of the pilot projects reports that they have been involved in the design process and have been able to influence the decision making to a high degree. Due to the energy efficiency ambitions the operation departments in these projects have had a key role in the project leading teams, and their competence has been crucial in discussions on construction concept. All three projects had ambitions for passive house or low energy house standard. As a part of the design process there were performed calculations and analysis regarding energy efficiency for alternative concepts. In one case there were performed an additional analysis on greenhouse gas emissions^{iv}, and this was conclusive in the question on rehabilitation of existing facilities or not.

After completion all FM informants have been actively involved in monitoring and adjusting operations of the facility. It is a shared experience that the first year of operation of a new building always needs an introduction period. For all the cases the client put extra effort into design phase. This was done partly by establishing multi professional teams of engineers and architects to work out alternative design concepts. Partly by including technical researchers, testing in laboratories and visiting other projects in other regions and countries. Consensus on concept and design plan is reported to be crucial for navigating through practical problems and dilemmas as they occurred during the construction phase.

Key success factors

For the moment^v all projects have been in operation for one year or more. Energy measurement reports indicate that all three buildings have succeeded regarding their energy ambitions. The informants were asked to reflect on the reasons for this success, and eventually on intentions that were not reached. Ambitious and thorough project works have been performed by all parties. In case of the two pilot projects our informants emphasize the importance of the “hands on” attitude from owners in innovative projects. Integrated concept is another key success factor. The key question in all decision making have been: How to fulfil the main purpose of the facility with a satisfying level of quality and with high energy efficiency.

Also education of the users and the operation personnel is among the success criteria. Tenants and each single employee have been educated on the energy and environmental visions, how the building facilities operates and implications for day to day use. Throughout the process the primary users have been informed about the plans, and later there were user questionnaires and energy performance statistics. In one case the project management involved “ambassadors” among the employees to present their plans and get feedback. Our informants are convinced such communication have put energy and performance of the new facility on the agenda among the users, with a positive effect for energy consumption.

Monitoring and analyzing energy performance is vital to learn and adjust. There are a number of metering points for the individual purposes and sections of the buildings. Based upon day by day (and partly hour by hour) registrations there have been adjustments to improve performance. Operation personnel are adjusting the systems due to planned activities weather forecasts. Systems for central operation control have been calibrated. Standard computers have been replaced by low energy computers, even for tenant companies. Employees are educated to turn off all machinery instead of using stand by modus.

There also seems to be an element of competition regarding energy efficiency. This is an underlying subject in all interviews. Facility managers are eager to find energy leaks and waste, improve routines and performance, to continually optimize the results. Owners of pilot projects proudly present the energy results for customers and the public.

CONSTRUCTION COMPANY REPRESENTATIVES

Our informants representing the construction companies all got involved at a stage when the overall plans were set for the building.

iii. Examples of conceptual solutions that are chosen due to energy and environmental improvements: a) A high degree of office landscapes. Free seating means better use of space for businesses where employees work part time out of the building. b) Multipurpose rooms where walls, furniture and other equipment easily can be changed. c) Routines to fully turn off all computers, printers and other energy users at night

iv. Therefore there was performed an energy analysis, considering the two alternatives at all stages in the life cycle, and including both materials, operation, development and maintenance for a period of 60 years (Ronning & Vold, 2008)

v. During the period of interviews, fall 2011

All our informants emphasize that their company has a positive attitude to challenges. They are attracted to ambitious projects where they have to look for new solutions to fulfil the specifications and develop their own competence, whether it concerns energy and environmental purposes or engineering and architectural issues. Some illustrating examples: How to build a concrete construction combining structural and temperature buffering qualities? What central operation control system will ensure recycling of heat and healthy ventilation under varying activities under changing weather conditions? Handling of waste and use of energy at the construction site were among the challenging specifications in the two pilot projects. The construction companies are proud to report close to 100 per cent recycling or reuse of waste materials and a low level of sickness absence during the construction period. An additional effect of the Clean Construction Site initiative is that the contractors experienced more efficient work at the site, due to better overview and better logistics. Sub-contractors reported better economic results which is an additional motivation to continue the initiative in future projects.

LITERATURE REVIEW

This review covers published studies on involving FM in the design phase of a construction project. While some of the studies focus on how to involve FM personnel in the process, others focus on the effects for environmental sustainability for the facility. There are three types of issues that the literature is covering. The issues are dealing with a) status of FM knowledge, b) structures for construction projects, c) communication among involved actors.

Studies on FM knowledge are concerned with the lack of status and formal competence. In general the care takers and cleaning personnel do not have a high status in the facilities where they are working. These functions are often outsourced. The specific FM knowledge is the understanding of the relationship between the performance of the physical resources and their impact on the end-users. This type of knowledge can be difficult to access since it is often tacit and experimental in nature (McLennan, 2000). This might explain the lack of awareness among project owners of including this knowledge resource (Larssen, 2011). Construction projects are complicated and fragmented processes. The many actors involved at different stages are found to hinder effective interaction between parties involved (Valen, Klakegg, & Hustad, 2010). Among the potential solutions suggested by scholars are project models including operation and long term perspective. Design-Build-Operate-Maintain (DBOM)^{vi} delivery system and other partnership models are expected to bring critical operations and maintenance knowledge into design (Dahl et al., 2005, Damgaard & Erichsen, 2009).

Ineffective communication and collaboration is found to be among the barriers for quality and efficiency in the construction industry. This is a challenge due to the number of actors with partly varying priorities. Shared objectives, openness and clear responsibilities/roles are suggested as possible improvements (Valen et al., 2010). Within project management there is increasing interest for the relational aspects of professional team processes. Teamwork based upon trust and shared understandings are particularly important to be able to exploit tacit knowledge, such as FM experience (Damgaard & Erichsen, 2009).

DISCUSSION

EXPERIENCED RELEVANCE OF FM INVOLVEMENT

The study presented in this paper is in an explorative stage. The purpose is to explore if and how involvement of facility managers in design affects the final construction, especially regarding environmental issues. Firstly, the research indicates that early involvement is crucial to reach ambitions for energy and environmental issues. To implement these issues professionals with operation and management knowledge have to be part of the initial concept considerations. In this concern our preliminary study is supported by previous research on the issue. However, our material also indicates that energy and environment has to be kept high on the agenda also during later stages in a construction project. Especially this is crucial in situations of conflicting goals. The owner of Project 2 seems to be aware of this challenge, and insisted on consensus in the project team in all decisions. Doing in consent have similar effects as partnership contracts when it comes to sharing goals for all actors involved in construction projects (Bresnen & Marchall, 2000).

Secondly, the experience from our case studies is that involvement of FM personnel has had positive effects on the results. FM representatives have provided practical experience to the design teams for the two pilot projects. However, good energy performance results in all three projects indicate that involving facility managers is not the only element that matters. Also tools such as energy calculations and Life Cycle Analysis have added facts to the decision making process, favouring environmental friendly alternatives.

vi. In this system the owner develops a conceptual plan (eventually involving architect and engineers) for a project, then there are solicited bids from contractors on design, build, operations and maintenance of the completed project.

In all cases specialized advisory engineers were involved at all phases. This indicates that in addition to FM personnel there are other sources to operation and energy performance knowledge. There is reason to believe that all these sources have provided insight that have convinced the owner and the design team that the visions were possible to reach.

Thirdly, involvement of FM expertise has had positive effects for the construction project in general. Among the added values is the project economy. In all cases the interest for energy performance is part of a strategy for improving life cycle economy of built assets. For instance reuse of heating and cooling energy which contribute positively both to environmental footprint and operation economy. Another added value is positive effects for indoor environment, due to low emission materials and noiseless ventilation^{vii}. The crucial question however is the long term performance of the constructions regarding the purpose they were built for. This might be possible to explore in a future study.

Finally, involvement of facility managers is no guarantee for all environment issues to be taken care of. For instance energy use in manufacturing of building materials is not a focus in these projects. All in all, involving FM personnel at an early stage have had a positive effect for energy efficiency in the facilities. This is partly because their skilled competence influenced decisions in the design phase. And partly because involved FM personnel have developed good insight in the construction that is useful for operating the building in the use phase. As a bonus effect FM personnel express interest in the challenge of continual improvements. In facilities like this, with ambitious energy plans and expectations as role models for future constructions, this might be of major importance.

FINDINGS RELATED TO LITERATURE REVIEW

FM knowledge and especially the lack of formal competence are emphasized in previous studies. The FM informants in our case studies all have a high level of formal competence. They have relevant education at university level, and more than ten years of experience from construction processes. Our impression is that they have been trusted allied of the clients. This implies increased status for FM considerations and has been important for energy and environmental goals, and thereby bridges one of the barriers highlighted in previous studies.

Early involvement and extensive team work is reported in our case studies. Especially in innovative projects, where risks are higher than in ordinary projects, collaboration at an early stage is crucial to reveal and deal with conflicting purposes and solutions. Also previous studies have identified lack of shared understandings of aims and objectives as a barrier for development and improvements within the construction industry (Valen et al., 2010).

The involvement process has been given a lot of time and resources in these projects. Professionals with different specialties have exchanged ideas and arguments in a process that has led to a high degree of shared understanding of the main purposes of the project. In addition the process has been innovative and resulted in constructions that entirely fulfill multi purposes. This has been possible without organizing formal partnerships or altering other structures. Traditional procurement models have been used and given good results, contradictory to experiences in other studies. A possible explanation for this is the clients ability to specify the project in advance of the engineering phase, including specifications for energy, operation and environment.

Both informant groups are concerned about how to organize a good design process. All cases report adjustments on the way, either bringing in supplementary members or exchanging persons. There is a shared opinion among our informants that a good team makes a huge difference. In two projects the client is reusing the core team and develops the concept from one project to the next. Previous studies have enlightened how the project-based nature of the construction activity is a barrier for taking high performance teams further (Cheng, 2009) (Haapalainen, 2008). Experiences in our case studies are highly interesting to explore further in relation to these previous studies.

FINDINGS IN AN ORGANIZATIONAL LEARNING PERSPECTIVE

The explorative case studies presented in this paper indicates that involving experienced FM personnel is of high value in projects with high ambitions regarding environment effects and energy efficiency. In further studies we will explore whether or not this knowledge makes a difference in other construction projects and in the practice of the organizations that make up the construction industry: Do construction companies, consultants and architects change practice? What about the clients? And what are the main drivers for change? For this purpose we like to focus on the organizational and industrial level of knowledge management. Especially how FM knowledge and early participation in pilot projects affect practice in the industry in general.

vii. Low pressure under floor ventilation (UFV)

Organizational learning is an area within organizational theory studying the way organizations learn and adapt. Models and theories within this tradition might be fruitful for further studies on impacts of FM involvement. In this final section we present some potentially fruitful theoretical contributions and illustrate how our preliminary findings might be analyzed further.

a) The four stage model of organizational learning presented by (Nonaka & Takeuchi, 1995) represents an approach differing from traditional ideas of organizational efficiency. The essence of the model is i) the dynamics of tacit knowledge becoming explicit and vice versa, and ii) the dynamics between knowledge at the individual level and at the organizational level. Nonaka presents organizational learning as a continual process, a spiral path from socialization to externalization, combination, internalization, new socialization and so on^{viii}.

In our cases the FM representatives proudly share their insight, and thereby their knowledge is being socialized into a broader group of professionals. Via analytical skills operators are able to externalize their tacit knowledge into explicit engineering knowledge. In the operation stage they combine their constructional insight with skilled experience to continually prepare the building for optimal performance. In our projects all employees have been involved in the high performance ambitions via energy performance reports and feedback routines. This internalization of performance knowledge to end-users has contributed to results.

b) Nonaka & Takeuchi also indicated that there are certain preconditions for knowledge developing organizations. Of special interest is “redundance” – overlapping information and activities among the actors. This precondition implies insight in the knowledge of the other actors (Nonaka & Takeuchi, 1995). This is found to be of special importance in innovative processes, as is the case for the two pilot projects in our study. Our informants emphasize the extra efforts made to create dedicated design teams, such as sharing offices, negotiate all solutions and create a good atmosphere for the team to perform well.

c) An alternative model of preconditions for organizational learning is Senge’s model of the five key disciplines of a learning organization (Senge, 1990)^{ix}. Of special interest is the system thinking. In our case studies it is obvious that system thinking has been the key to the high performance facilities. The functions of the buildings are highly integrated, especially using, producing, distributing and storing energy. Similarly the design teams were organized to create shared visions for the projects.

CONCLUSIONS

This preliminary study has proven our hypothesis of positive effects of FM involvement to the design and performance of the buildings. This paper shed light on how FM involvement improves the results. Based upon three case studies we have explored involvement of facility managers in the design phase of construction projects.

Our main findings are as follows:

- a) To achieve energy efficiency in new construction projects these ambitions have to be implemented at the design stage and given priority in situations of conflicting goals.
- b) Involving the facility department in the design team has positive effect on energy performance in the operation phase. Such exchange of knowledge contributes both to the design and to the daily operation.
- c) FM involvement also has positive effects for the indoor climate and the projects life cycle economy.
- d) Involvement of entrepreneurs and sub-contractors in the ambitions for energy efficiency also have additional positive effects, increasing progress, saving production costs and gaining additional competence among all employees.

Our preliminary findings will be used as hypothesis in further studies. Partly we will explore the role of ambitious owners in pilot projects as well as engaged FM roles and construction parties. And partly we will study the relation between FM involvement and energy efficiency in construction projects in general. This preliminary study emphasise system thinking as a key to high performance facilities, and this approach will be explored further.

viii. Socialization – sharing tacit knowledge to others. Externalization – transforming tacit knowledge into explicit knowledge that is codified, systematic and formal. Combination – dissemination of codified knowledge, developing it further. Internalization – when employees internalize an organisation’s formal rules and procedures.

ix. Senge’s idea is to destroy the illusion that the world (or a construction project) is created of separate, unrelated forces. When giving up this illusion we can build learning organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.” (Senge, 1990:3)

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DECISION SUPPORT FOR FACILITIES MANAGEMENT OF THE FUTURE: SUSTAINABILITY ACCELERATOR

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Future buildings must be much more sustainable than the existing buildings. Therefore sustainability will become a major issue for facilities management. Currently most important decisions about the building sustainability are made by applying sustainability assessment tools, the so called green rating systems, like BREEAM and LEED. However these tools have their flaws and are not really suited for the early conceptual design phase, where the most important decisions have to be made. New design tools, to support design decisions are necessary to stimulate and accelerate application of sustainable solutions, products and systems. The 'Sustainability Accelerator' is a decision support tool, which uses an approach to Life Cycle Performance Costs calculations, based on discounted cash flows and user scenarios. A first version was used to compare performances of different building services alternatives for office room conditioning over Life Cycle Costs and Life Cycle Performance Costs. With the Life Cycle Performance Costing tool, facilities managers involved in the design process, can determine the most cost effective sustainable solution over the whole life cycle of the building.

Key words: sustainable assessment tools, life cycle performance costs

INTRODUCTION

Buildings are a necessity of human activity, but unfortunately represent a significant contribution to energy use and consequent greenhouse emissions (Morrissey and Horne 2011). Buildings are durable and thus decisions about building design aspects related to their performance have long-term consequences (Ryghaug and Sørensen 2009, Morrissey and Horne 2011). Following the Kyoto summit, and all the other summits on sustainable development, it is clear that one of the driving forces in the design and refurbishment of the building stock is determined by sustainability factors (John et al. 2010). Sustainability is a crucial issue for our future and architecture has an important role to direct sustainable development (Taleghani et al. 2010). However it is not only the architects and the engineers of the design team that have a huge influence, also facilities managers have a great role in contributing to the reduction of the built environment impact on the environment. Facilities management, as a profession, became latched onto the sustainability agenda, as a result of the increasing environmental awareness and legislative pressures (Elmualim et al. 2010). The European Union and its Member States have a large number of on-going policy initiatives directly aimed at supporting of sustainability of the built environment. As the built environment is responsible for nearly 40% of CO₂ emissions, new approaches are necessary stimulated by legislation. The climate and energy strategies are aimed, that by 2020 renewable energy to represent 20% of energy production; a reduction of greenhouse gas emissions by 20% (base 2005) and achieving energy savings of 20%. The targets go even further: to reduce CO₂ emissions by 80-90% (Nearly Zero) by 2050. In addition, Directive 2006/32 EC requires Facility Managers to reduce energy consumption and operational costs. In a recent report of the Pacific Northwest National Laboratory (PNNL), they gave results of a post-occupancy evaluation of 22 'green' federal buildings from across the United States. PNNL found that, on average, green buildings, compared to commercial buildings in general use 25% less energy, emit 34% less carbon dioxide, cost 19% less to maintain and have 27% more satisfied occupants (Fowler et al. 2010). So sustainability is a way to reduce energy consumption and reduce operational cost as well. Therefore conducting (sustainability) performance based assessments of buildings operation is of great importance and should be considered right from the early design phases (Keller et al. 2008).

An important additional development is the shift by clients, from focus on (energy) efficient to effective building solutions. Buildings, when properly designed and constructed, can lead to significant improvement in the productivity of the workers using the buildings. Buildings facilitate the core business function of organizations and can as such contribute to higher business gains for the organization by enabling higher productivity of the employees (John et al. 2010). The added value of the building, to the client's business process, is now the main concern when designing. This new business strategy is combined with the quest for more sustainable solutions (see

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Figure 1). The goal is a 'greener' ecological foot as well as a more effective building.

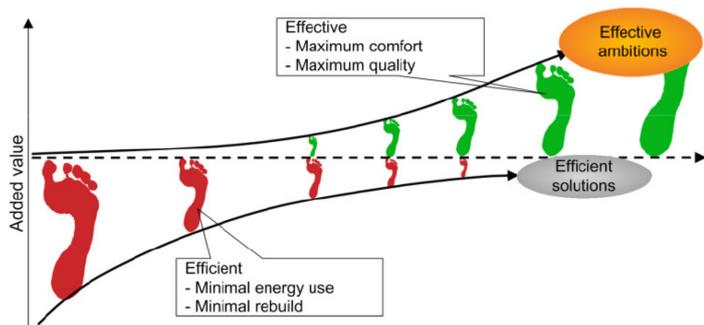


Figure 1. Strategy to come from efficient to effective buildings

There are many sustainable assessment tools available to support design teams in their quest for green effective buildings (Sanuik 2011), which makes it difficult to choose, which tool should be used to implement the new business strategy most effective.

CASE STUDY SUSTAINABLE ASSESSMENT TOOLS

The four most popular sustainable assessment tools used in the Netherlands were determined: BREEAM, LEED, Greencalc+ and Ecological Footprint. To investigate their usefulness and to compare their results, the four most popular sustainable assessment tools in the Netherlands (BREEAM, LEED, Greencalc+ and Ecological Footprint) were applied to a set of 8 state-of-the-art buildings. To test and evaluate the sustainable assessment tools it is necessary to select a representative set of buildings and to use the similar objects and aspects as a basis for comparison. From earlier studies analyzing buildings in Germany and the Netherlands in total 8 buildings were selected (Zeiler and van Deursen 2010). Not all aspects of the buildings can be used for comparing the sustainable assessment tools because Ecological footprint and Greencalc+ can only be compared at the aspects “materials, land use & ecology”, “energy”, “water” and “transport”. To compare the selected assessment methods, their results need to be calculated as the maximum percentage for an specific aspect of a building performance. This is because the results of all assessment methods are expressed in different values, namely: Global hectares (ecological footprint), Earth’s environment costs in € (Greencalc+) and credits for the checklists (LEED and BREAAM). The comparison of results of the 4 common aspects (energy, transport, water and materials, land use and ecology) of the assessments tools, shows that there is a fluctuation (up to 20%) in total score between buildings depending on which sustainable assessment tool is used, see Figure 2. This makes it in fact rather uncertain to base the design decision on them.

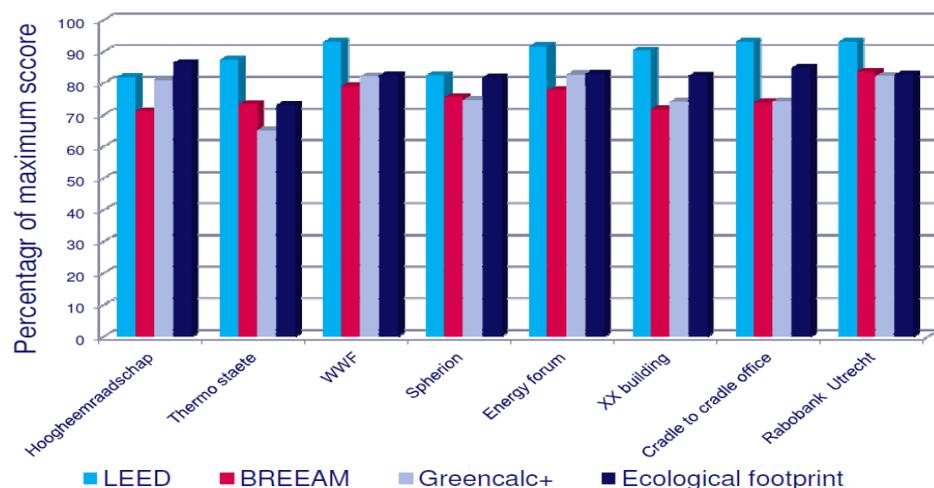


Figure 2. Results of total score of four common aspects by the different assessment tools

In addition the different current sustainability assessment tools all have still some flaws and the green building standards are ‘still’ under construction (Block 2009). Construction industries and clients need to be provided with tangible proof from the schemes’

operators that increasingly demanding green rating systems will actually add value to all and not become a souvenir trinket from hell (Sanuik 2011). At the moment the current sustainable assessment tools do not facilitate the proactive investigation of the creative solution space or the architectural aesthetics involved in building design (Hansen and Knudstrup 2009). There is a pressing need for practical tools for sustainable facilities management (Elmualim et al. 2010). The priority for the near future is to provide insight into the consequence of building design decisions on building sustainability performance.

Facilities managers need decision support tools to make their (future) building more resilient to risk, cost-effective to maintain and run, use less energy and other resources and are more comfortable and better places to work. Only then, progress can be made towards more effective, productive as well as more sustainable buildings. Based on the results of the comparison of the 4 existing sustainability assessment tools, research was started to develop a new tool, which would support designers, as well as facilities managers, more effectively in their decision making during the building design process.

FURTHER RESEARCH: THE SUSTAINABILITY ACCELERATOR

Architects, especially those heavily involved in sustainable design, stated that the change towards more sustainable building solutions is slow and that it remains a constant battle to implement sustainable design solutions (Emmitt 2008). The report 'Aanvullende beleidsopties Schoon en Zuinig' (Daniels and Elzenga 2010) examined effects and costs of policy options, aimed at attaining the sustainability targets of the "Schoon en Zuinig" (Clean and Efficient) policy program for energy and climate, introduced in 2007. The Netherlands will have to gear up its (renewable) energy policy to meeting the binding EU targets of renewable energy use in 2020. So it is not easy to reach the sustainability goals. Cook et al. (2007) listed the most significant drivers and barriers for the use of sustainable technologies, the research suggests that financial viability is considered to be the most important deciding factor in the selection of sustainability options in building projects (Alnaser et al. 2008). Lifecycle Cost Performance Calculations (LCPC) approach enable to compare several sustainability concepts with each other. To be able to make good and simple comparisons, could accelerate application of sustainable options. Therefore in 2010 Royal Haskoning started, in collaboration with TU Eindhoven, the development of a 'Sustainability accelerator'. To be able to reach the necessary targets it is necessary to accelerate the achieved sustainability performances, see Figure 3.

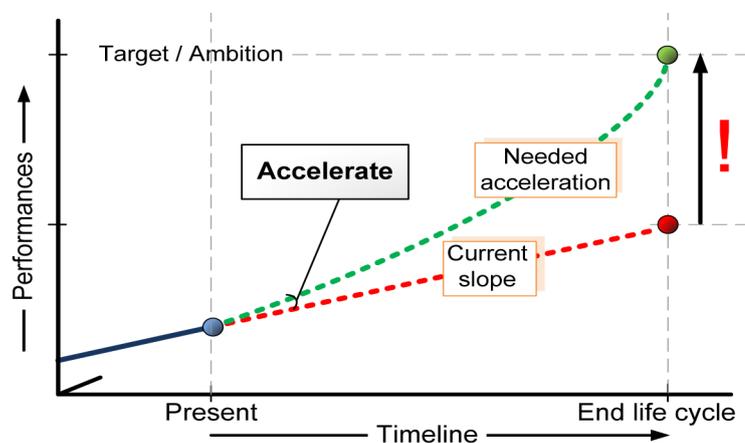


Figure 3. The necessary acceleration to reach the target and ambition goals

To perform the required LCPC analysis a generic tool has been developed to be able to compare several design concepts that help to meet the demands for a specific level of sustainability. It is necessary to accelerate sustainable applications in the built environment, to achieve the strict demands of society on sustainability in time. The 'Sustainability Accelerator' is meant to accelerate the decision process around sustainable applications over the lifetime of the building. This is because normally, there is no clear method prescribed and there is no adequate tool available to link the pros and cons over the lifetime of the building to all stakeholders involved. However it is very important to clarify for the client the benefits of the sustainable alternatives in terms of savings in labor costs, reducing absenteeism and/or higher productivity due to a better indoor climate. The LCC approach is thus extended to a LCPC (Life Cycle Performance Costing) approach.

EXAMPLE OF LIFE CYCLE PERFORMANCE COSTING

To illustrate how the 'Sustainability Accelerator' works it was used to calculate the Life Cycle Performance Costs and so includes the benefits of workplace air conditioning concepts. Four concepts were considered, see Figure 4: induction units in the ceiling (reference/base concept (A) thermally active building structures (B) climate ceiling (C) and personal conditioning concept (D).

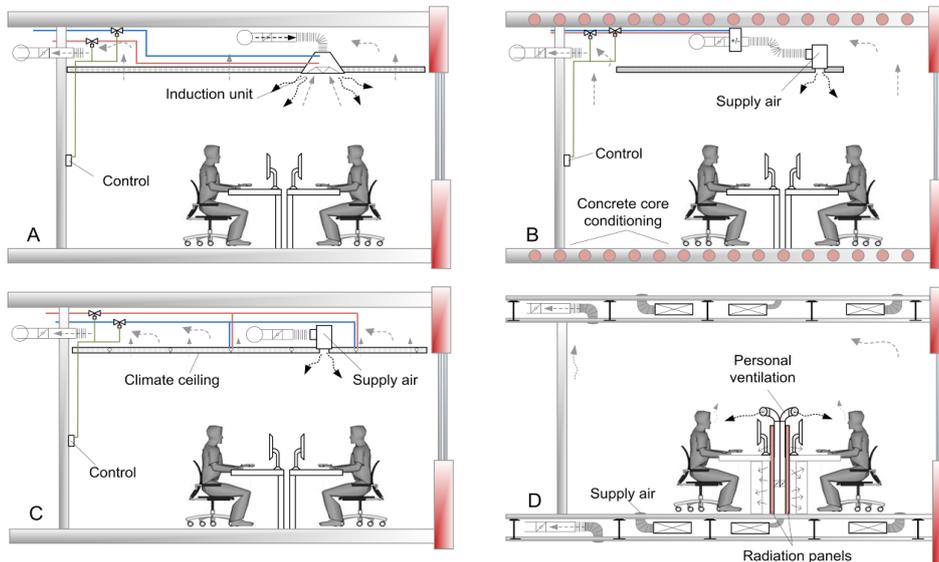


Figure 4. Schematic presentation of workplace air conditioning concepts

For all concepts the same level of thermal comfort and air quality is realized. The investment costs (CAPEX) are determined considering an office building of 10,000 m². For the different concepts the investments cost above 850 €/m² are determined. The building services other than the workplace concepts are considered equal. Also Energy, OPEX(Operational Expenditure), replacement costs are considered (see Table 1 and 2).

Table 1. Input LCC calculations

Costs		Concept			
		A	B	C	D
CAPEX - investment building services	[€/m ²]	172	201	247	300
CAPEX - construction costs > 850 €/m ²	[€/m ²]	30	140	5	170
Replacement costs after 16 yrs	[€/m ²]	79,6	101,3	160,6	123,7
OPEX - maintenance	[€/m ² yr]	0,30	0,03	0,25	0,35
Energy costs - gas	[€/m ² yr]	0,94	0,85	0,89	0,7
Energy costs - electricity	[€/m ² yr]	5,50	5,08	4,98	2,91
SPOT	[yr]	-	178	81	97

Table 2. Financial input parameters

General parameters			
period	n	30	[yr]
electricity price increase	i_e	7%	[%]
gas price increase	i_g	7%	[%]
increase bio oil	i_o	9%	[%]
inflation	j	2,5%	[%]
equity		20	[€/m ²]
internal discount rate	R_i	7%	[%]
external discount rate	R_e	6%	[%]
repayment period	n'	30	[yr]
financing interest		6%	[%]

The individual workplace air conditioning system (D) uses a significant less ventilation (Zeiler, 2010). This results in large reduction of energy consumption and energy costs. However concept D requires a relatively high investment. The dynamic calculations include also fluctuating energy consumption and their related CO₂ emission costs (see Figure 5). The amount of CO₂ emissions was calculated based on the different energy amounts used for ventilation, cooling, heating and pumps. The initial value for the CO₂ emissions is € 14/ton/yr.

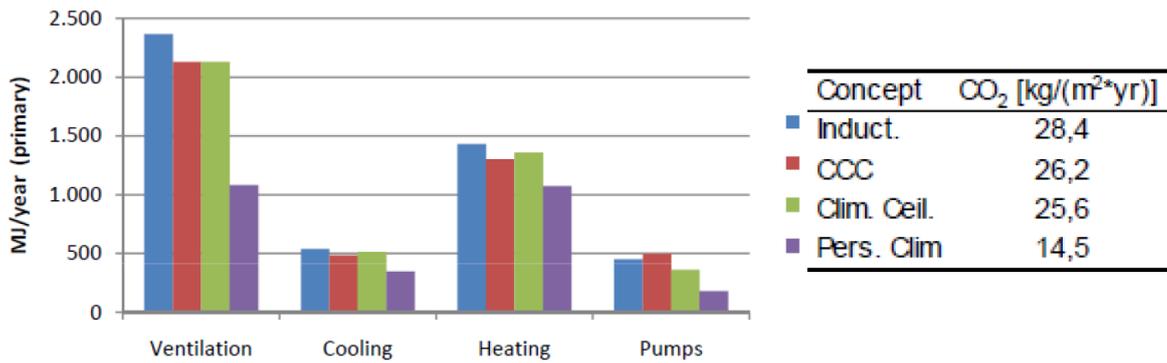


Figure 5. Energy consumption of the different concepts and their related CO₂ production

Also differences in maintenance costs were considered over time as well as different renovation costs for each concept. It is assumed that the project is financed by a third party using the same discount for each concept. The different LCC values for the system A to D are presented in circular histograms of Figure 6.

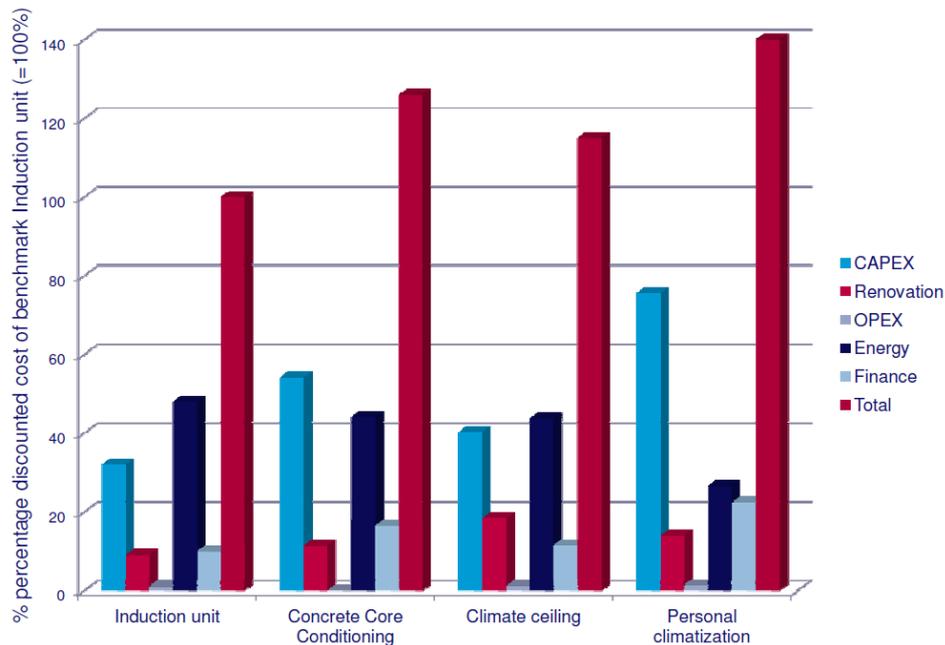


Figure 6. Histograms of concept A to D of the LCC results.

The breakdown in costs is different for each concept. It can be seen in Figure 4 that the energy costs are the major costs using concept A (Induct) and the investment costs (CAPEX) are highest using concept D (Pers. Clim). From literature (REHVA 2006) it is known that a better indoor climate results in a higher performance of the building users. Within office buildings the productivity can be improved up to 3%. Considering that 94% of the total costs over the life time are labor costs, a productivity increase of 3% represents a large benefit (REHVA, 2006).

Typical labor costs are € 2.000 per m²/year. Based on the differences in air velocity, temperature radiation, individual temperature control and thermal comfort, the increase of productivity for each concept was compared to the reference concept A, B+0,25%, C+ 0,50% en D+ 2,50%. The percentages used for the increased productivity, are derived from the expected hours that temperatures in summer will be above 25 °C. Concepts B, C and D will have less temperatures above 25 °C, which will result in a higher productivity.

The effect of productivity loss due to thermal discomfort is researched in many studies, an overview can be found in (Seppänen et al. 2003, Seppänen and Fisk 2005, Seppänen et al. 2006, Fisk and Seppänen 2007). More recent research (Lan et al. 2011) confirms these findings. The LCC results without and the LCPC results with the effect of productivity are presented in Figures 7 and 8.

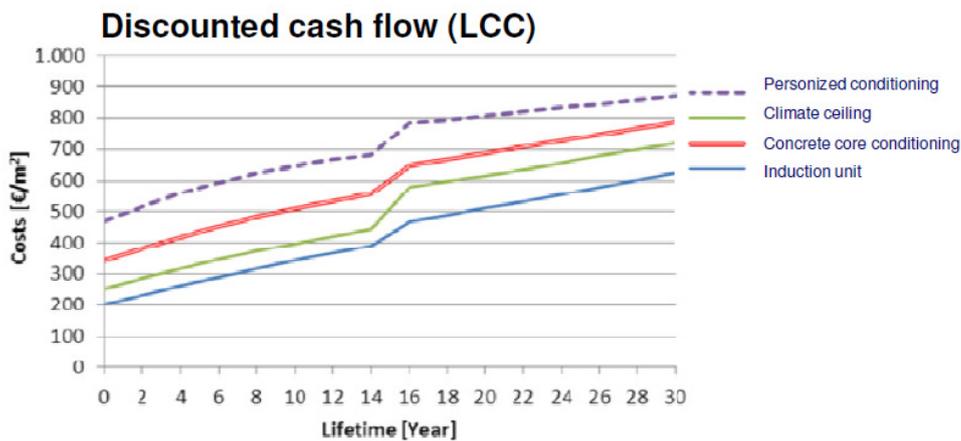


Figure 7. LCC results workplace air- conditioning concepts

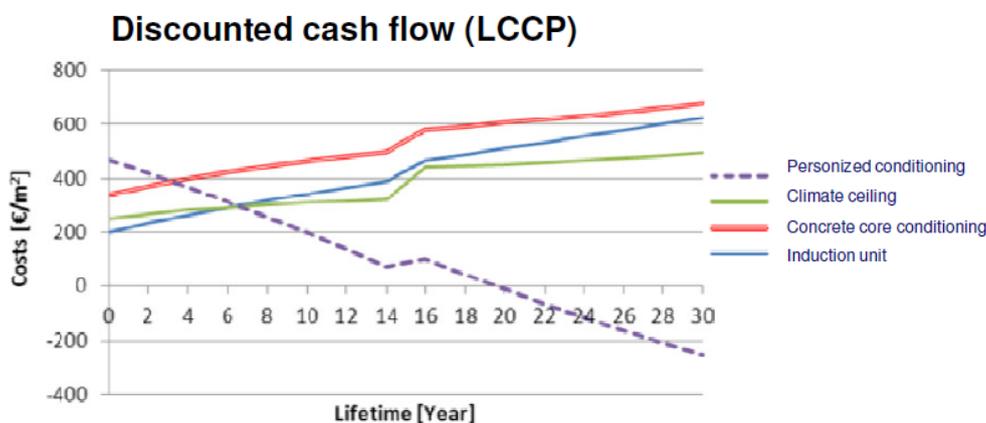


Figure 8. LCPC results workplace air-conditioning concepts with the effect on productivity

The LCC costs in these figures are discounted cumulative costs over the considered period of 30 years. Although the energy costs for concept D are low, the LCC costs are high compared to the other concepts due to the capital cost as a result of the higher initial investment. When the effect of productivity is considered it can be seen in Figure 8 that the effect on LCPC costs is high. The concept C has lower LCPC costs than concept A (Pay Out Time 7 years) and concept D has even a negative LCC meaning that the income due to the increase of productivity is larger than all LCPC costs for workplace air conditioning.

DISCUSSION

A sustainable built environment is a necessity for the future. Although sustainability is a loosely used term to define all things environmentally friendly, the commercial real estate industry is increasingly turning to sustainability assessment standards (Mattsson-Teig 2008). However applying the different sustainable assessment tools leads to different choice for the best building, which means that applying such tools for decision support within the conceptual design phase, would lead to different outcomes (Wallhagen and Glaumann 2011). The comparison of the tools and their results is difficult (Haapio and Viitanimi 2008, Roderick et al. 2009) and depends on the tool used as can be seen from the case study.

As financial viability is considered to be the most important deciding factor in the selection of sustainability options our development is focused not on developing a new hybrid approach (Juan et al. 2010) or to extract eco-indicators (Vakili-Ardebili and Boussabaine 2010), but on a method and a tool that supports the design team in the early stages of the design by using a dynamic instead of a traditional static approach. The dynamic approach consists of a LCPC calculation based on discounted cash flows and the use of scenarios.

Some of the current sustainability assessment tools like BREEAM recognize the importance of such a LCPC analysis, by granting points when an LCPC analysis is performed and the results are implemented into the design (Dutch Green Building Council 2010). With the tool it must be possible to carry out a LCPC-study fulfilling the requirements of BREEAM-NL (BRE Environmental Assessment Method for the Netherlands) credit MAN 12 (Dutch Green Building Council 2010).

An important motivation for the LCPC analysis is the increasing share of Public Private Partnership (PPP) and Design Built Finance Maintain Operate (DMFMO) building processes in the built environment. The financier of the building is therefore interested in the long term aspects of LCPC. The new hybrid procurement method for new building as well as refurbished buildings, like PPP and DMFMO, are shaping the future horizon of how a built facility is supported throughout its life. Decisions have to be made how to maintain and support the facility for a period of about 30 years (John et al. 2010).

CONCLUSION

From the outset of the design process, a tool is needed for the LCPC analysis to communicate internally within the design team, as well as towards the customers, concerning the LCPC values of different design options. The 'Sustainability Accelerator' is a tool, that supports the design team making design decisions, by using a approach based on the whole life cycle of the building performance. The tool encourages the design team to come forward with innovative sustainable solutions and enables them to give clear insight by evaluating those solutions over the lifetime of the building. The 'Sustainability Accelerator' supports decision making about sustainable alternative design options and therefore accelerates sustainable applications in the built environment. The LCPC tool compares the building performance based on the design alternatives and their different scenarios related to investment, maintenance, operation as well as adjustments to enhance the performance of the building in the future.

The developed LCPC tool gives a clear insight in the results of different alternative solution proposals. The effect of productivity increase on the LCPC results for different workplace air conditioning concepts is large, which can compensate the higher initial investment costs. This also might, in a similar way, affect the decision about more sustainable solutions. Therefore, it is advised for facilities managers, when selecting alternative within the building design process, to consider applying a LCPC tool instead of one of the traditional environmental assessment tools like BREEAM or LEED.

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MODEL FOR THE INTEGRATION OF SUSTAINABILITY ASPECTS IN THE CORPORATE REAL ESTATE PORTFOLIO MANAGEMENT

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Climate change and global crisis lead to an increased public awareness of sustainability issues. In order to remain competitive, companies hence need to focus on sustainability, too. Amongst others, corporate social responsibility and marketing aspects force corporate real estate management (CREM) into improving the sustainability of their real estate portfolio. Portfolio theories have neither regarded sustainability aspects nor non-monetary influences on the building quality yet. The following paper gives an overview of how the portfolio management of non property companies can be supplemented by sustainability aspects and of what a sustainable portfolio management process flow might look like. Existing Green Building labels are tailored to the needs of property companies. For this reason, these labels are analyzed regarding their suitability for the corporate real estate portfolio management. The analysis is founded on a literature research (conceptual comparison) and the sustainability analysis of the portfolio of an international chemical company. Eight of the company's office buildings, located all over Europe, are assessed in detail. The analysis reveals that the existing Green Building labels do not assess the sustainability of corporate real estate in a realistic way. That's why the so called Corporate Real Estate Sustainability Index (CRESI) was developed. Part of the CRESI is a realistic evaluation of the sustainability, the strategic importance and the technical due diligence of non-real estate company buildings based on a newly designed „checklist“ following LEED, BREEAM and DGNB. CRESI helps to cluster real estate portfolios and derive strategies according to the sustainability, the strategic importance and the technical due diligence of the buildings. By using CRESI a sustainable portfolio management can therefore effectively be established. It enables the user to allocate the CREM budget and to give recommendation for improvement measures and the certification of lighthouse projects.

Keywords: corporate real estate, portfolio management, sustainability

INTRODUCTION

Climate change and global crisis contribute to a growing public awareness of sustainability. The increasing pressure of various social interest groups arouses a stronger corporate commitment to sustainable development. Besides idealistic motives, the movement is strengthened by the growing awareness that sustainability aspects contribute to corporate opportunities and thus competitive advantages of private and public companies. In order to remain competitive, companies therefore need to focus on sustainability, too.

AIMS

After having started to improve the sustainability in the core business, companies now also focus on their corporate real estate (CRE). Amongst others, corporate social responsibility and marketing aspects force corporate real estate management (CREM) into improving the sustainability of their real estate portfolio. As portfolio theories are tailored to the needs of property companies and as they haven't regarded non-monetary influencing factors and sustainability aspects yet, the following paper gives an overview of what the sustainable portfolio management (PM) tool of nonreal estate companies might look like. For this purpose it deals with the following questions:

- Are existing sustainable building labels suitable to be used for a sustainable corporate real estate portfolio management (SCREPM) or is it necessary to develop a separate sustainability assessment method for CREM?
- Which aspects need to be included into SCREPM?
- How is CREPM to be supplemented with sustainability aspects?
- What is a SCREPM tool to be used for? How can it be implemented?

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METHOD

In order to verify the adaptability of existing Green Building labels and PM tools to the needs of nonreal estate companies, they are analyzed regarding their suitability for the corporate real estate portfolio management (CREPM). The research is founded on a conceptual analysis and the sustainability analysis of the portfolio of an international chemical company. Eight of the company's office buildings, located all over Europe, are assessed in detail. Based on the assessment results, the strengths and weaknesses of the sustainable building labels are identified. Moreover, an excerpt of the results of a conceptual comparison of existing portfolio management approaches is described. The approaches are analyzed and assessed with respect to their suitability for CREM, too. The findings of the analyses are incorporated in a new SCREPM model, which helps to cluster buildings according to their as-is situation. As a result, building-specific improvement measures can be derived and budgeted and the portfolio composition can be optimized. The SCREPM model combines qualitative and quantitative PM. Due to the limited scope of the paper this approach cannot be explained in detail. However, it is part of the SCREPM process flow, which is described at the end of this paper. The advantage of the model is that it helps to overcome the deficiencies of current Green Building labels and PM approaches.

RESULTS

GREEN BUILDING (GB) LABEL SYSTEM ANALYSIS

Three of the most famous labels (LEED, BREEAM and DGNB) were conceptually compared and tested in practical application to provide a basis for evaluating their suitability for non-real estate companies. Within the framework of the practical application, 8 exemplary office buildings were assessed according to LEED, BREEAM and DGNB. In addition, a technical due diligence (TDD) was carried out. By conducting the GB assessment as well as the TDD, it was possible to find out, whether a building, which a TDD identifies as "good", is necessarily sustainable. While the GB rating systems led to similar results, in 3 of the 8 cases the results of the TDD were completely contrary to the sustainability assessment. This fact indicates that it is necessary to supplement the classical TDD by sustainability criteria, because a good building condition does not guarantee a sustainable building. Although the GB assessment results of LEED, BREEAM and DGNB correspond to each other, the application to the exemplary buildings and a conceptual analysis of the systems showed that they have a different focus and content. The labels do not cover the needs of a PM, because they do not assess the sustainability of CRE in a realistic way. The conclusions drawn are based on the analysis of selected factors and are summarized below:

- **Internationality (global distribution):**

There is no internationally applicable, uniform certification system. However, not all of the relevant countries have their own national certification system.

- **Worldwide reputation / level of awareness:**

LEED and BREEAM are the most famous GB labels (LEED is internationally best known and already used worldwide; BREEAM is internationally most frequently applied, but mainly used in Great Britain). DGNB is a young system. It is best known in Germany and about to expand rapidly.

- **Applicability for corporate real estate:**

CREM is part of the non core business and aims at supporting the primary processes (company as owner, operator and user). Contrary to this, GB labels are mainly created for real estate companies (investor, operator) and thus are focused on different characteristics. Although LEED, BREEAM and DGNB are, amongst others, specialized in the assessment of office buildings, they only suit companies to a limited extent (e.g. investors focus on regions / projects with high return expectations; in contrast, CREM acts in accordance with the requirements of production, production supporting services or distribution and sales. For this reason, return expectations are not of the highest priority.).

- **Applicability for existing buildings:**

Existing building and new building projects cannot be handled equally. Sustainability assessment methods for new construction do not suit the assessment methods for existing buildings, and vice versa. The BREEAM and DGNB certification systems for existing buildings are very young yet and still need to prove their usability. In addition, "LEED for Existing Buildings Operation & Maintenance" and "BREEAM in Use" focus on the utilization phase and the operational processes, but not on the building structure itself.

- **Complexity of the system:**

DGNB is a very complex system, which (as mentioned) has mainly been used in Germany. It is quite flexible and thus can and will be adapted for international use. LEED and BREEAM are less complex, but have a lower standard than DGNB. In some cases, European legal requirements exceed LEED / BREEAM standards (cf. waste management). Both labels are classical GB labels and cover less sustainability criteria. They focus on ecological and energy aspects and hardly regard economical and social issues (e.g. life cycle costs, comfort).

- **Applicability for portfolio management purposes**

Existing sustainability labels can be adapted for a portfolio assessment, but they cannot be directly adopted. Either their criteria are too complex / soft or they do not suit the corporate structure. In most cases, the buildings' sustainability cannot (exactly) be defined without further efforts. Detailed analyses like eco balances, life cycle assessments, tracking of energy consumption on system level, cost estimates and / or economic calculations are needed. As a consequence, the sustainability assessment cannot be carried out based on a site visit and existing documentations. That's why GB label systems are not a practicable tool for SCREPM.

In addition to the above-mentioned results, a conceptual analysis of LEED, BREEAM and DGNB strengthens the findings that existing GB labels do not suit PM purposes. The analysis of LEED revealed that 52,7 % of the LEED criteria cannot be used for the sustainability due diligence (SDD) of a building. 46,4 % of the criteria assess the buildingrelated processes (e.g. cleaning, sustainable food), but not the building itself. In addition, 6,3 % of the criteria evaluate management processes. They examine the fulfilment of a cooling tower management and the reporting of building emissions ("emissions reduction potential"). These criteria are not suitable for CREM, too, because they cannot be influenced by construction measures. The investigation of BREEAM shows that even less of the BREEAM in Use criteria can be adopted for a SCREPM. As BREEAM is not as transparent as DGNB and LEED, it is hard to name the accurate proportion of criteria, which suits the sustainable portfolio management purposes. According to BRE, only about one third (33 %) of the catalogue deals with the building structure, the other criteria are related to the building management and organisational aspects [BRE 2011]. DGNB assesses the sustainable building structure by 90 %; only 10 % of the credit points concern buildingrelated processes and are therefore not adequate for a SDD. Despite all that, DGNB is very complex. For this reason, only few of the criteria can immediately be used for a SCREPM. They lack practicability for CREM purposes, because they need very detailed information and calculations.

The following table shows selected examples for criteria, which are assessed by at least one of the three GB labels. It lists criteria not fitting CREM for different reasons:

Table 1: Green Building label criteria – suitability for corporate real estate

CRITERION	LEED	BREEAM	DGNB	REMARK
Energy consumption	Assessed	Assessed	Assessed	Labels don't regard industry specifics like steam surplus, which is used as energy source
Public access	Not assessed	Not assessed	Assessed	DGNB demands facilities that attract third parties (e.g. cafe), but for data protection reasons CRE often requires access control and exclusion of public
Sustainable purchasing	Assessed	Assessed	Assessed	LEED prescribes products to be used. It requires the use of local food, which cannot be influenced by CREM.
Cooling tower water management	Assessed	Not assessed	Not assessed	LEED assesses chemical management / non-potable water source use, but if building has no cooling tower, 0 of 2 points can be achieved
Life cycle costs (LCC)	Not assessed	Not assessed	Assessed	DGNB calculates LCC, but cost allocation usually not detailed enough to identify selected costs as required by DGNB

Table 1: Green Building label criteria – suitability for corporate real estate only shows an excerpt of critical criteria. However, there are many more of them. Even if the label criteria – as well as their ideas and indicators behind – can be adopted for CREM purposes, their assessment methods often need to be made practicable. The target is to reduce their effort to such an extent that they can be used within the framework of a site visit. For this reason, it is necessary to provide qualitative and quantitative assessment methods, which are aligned with corporate needs. If there is detailed information about a criterion, the quantitative assessment method is to be used; if not, a qualitative assessment is to be sufficient.

Even if LEED, BREEAM and DGNB are adapted to CREM characteristics, it is still necessary to implement the criteria into a portfolio management. GB evaluation methods are made for single assets, but not for overall portfolios or PM purposes. That's why this paper makes a first approach how to combine PM and sustainability assessment tools to the so-called "sustainable corporate real estate portfolio management" (SCREPM).

ANALYSIS OF PORTFOLIO MANAGEMENT APPROACHES

Portfolio management has its origin in the finance sector and is, amongst others, the science of making decisions about investment mix, matching investments to objectives, asset allocation and balancing risk against performance. PM theories distinguish between quantitative and qualitative models. In the 1950s, the later Nobel Prize winner Harry M. Markowitz published his book "Portfolio

Selection". In this book about the quantitative PM he proved that there is an influence of diversification on risk and return (Spremann06: p. 52 f.). Markowitz' theory was the foundation for today's real estate portfolio management (Lange 2011: p. 537). However, the Modern Portfolio Theory is based on many restrictions and assumptions with respect to the market environment and investors. For example, it is based on the assumption that assets are fungible. In the case of real estate, this applies only to buildings not essential for the core business or to the buildings of property companies. CRE lacks a high degree of fungibility and needs to follow the principles of the core business. For this and other reasons, the MPT is not applicable to CRE. It can only be extended to buildings not essential for the core business and to a nonreal estate company's buildings, because these buildings fulfil at least part of the requirements the quantitative PM is based on (Lehner 2010: p. 73 f.).

The qualitative portfolio management evolved at the same time as the quantitative PM. It is intended for the strategic management to sustain the long-term success of companies by using resources in an efficient way and by successfully positioning in the market (Hungenberg 2004: p. 18). Boston Consulting Group (BCG) and McKinsey played a key role in this development (Wellner 2003: p. 158). Their qualitative PM approaches have already been adapted to the real estate sector and have proven themselves in practice. According to the qualitative PM, buildings are allocated to different clusters in a matrix. More or less, the axes and the respective criteria can freely be chosen (e.g. rents, operation costs, space efficiency). The flexibility of the matrix and its dimensions enables the user to add, withdraw, replace or adapt assessment criteria. In this way, sustainability aspects, which have not yet been considered in the PM, can be included in the evaluation process in future.

On the basis of the BCG and McKinsey model numerous other approaches have been developed, but never been fully established on the market. BCG and McKinsey are the most commonly used approaches and therefore most likely to be understood and accepted on the market. That's why the following paper only refers to the more practicable and well-known McKinsey PM model.

SUSTAINABLE CREPM MODEL

DEVELOPMENT OF SUSTAINABILITY INDEX AND SCREPM MATRIX

In order to carry out a SCREPM, assessment categories, -criteria and -methods need to be determined. They can serve as a basis for the creation of a checklist consisting of relevant sustainability and other criteria. This checklist can be used for the qualitative CREPM. To develop the checklist, existing assessment methods need to be analyzed and adapted to CREM purposes and its specifics. Inappropriate criteria need to be revealed and dropped, replaced and / or adjusted. The goal is to use the checklist for a due diligence – including a technical (TDD) and sustainability due diligence – as well as for the assessment of the strategic importance of a site / building. The checklist should allow a quick check, which is periodically updated. It offers the different stakeholders the opportunity to assess the condition and potential of their office buildings on a uniform basis. As a result, the portfolio can be clustered according to the sustainability, maintenance backlog and remaining useful life of its buildings (e.g. high potential due to technical and sustainability due diligence). By considering the strategic importance of the different buildings, it is possible to decide how to proceed in a reasonable way. Possible implications might be: investing in building retrofits, divesting, investing in case of equipment breakdown only, certifying lighthouse projects and / or investing in measures positively affecting a GB certification. If relevant, improvement measures can be derived and budgeted for all or for selected buildings. Examples for possible TDD-, SDD- and site assessment criteria are listed below. They have been identified based on the results of the GB label analysis and on a literature research. All potential criteria were listed and ranked by real estate experts using pairwise comparisons. In this way, the huge number of criteria could be reduced down to the most relevant aspects in order to provide a practicable tool. Concerning the limited framework of this paper, the survey won't be described in detail.

Table 2: Assessment criteria for SCREPM-categories

TECHNICAL DUE DILIGENCE	SUSTAINABILITY DUE DILIGENCE	DEPENDENCE ON BUILDING
Condition of building components (e.g. windows)	Primary energy consumption	Plannings for the building
Condition of technical installations (e.g. ventilation)	Greenhouse gas emissions	Strategic function
Maintenance backlog	Renewable energy consumption	Market situation (e.g. rents)
Overall maintenance costs	Life cycle costs	Infrastructure (e.g. public transport, media supply)
Remaining useful life	Indoor Air Quality	Partner networks (e.g. clients, suppliers)
Heritage protected building	Thermal comfort	Saleability
Priority of maintenance measures	Thermal insulation of building envelope	Special uses (e.g. laboratory)
Building space	Building automation system	
...	Maintenance friendliness	
...

As already mentioned, the criteria within the three SCREPM categories are assessed either quantitatively or qualitatively and summed up using a scoring model. In this model, the criteria are weighted according to their relevance to the SCREPM user. For each category a maximum of 5 points can be achieved. The scores of the TDD and SDD are weighted and summed up again, multiplied by 20 (to avoid high-density point clouds) and result in the so-called corporate real estate sustainability index (CRESI, 0 to 100 points):

$$CRESI_r = \left(\frac{1}{2} \sum_{i=1}^m w_i^T \cdot T_i + \frac{1}{2} \sum_{j=1}^n w_j^S \cdot S_j \right) \cdot 20$$

- CRESI_r cre sustainability index of building r at time t (0-100 points)
- w_i^T, w_j^S weighting of TDD criterion i, weighting of SDD criterion j
- T_i assessment result of technical due diligence criterion i (1-5 points)
- S_j assessment result of sustainability due diligence criterion j (1-5 points)

The result of the “dependence on building / site” assessment is also multiplied by 20 and delivers the so-called DOS:

$$DOS_r = \left(\sum_{k=1}^o w_k^D \cdot D_k \right) \cdot 20$$

- DOS_r dependence on building / site r at time t (0-100 points)
- w_k^T weighting of site criterion k
- D_k assessment result of dependence on site criterion k (1-5 points)

Finally, the scores are entered in the portfolio matrix. The CRESI is displayed on the horizontal axis; the dependence on building / site is displayed on the vertical axes. The axes are subdivided into three areas, which display the different clusters of the matrix.

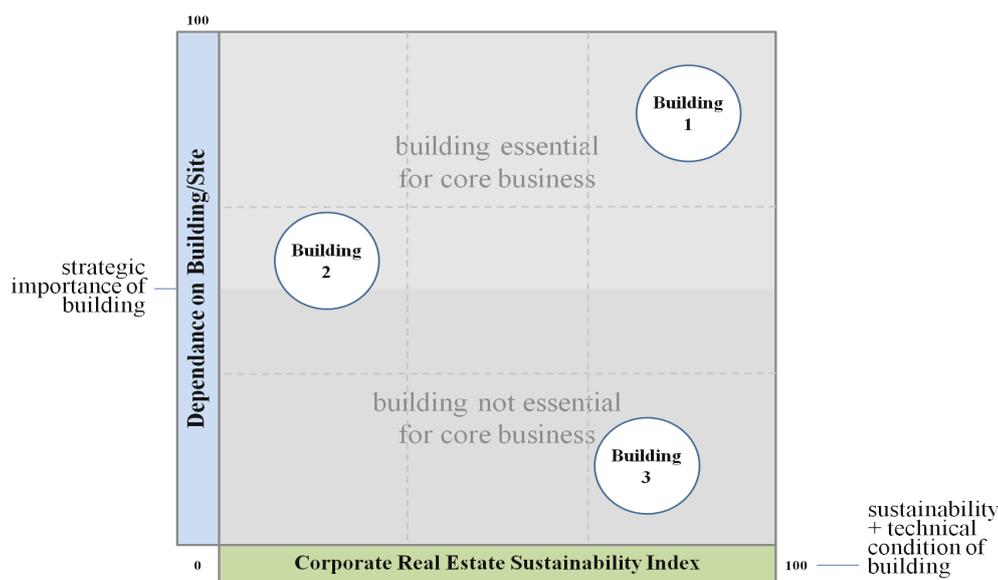


Figure 1: Sustainable Corporate Real Estate Portfolio Matrix (SCREPM)

Based on the visualized results, generic strategies can be derived. Buildings located further on the right side of the matrix are more sustainable and consequently reach a higher CRESI score than buildings located further on the left. Buildings with a higher DOS score for the dependence on building / site are located in the upper part of the matrix. This means they are strategically important buildings (essential for core business), due to the fact that it's more difficult to abandon, sell or demolish them. As a consequence, the most important buildings are those in the upper left and right area of the matrix, since they are strategically very important and very sustainable (upper right side) or not sustainable at all (upper left side). These buildings are therefore candidates for improvement measures and / or a sustainability certification.

DEVELOPMENT OF GENERIC CORPORATE REAL ESTATE STRATEGIES

As well as recommending improvement or certification measures, it is possible to give advice for the other clusters, too. For each of the different matrix clusters generic strategies can be defined. They distinguish between buildings essential for the core business and buildings not essential for the core business:

Buildings essential for the core business:

- Strategically important buildings (high DOS score) with a high CRESI (very good TDD and SDD score) belong to the cluster, which should be maintained and / or further improved.
- Strategically important buildings with a low CRESI (low TDD and SDD score) belong the cluster, which should be significantly improved and / or even revitalized.
- Strategically important buildings with a medium CRESI belong to the cluster, which should be improved with respect to the building structure and / or sustainability.

Buildings not essential for the core business:

- Buildings strategically not important (low DOS value) but with a high CRESI (high TDD and SDD score) belong to those objects, which should be treated like income properties and assessed regarding their risk return ratio. According to the result of this assessment, they should be kept or profitably sold.
- Buildings strategically not important with a low CRESI (low TDD and SDD score) belong to the cluster that should be divested.
- Buildings strategically not important and with a medium CRESI are objects in a good condition, which should be either sold as they are or improved with respect to their sustainability. After the improvement the buildings should be treated like income properties, which are assessed according to their risk return ratio and kept or profitably sold.

The definition of generic and hence individual real estate strategies enables the user to allocate the CREM budget and to give recommendation for improvement measures as well as for the certification of lighthouse projects. Although there is a proposal for how to implement CRESI into budget allocation, it cannot be presented in detail within the framework of this paper. The approach combines qualitative and quantitative PM (following MPT) and is primarily intended for buildings essential for the core business. All buildings that are not essential for the core business require a separate, quantitative PM. They need to be managed like income properties, which are managed in accordance with their risk return ratio.

SCREPM PROCESS FLOW DIAGRAM

To give an overview of how to implement SCREPM of buildings essential and not essential for the core business into daily business, the individual steps and the process order of the model are shown in a process flow diagram (Figure 2). The sustainable real estate portfolio management model for non-real estate companies is based on CRESI. It supports well-informed decisions and provides recommendations that help to create and control a sustainable real estate portfolio and to optimally support the corporate strategy. Starting point of SCREPM is a real estate data base consisting of building and market data. These data are the basis for different indicators and market forecasts, which are used to conduct a portfolio analysis. The analysis clusters the portfolio buildings according to their condition and strategic importance and delivers generic strategies, which are derived from company goals. In order to define buildingspecific strategies and optimization measures, SCREPM differs between buildings essential for the core business and buildings not essential for the core business. The budget for buildings essential for the core business is allocated according to CRESI and DOS. Budget and strategies for buildings not essential for the core business are defined on the basis of risk-return-ratios and CRESI. Afterwards, the strategies determined are implemented and the targets are controlled. The process is regularly repeated so that the building stock and portfolio composition are continuously improved.

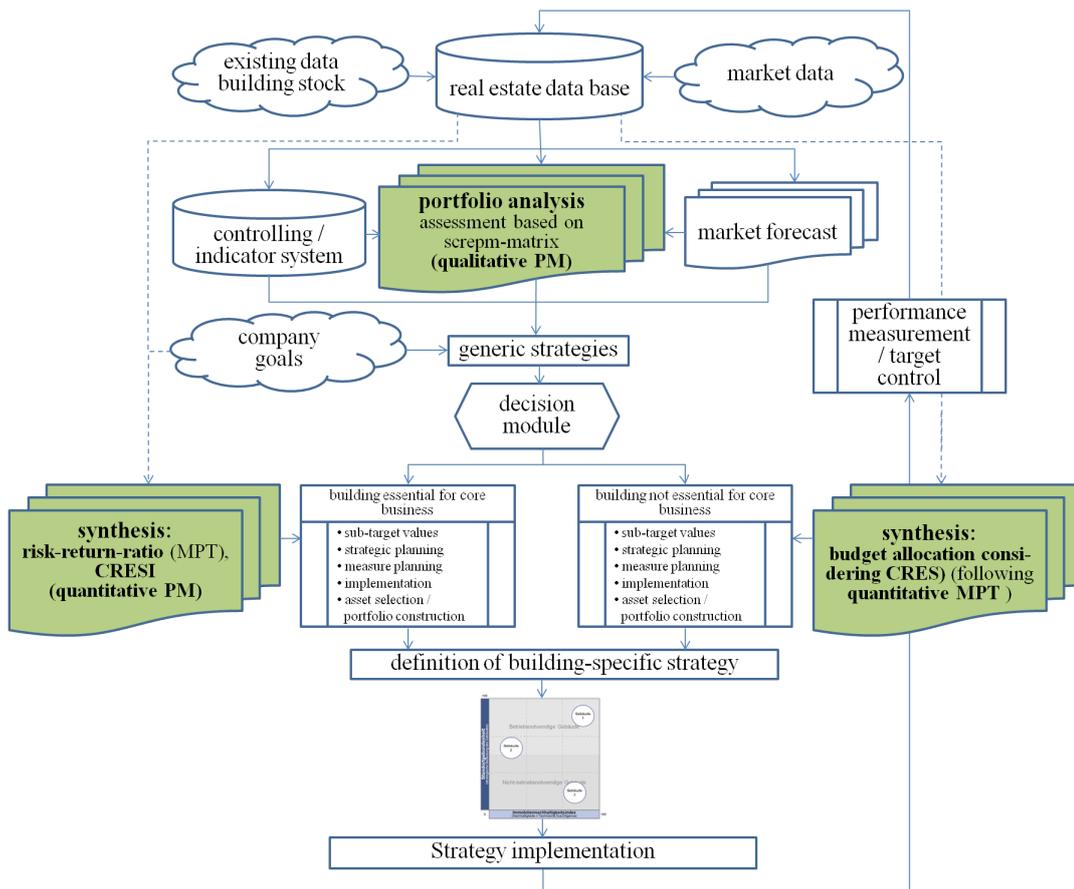


Figure 2: Sustainable SCREPM process flow diagram

CONCLUSION AND OUTLOOK

SCREPM is confronted with many difficulties the common real estate PM needs to deal with. It is hard to analyze and assess heterogeneous portfolios according to a similar scheme. Expected market values can be way above or beyond sales values. In addition, the data required for a SCREPM often lack actuality. For this reason, the SCREPM assessment is only valid as long as the objects do not change their characteristics due to alteration, advancing age, etc. The first step towards a PM is usually to collect the required data, which can be very time-consuming and cost-intensive. However, this data is the basis for a SCREPM, too. It needs to be reliably and short-term available (Gier 2006: p.50).

Regardless of the challenges to bear, SCREPM might be a very powerful tool. It is a transparent and easy to use model for experts. SCREPM assesses the condition and strategic importance of corporate real estate and considers sustainability aspects, which help to identify long-term risks. The tool shows the position of different office buildings within the portfolio and points out their strengths and weaknesses. In this way, it provides a sound basis, on which decisions regarding improvement measures and budgeting can be made while considering the corporate strategy and restrictions (e.g. differentiation between buildings essential and not essential for the core business). The current condition and development of the portfolio over time can be monitored and benchmarked regularly, so that the model can be used for communication as well as for medium- and long-term planning.

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IMPORTANT ABBREVIATIONS

CRE	Corporate Real Estate
CREM	Corporate Real Estate Management
CREPM	Corporate Real Estate Portfolio Management
CRESI	Corporate Real Estate Sustainability Index
DOS	Dependence On Site
GB	Green Building
MPT	Modern Portfolio Theory
PM	Portfolio Management
SDD	Sustainability Due Diligence
SCREPM	Sustainable Corporate Real Estate Portfolio Management
TDD	Technical Due Diligence

STRATEGIC FRAMEWORK FOR BUILDING ENVIRONMENTAL PERFORMANCE

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Construction organisations are increasingly promoting practices that are aimed at reducing the environmental impact of construction site activities. Several different types of environmental performance rating systems are now available to assess construction sustainability. Many environmental assessment systems are available globally and are used to demonstrate buildings energy performance credentials and therefore its ability to reduce environmental carbon footprint. The most well known is the British BREEAM and the U.S. based LEED. Others include DGNB (Germany), CASBEE (Japan), Green Star (Australia), as well as HK-BEAM (Hong Kong). BREEAM is widely used in UK. The BREEAM assessment tool assess' buildings environmental performance at all stages including the design, construction and post construction stages. This is done by using a straightforward scoring system. Since its introduction, many construction firms in UK are faced with enormous difficulties and high costs on how to go about meeting building energy performance credentials compliance requirements. This paper discusses a simple methodological process which will help contractors to reduce the high costs incurred during BREEAM implementation. BREEAM building compliance requirements is analysed together with the problems confronting contractors' organisation. A simple checklist developed from structured interviews with Quantity Surveyors, Site agents and Contracts manager which will assist main contractors to monitor their performance during its implementations, is provided.

Keywords: BREEAM, building environmental assessment systems

INTRODUCTION

The built environment accounts for roughly 40% of both the total energy consumption and the carbon dioxide emissions globally (Todd, 2010). Furthermore, it is estimated (Kohler, 1999, US Green Building Council, 1996) that approximately 80% of carbon emissions caused by buildings are created during the operating phase of existing buildings, making the topic of this paper both relevant and current. BRE Global Ltd introduced 'BREEAM, (Building Research Establishment Environmental Assessment Method) for the assessment of construction sustainability. "BREEAM is the leading and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance" (BREEAM, 2009). This framework was introduced in response to the growing demand from governments, clients, end users and designers to demonstrate building's energy performance credentials and their sustainability.

The BREEAM assessment tool assess' buildings environmental performance throughout the life span of the building. This is done by using a straightforward scoring system (EAC, 2011). The end user/client can determine the standard of performance required for the building by specifying the level of BREEAM to be obtained for example, 'outstanding,' 'excellent,' 'very good' and so on (table 1). Client's specifying can establish the level required by determining what they would like their building to achieve environmentally and cross reference this with the criteria to ascertain, which level it corresponds. A building compliance is determined by meeting the criteria set out for the level required, which will be split into mandatory and non-mandatory credits. Contractors must decide which non-mandatory credits they will attempt to achieve the required score so as to obtain the level specified. The contractor must consider this whilst still providing the client with a building that meets their business requirements. Deciding which credits to attempt may vary between contractors depending on considerations such as budget or site location or ease of ability to obtain particular credits. Main contractors must take responsibilities on how to achieve the level specified before a project can be handed over to the client.

By developing a clear understanding of the principles and requirements, organisations can take pre-emptive measures to ensure compliance with the specified BREEAM level in the buildings they construct. Current methods used by project teams vary widely, based upon perceptions on whose 'job' it is to ensure compliance and whom should take on the role of BREEAM 'champion'. There are no guidance notes or documentation in place to monitor if compliance is being achieved effectively throughout the project period.

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Methods currently used tend to be a reactive process of sending out vast quantities of emails and telephoning contractors to chase information required for BREEAM compliance. Meetings with the BREEAM assessor are also limited throughout the project, thus, limiting support and encouragement in obtaining the required information. The current methods of obtaining information are both ineffective and time consuming. A simple proactive approach in the form of pre-emptive tick sheets discussed in this paper could eliminate a number of these problems faced by many contractors.

KEY FEATURES OF BREEAM

BREEAM covers a wide range of developments and has been tailored to be relevant to the majority of projects. The framework is first split into BREEAM construction and BREEAM refurbishment. BREEAM construction covers developments such as courts, data centres, eco homes, education, healthcare, industrial, multi-residential, offices, prisons, retail and other buildings. BREEAM refurbishment covers both domestic and non-domestic refurbishments (BREEAM, 2009). BREEAM cannot however, be used to assess existing, un-refurbished buildings as they simply would not meet the criteria. Each project has a one off tailored assessment due to the vast options available at the design stage for clients to choose from and further options at construction stage.

The BREEAM frameworks assess buildings performance over and above the requirements of local codes and best practice standards (The British assessment bureau, 2011). This therefore, allows a comprehensive measure of buildings sustainability. The framework takes a number of key factors into account, including; climate, ecology, construction materials, culture, construction practices, building regulations infrastructure, historical context, political decisions and geography (The British assessment bureau, 2011). The scores required for each BREEAM rating level is shown in Table 1.

Table 1: BREEAM, 2009 rating benchmarks

(BREEAM, BRE Environmental & Sustainability Standard, 2009)

BREEAM Rating	% Score
Unclassified	<30
PASS	≥30
GOOD	≥45
V GOOD	≥55
EXCELLENT	≥70
OUTSTANDING	≥85

The scheme within the framework is split into management, health and well-being, energy, transport, water, materials, waste, land use and ecology and pollution (Table 2). Each of these sections contains both mandatory and non-mandatory credits, which are weighted according to their relative importance (BREEAM, 2009).

Table 2: BREEAM 2009 Environmental weightings

(BREEAM, BRE Environmental & Sustainability Standard, 2009)

BREEAM Section	Weighting (%) New builds, extensions & major refurbishments
Management	12
Health & Well Being	15
Energy	19
Transport	8
Water	6
Materials	12.5
Waste	7.5
Land use & Ecology	10
Pollution	10

The number of credits attempted over and above the mandatory credits is dependant upon the overall rating required. The weighting for each section is shown in Table 2.

Table 3 displays the minimum number of credits required to achieve the criteria within the relevant sections. BREEAM assessors can also award innovation credits, above the standard criteria. These provide additional recognition for a building that innovates in the field of sustainable performance beyond the level that is recognised and rewarded within the standard BREEAM requirements (BREEAM, 2009). An additional 1% score can be added to a building final BREEAM score for each innovation credit achieved. The maximum number of innovation credits that can be achieved is 10 (BREEAM, 2009). There are two ways a building can achieve an innovation credit (BREEAM, 2009). The first is by addressing the exemplary performance requirements in the relevant section where available. Table 4 shows, which sections have criteria with an opportunity to gain exemplary credits (BREEAM, 2009).

Table 3: Minimum BREEAM standards

Source: BREEAM, BRE Environmental & sustainability standard, 2009

BREEAM issue	BREEAM Rating/Minimum number of credits				
	Pass	Good	Very Good	Excellent	Outstanding
Man 1 – Commissioning	1	1	1	1	2
Man 2 – Considerate Constructors				1	2
Man 4 – Building user guide				1	1
Man 9 – Publication of building information (BREEAM Education only)					1
Man 10 – Development as a learning resource (BREEAM education only)					1
Hea 4 – High Frequency sighting	1	1	1	1	1
Hea 12 – Microbial contamination	1	1	1	1	1
Ene 1 – Reduction of carbon dioxide emission				6	10
Ene 2 – Sub-metering of substantial energy users			1	1	1
Ene 5 – Low or zero carbon technology				1	1
Wat 1 – Water consumption		1	1	1	2
Wat 2 – Water meter		1	1	1	1
Wat 3 – Storage of recyclable waste				1	1
LE 4 – Mitigating ecological impact			1	1	1

Table 4: BREEAM issues with exemplary level requirements

Man 2 – Considerate Constructors
Hea 1 – Daylighting
Hea 14 – Office space (BREEAM Retail & industrial schemes only)
Ene 1 – Reduction of CO ₂ emissions
Ene 5 – Low or zero carbon technologies
Wat 2 – Water meter
Mat 1 – Materials specification
Mat 5 – Responsible sourcing of materials
Wst 1 – Construction site waste management

The second way a building can achieve an innovation credit is by the main contractor making an application to the BREEAM assessor for the building, requesting recognition for the feature, process or system installed.

RESEARCH METHOD

To understand the organisations view on compliance with the BREEAM framework, a case study involving recently completed two-storey medical centre was used focusing on the main contractor’s organisation. This building was completed in June 2011 with 40 weeks construction period at the cost of approximately £2.4 million. The project was for the construction of a two-storey medical centre and a single-storey pharmacy building. The buildings’ gross internal floor area (GIFA) was approximately 1200m² consisting of offices, treatment/consultation rooms, WC’s and circulation areas.

The general construction of the building consisted of brick and block cavity wall with rendered areas along with concrete tile and single ply roof finishes.

At tender stage, limited information was provided in relation to the BREEAM requirements other than that the building must achieve a 'Very Good' rating. With this in mind and the limited knowledge of the company in relation to the requirements of a 'Very Good' rated building, a provisional sum of £17 000.00 was allowed for any additional requirements over and above those usually implemented to achieve building BREEAM's benchmark.

The provisional sum allowed for the project included for external features such as cycle shelter installation, covered bin stores, landscaping and planting to support and encourage the local ecology, leak detection to the incoming water supply and a rainwater attenuation system. Internal features such as localised energy consumption meters to allow building users to monitor their energy usage were incorporated along with low level flush toilets, and sustainable construction materials were used where possible throughout the project.

Although, many of these features were envisaged at tender stage, the extents of these requirements were unknown and unforeseen costs were also covered by this sum of money. This was, however in addition to the contingency value allowed for the project. Questions relating to the management system for obtaining BREEAM compliance were directed to the Quantity Surveyor, Contracts Manager and Site agent/Manager responsible for this project using structured interview.

The criteria were chosen due to their roles within the BREEAM framework and do not form an extensive list of all elements to be addressed as noted within the documentation. These questions were asked in order to establish if the respondents believed it was simple to establish the individual project team member's responsibilities within the framework.

The responses to the tick sheet were analysed and the feedback was incorporated into three new job role specific tick sheets for the job roles mentioned above. These tick sheets shown in table 4 were formed based on majority weightings of responses for each criterion. Due to the type and amount of questions asked, a descriptive analytical approach has been adopted.

DISCUSSIONS AND ANALYSIS OF RESULTS

Due to lack of knowledge with regard to what steps are required in order to achieve BREEAM 'Very Good' requirements, the majority of the £17 000.00 provisional sums was spent on mechanical and electrical projected liability instead of what it was originally allocated during the pre contract stage as the cost requirements to this area of works were greatly increased.

The main reason for this was due to the high specification of sanitary ware, localised metering of services, limiting the use. As a result of this problem an additional heating/cooling controls costing £20,000 was purchased. The £17,000.00 provisional sum was exceeded due to additional features amongst many others and the contractor was forced to spend the contract contingency monies. In most cases, these issues could have been avoided with an improved knowledge of the requirements that allows the team to act proactively rather than reactively.

A more accurate tendering figure would have been submitted allowing the main contractor to work with the subcontractors more closely from the outset of the project.

During the project period, more typical construction processes took priority over the need to adhere to BREEAM compliance issues and therefore BREEAM meetings were held later than scheduled in the project master programme due to the fact that information needed were unknown. Realistic data required to meet the BREEAM building sustainability requirements were also gathered much later in the project than necessary.

This led to many of the issues being dealt with on an ad-hoc and reactive basis rather than in a methodological and proactive exigency required for this type of project, and criteria that were not initially being attempted now had to be attempted in order to obtain the necessary number of points to achieve a 'Very Good' BREEAM rating. This was due to a failure to install products or use materials that would have contributed credits as per the action tracker.

The above evidence proves that the main contractor needs to take control of establishing the requirements of the required rating from the outset of the project to ensure BREEAM compliance is achieved in the most economical and efficient way. The tick sheet (Table 5) is not a definitive list of main contractor requirements however, this has been prepared as guidance in relation to key elements to be addressed in order to satisfy BREEAM requirements. This would enable the user to prepare a more accurate estimate of the BREEAM rating to be achieved. It is important for the user of this tick sheet to consult individual project action tracker for detailed information with regard to the requirements for mandatory and non-mandatory credits along with specification of evidence required.

Table 5: BREEAM conformance tick sheet

TASK	ACTION BY (QS,CM,SA)	ESTIMATED COST	COMMENTS
<p>GENERAL</p> <p>BREEAM assessor appointed/contacted</p> <p>BREEAM assessor issued with drawings and/or specification</p> <p>Consultation with Architect</p> <p>Consultation with Client</p> <p>M&E Consultant/subcontractor appointed</p> <p>MANAGEMENT</p> <p>MAN 2 – Considerate constructors applied for</p> <p>MAN 3 – Create/update templates for monitoring CO2 consumption, deliveries and water consumption, pollution and site waste management procedures</p> <p>MAN 4 – Create/arrange creation of building user guide</p> <p>MAN 8 – Consult crime liaison recommendations</p> <p>HEALTH AND WELLBEING</p> <p>Continual progress meetings with M&E subcontractor to monitor progress with daylight calculations etc</p> <p>HEA 9 – Obtain literature confirming *VOC emissions meet the required level</p> <p>ENERGY AND CARBON DIOXIDE EMISSIONS</p> <p>ENE 1 – Place order for air test</p> <p>ENE 1 – Ensure air tightness for air leakage testing</p> <p>ENE 2 – Ensure M&E quote allows for sub-metering appliances</p> <p>Place order for cycle storage facilities, consult action tracker for criteria</p> <p>TRANSPORT</p> <p>TRA 1, 2 and 5 – Ensure all compliance evidence obtained from consultancy with regard to travel plan, amenity location and public transport</p> <p>TRA 3 – Place order for cyclist facilities (if attempted)</p> <p>TRA 7 – Place supplier order for travel information board.</p> <p>WATER</p> <p>WAT 1 – Ensure sanitary ware conforms with water consumption requirements when placing order</p> <p>WAT 2 – Ensure water meter, includes pulsed output</p> <p>WAT 3 – Ensure leak detection to water supply in quotation (if attempted)</p> <p>MATERIALS</p> <p>MAT 1 – Provide construction details to assessor to enable input into Green guide calculator (if attempted)</p> <p>MAT 5 – Ensure materials are responsibly sourced</p> <p>MAT 6 – Insulation (volume calculation)</p> <p>MAT 7 – Implement designing for robustness features ei. Buffer rails, door stops etc</p> <p>WASTE</p> <p>WST 1 – Construction site waste management plan</p> <p>WST 2 – Place order for recycled aggregates (if attempted)</p> <p>WST 3 – Recyclable waste segregation</p> <p>LAND USE AND ECOLOGY</p> <p>LE4 – Ensure planting plan meets requirements for mitigating environmental impact</p> <p>POLLUTION</p> <p>POL 2 – Ensure leak detection for refrigerant included in M&E quotation</p>			

Instruction: Please ensure you check your project specific action tracker to establish which credits you will be attempting.

*(VOC emissions – Volatile Organic Compounds)

The above checklist shown in Table 5 is developed to help contractors during the BREEAM implementation and provides all the information that should be addressed. It is also important that a key member of staff is appointed as BREEAM champion to oversee its implementation during tender and construction stages.

CONCLUSION

The lack of methodological approach and management systems during the implementation of BREEAM building sustainability compliance demonstrates a lack of knowledge within the industry for carrying out this work. An inadequate detailed methodological procedure during construction operations has proven costly to main contractors' organisations. This is due to late detailed considerations and accurate assessment of BREEAM's checklists and for not being able to manage and control factors affecting compliance. As a result of taking a reactive approach to comply with the framework, main contractors are making the process more time consuming and costly than necessary, thus incurring unnecessary further costs.

Main contractors' organisations need to take a more proactive approach to initially train the project team and provide up-to-date training in-line with the progression of BREEAM framework. Contractor's organisations must also provide the necessary tools and assistance that will enable the designated BREEAM champion to have the best chance of accurately assessing all the resources needed to achieve compliance instead of using provisional sums which in the majority of cases may not be sufficient to cover the costs of fully complying with BREEAM sustainability benchmark. At present, there is no policy for appointing a person designated to the role of BREEAM champion. The use of the checklist shown in table 5 will assist in this regards.

The advantage of using a case study in this study is that the information obtained was both current and factual data from a 'live' project. Nevertheless, it is important to recognise that this study has limitations one of which is that it did not provide a full picture of many contractors' organisations as a whole. It is important to carry out a more comprehensive study in this area in order to develop a more robust BREEAM cost-checking tool.

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CULTURAL HERITAGE MANAGEMENT AND HERITAGE (IMPACT) ASSESSMENTS

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Cultural heritage management is going through a process of change, where the focus is no longer the management of monuments, groups of buildings or sites, but the cultural significance they convey, such as the values and attributes, either tangible or intangible, which motivated these assets to be considered outstanding and designated as cultural heritage. Cultural heritage managers need to ensure that the management practices and methods they follow remain adequate and when they don't, to revise them in order to succeed in protecting the cultural heritage assets under their safeguard. This article aims to provide a brief background and state-of-the-art on heritage (impact) assessments. Further, it introduces a method to assist heritage (impact) assessments, which can either be applied to identify or monitor evolution in time and/or help determining the impact of various agents of change, such as climate, natural catastrophes or development, on the cultural significance conveyed on cultural heritage assets. An illustration on the progress and outcomes of its application on World Heritage properties located in Guimarães (Portugal), Willemstad (Curacao), Galle (Sri Lanka) and Zanzibar (Tanzania) will be presented and sustain the discussion on the contribution of such method to cultural heritage management, while exploring its strengths, weaknesses, opportunities and threats (SWOT analysis). Last, conclusions are presented, as well as, recommendations for further research. The method, application and validation presented in this article are very useful to facility managers whose assets happen to be cultural heritage, policy makers who regulate cultural heritage protection and planning processes, and technical experts performing heritage (impact) assessments. Besides raising awareness for heritage (impact) assessments, this method also expects to contribute to the increase of cultural heritage management practices that enhance cultural heritage and in turn enable the contribution of cultural heritage to the sustainable development of present and future generations.

Keywords: cultural heritage management, cultural significance, heritage impact assessment, sustainable development

INTRODUCTION

Cultural heritage management is going through a process of change, where the focus is no longer the management of the integrity of the cultural heritage assets, but the cultural significance they convey, such as the values and attributes, either tangible or intangible, which motivated these same assets to be considered outstanding and designated as cultural heritage. Cultural heritage managers need to ensure that the management practices and methods they follow remain adequate and when they don't, to revise them in order to succeed on protecting the cultural heritage assets under their safeguard. The Burra Charterⁱⁱ (ICOMOS Australia 1999) came to fill the gap left by the Charter of Venice (ICOM et al 1964), recognizing the "conservation as a dynamic process of change management" that should be conducted through a value-based approach; in which the "Statement of Significance" becomes the key document of the entire process. Even if national-oriented, the Burra Charter had a strong impact in the international community involved with the field of cultural heritage management. This same Statement of Significance became mandatory for States Parties to include in new nominations of properties to the UNESCO World Heritage List (UNESCO 2005). Nowadays, it is best known as the Statement of Outstanding Universal Value (UNESCO 2008).

The value-based management process described by Burra Charter entails three stages: significance assessment, policy-making and management (ICOMOS Australia 1999). Further revisions introduced a fourth stage for assessing vulnerability into the process in order to explicitly identify threats to cultural significance (Kerr 2000; Clark 1999, 2001), or for purposely change cultural heritage, through means of implementing development projects (Pereira Roders & Hudson 2011). This value-based management process has been extensively applied in countries such as Australia and United Kingdom, either by changing the legislation or drafting new conservation guidelines (English Heritage 2008). Other research has been found focused in developing, improving and/or verifying this process, among which are the important reports produced at The Getty Conservation Institute (Avrami 2000; Mason 2002; Torre 2003).

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ii. The Australia ICOMOS charter for the conservation of places of cultural significance was adopted by Australia ICOMOS in 1974 at Burra, Australia. The charter has since been revised and updated, and the sole version now in force was approved in 1999 (Torre, 2003).

The next challenge proposed to facility managers involved in cultural heritage management regards measuring the impact that specific development proposals may have on the significance of cultural heritage assets, facility managers are responsible to manage and protect for present and future generations. Even when included in Environmental Impact Assessments (EIA), cultural significance remained limited and presented lacks in relation to the attributes and values conveying cultural significance. Such shortage is dangerous and risk jeopardizing the cultural heritage assets (Teller and Bond 2002; Bond et al. 2004; Dupagne et al. 2004, Jones and Slinn 2008). Nonetheless, the scenery is slowly changing and tools such as the SUIIT method started being created and implemented, aiming to create guidelines for managing change within historic areas including cultural heritage assets, and “contribute to their long-term sustainability” (Dupagne et al. 2004).

This paper aims to provide the background and state-of-the-art of heritage impact assessments, as well as, to propose and discuss a new method to assess the significance of cultural heritage assets. Initially developed by Pereira Roders (2007) as part of a design process model to guide designers involved in rehabilitation interventions, this method kept on evolving while being implemented by a group of MSc. students graduating in Architecture under the Graduate Studio “Cultural heritage and Sustainability: World Heritage cities as case study”, at the Department of the Built Environment, Eindhoven University of Technology, the Netherlands. Briefly, this group of students cooperates directly with the local governments and/or institutions involved with the management of the World Heritage assets taken as case study. They work during the whole academic year on their thesis, and for the data collection they undertake a period of three months abroad for fieldwork. Moreover, their results are used to validate the results of a broader and international-oriented research program aiming to survey the relationship between heritage (impact) assessments and the sustainable development of urban settlements that include cultural heritage assets listed as World Heritage within their urban areas.

This research has started in 2009 and aims to be completed by 2014, with the target to develop, test and verify a web-based tool which can assist local governments performing heritage (impact) assessments on World Heritage assets located in urban contexts. Eindhoven University of Technology is cooperating with UNESCO World Heritage Centre, the Organization of World Heritage Cities, various local governments and Universities worldwide who expressed interested to join and contribute to this challenging research program.

CULTURAL SIGNIFICANCE

The concept of cultural significance is used by the conservation community when addressing the range of values ascribed to a cultural heritage asset and justifying its designated status (Avrami et al 2000). Furthermore, cultural significance can be present in the place itself, its fabric and setting, as well as, on its use, associations, meanings, records, related places and objects (Australia ICOMOS 1999). Cultural values are subjective and extrinsic (Hodder 2000); though, they would change over time but not in time. Different groups (of generations, professionals, etc) and even individuals may simply attach different weight to the cultural values, and different levels of relevance to the same cultural heritage asset, but still, the cultural values remain the same (Pereira Roders & Hudson 2011).

Since Riegl distinction between memorial and present-day values (Riegl 1903) several typologies of cultural values have followed (Mason 2002; Riganti and Nijkamp 2005; COE 1976), including in national and international heritage conservation guidelines (English Heritage 2008; EC 2005 in Battaini-Dragoni, 2005). In 2007, Pereira Roders has defined eight primary values: social, economic, political, historic, aesthetical, scientific, age and ecological values; and varied secondary values. This typology of primary values was proposed to complement the four cultural values – historic, aesthetical/artistic, scientific and social values – recognized at UNESCO’s World Heritage Convention (1972, 2008); with the three pillars of sustainable development – ecological, social and economic values, the political values (Riganti and Nijkamp 2005) and the age values (Riegl 1903) as the primary values conveyed in cultural heritage assets.

The aim was to verify Mason’s (2002) assumptions on; first, the regency of traditional values e.g. historic for assessing cultural significance; second, the existence of a broader nature of values conveyed in cultural heritage assets, and third, the contribution of a typology of values to mitigate manifoldness, by providing an effective and neutral guide to be used by those involved with cultural heritage assets. Forty international documents were surveyed, such as the recommendations prepared by UNESCO, ICOMOS and Council of Europe to evidence that the variety of values being used to describe the significance of cultural heritage assets was much broader than expected, when arguing why these assets should be protected, as well as, the rankings of these values in referenced frequency.

CULTURAL VALUES

For a better understanding, follows the definition of the eight primary values. The social value of heritage assets is often expressed by concepts such as “spirit of the place” or *genius loci* (Mason 2002). They associate the place with feelings of identity, distinctiveness, social interaction and coherence (English Heritage 2008), enabling the establishment of spiritual links between people and buildings, objects and places. According to Mason (2002), the economic values are distinct from the other primary values as their interpretation is fundamentally different. Embodied within economic theories, the economic value is understood through the logic of market and profit, in which the potential function and the income obtained from its use is what is valued.

The values ascribed to cultural heritage assets can also be part or symbolize power struggles and exertions that determine the fate of cultural heritage (Mason 2002); on the same way the nomination might have resulted from a political decision. However, those facts cannot be assumed as attributes of political value, as they might be not related or symbol of power, pride, distinctiveness and ideological approaches. The historic values take present generations to the past, being the roots of the very notion of heritage assets (Mason 2002). Beyond the historical feature, which in fact entails the age value (Pereira Roders 2007), the historic values could be accruing from “its association with people or events, from its rarity, from its technological qualities, or from its archival/documentary potential” (Mason 2002). Therefore the spiritual links established diverge from the ones created by social values, by the fact that they must be connected with the past, and are limited by the survival of the physical fabric, meaning the preservation of its authenticity (English Heritage 2008).

The aesthetical values, as the historic, are traditionally used to labelling objects and places as heritage (Mason 2002). However, they are probably the most subjective and individualistic of the sociocultural values (Mason 2002), traditionally resulting from the way that people draw sensory and intellectual stimulation from a place (English Heritage 2008). There are some aspects of aesthetical values that can be objectively measured, not regarding to beauty or sublime, but regarding to creativity, conceptualization and preservation of the related attributes (Pereira Roders 2007).

According to the Burra Charter (1999), the scientific values of a place depends “on the importance of the data involved, its rarity, quality or representativeness, and on the degree to which the place may contribute” to future knowledge. Indeed, the scientific values are focused on the design process and conceptualization of the cultural heritage asset (Pereira Roders 2007), as a masterpiece of technology and engineering.

Traditionally connected to historic values, the age values are distinguished from for their relation to the life cycle of the cultural heritage assets, its survival and evolution throughout a period of time (Riegl in Pereira Roders 2007). The maturation and the several changes introduced over the time, building up evidences from the passage of varied generations, constitutes the age value of heritage assets (Pereira Roders 2007).

Firstly mentioned on the Declaration of Amsterdam (COE 1976), the ecological values refers to the relation that heritage assets play with the natural environment. Moreover, the ecological values regards to the continuity of the asset, the capacity to regenerate and survive in a sustainable conscious manner (Pereira Roders 2007).

Table 1: The cultural values (ICOMOS Australia, 1999; Manson, 2002; Pereira Roders, 2007; English Heritage, 2008)

PRIMARY VALUES	SECONDARY VALUES	REFERENCES
	SOCIAL	Spiritual
Emotional, individual		memory and personal life experiences;
Emotional, collective		notions related with cultural identity, motivation and pride, sense of “place attachment” and communal value.
Allegorical		objects/places representative of some social hierarchy/status;
ECONOMIC	Use	the function and utility of the asset, original or attributed;
	Non-use	the asset’s expired function, which has its value on the past, and should be remained by its (material) existence, option (to make some use of it or not) and bequest value (for future generations);
	Entertainment	the role that might be have for contemporaneous market, mainly for tourism industry;
POLITICAL	Allegorical	oriented to publicizing financially property;
	Educational	the education role that heritage assets may play, using it for political targets (e. g. birth-nations myths, glorification of political leaders, etc.);
	Management	made part of strategies and policies (past or present);
	Entertainment	part of strategies for dissemination of cultural awareness, explored for political targets;
HISTORIC	Symbolic	emblematic, power, authority and prosperous perceptions stem from the heritage asset;
	Educational	heritage asset as a potential to gain knowledge about the past in the future;
	Historic-artistic	quality of an object to be part of a few or unique testimonial of historic stylistic or artistic movements, which are now part of the history;
	Historic-conceptual	quality of an object to be part of a few or unique testimonial that retains conceptual signs (architectural, urban planning, etc.), which are now part of history;
	Symbolic	fact that the object has been part/related with an important event in the past;
AESTHETICAL	Archaeological	connected with Ancient civilizations;
	Artistic	original product of creativity and imagination;
	Notable	product of a creator, holding his signature;
	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
SCIENTIFIC	Evidential	authentic exemplar of a decade, part of the History of Art or Architecture;
	Workmanship	original result of human labour, craftsmanship;
	Technological	skillfulness on techniques and materials, representing an outstanding quality of work;
AGE	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
	Workmanship	craftsmanship value oriented towards the production period;
	Maturity	piece of memory, reflecting the passage/lives of past generations;
ECOLOGICAL	Existential	marks of the time passage (patine) presents on the forms, components and materials;
	Spiritual	harmony between the building and its environment (natural and artificial);
	Essential	identification of ecological ideologies on its design and construction;
	Existential	manufactured resources which can either be reused, reprocessed or recycled;

METHOD TO ASSIST HERITAGE (IMPACT) ASSESSMENTS

The method described in this article progresses from the explained surveys on the international documents to identify the values reflected in the arguments to sustain the protection and conservation of cultural heritage assets, as well as, on the design process for rehabilitation projects, where through the comparison between the results from the pre-design and design stages, one could systematically determine the impact of such project on the significance of such assets (Pereira Roders, 2007).

So far, this assessment has had three distinctive stages of evolution, towards broadening on the sources of data, objectivity and role of the surveyor on the heritage impact assessment process. In general terms, all three stages of evolution included the highlighting and categorizing of arguments used to justify the significance of the cultural heritage assets or their protection and conservation. The list of cultural values and their description (table 1) was prepared to guide the identification of the eight primary values (Tarrafa Silva & Pereira Roders 2010).

Stage 1: Relation between documents

The data sources from stage 1 were mainly documentary. Meaning that the eight primary values have been identified by following a process of content analysis and subsequent coding on the most relevant documentation produced during the nomination and protection stages of the OUV-based management process (Pereira Roders and Van Oers 2010), such as the decision reports resulting from the annual UNESCO Sessions of the World Heritage Committee, the Nomination files, the Advisory Body evaluation reports, the periodic and reactive monitoring reports, as well as, the national and local policies.

A comparison was made with the results achieved when surveying the selection criteria from the results achieved in each one of the documents in order to understand how far the documents would reflect an understanding of the values reflected on the selection criteria chosen to justify the nomination of these particular assets. Concerning data analysis, two different approaches were undertaken – direct and indirect – distinguished by method, but making use of the same primary values.

The method used for the direct approach consisted in establishing a correlation between the primary values and the WH criteria proposed by SP, recommended by ICOMOS as Advisory body, or inscribed by WH Committee for the three Portuguese WH cities. As the cultural values were previously identified by Pereira Roders & Oers (2010b) for each selection criterion (UNESCO 2005), this approach merely concerned the direct identification of the cultural values identified for each city.

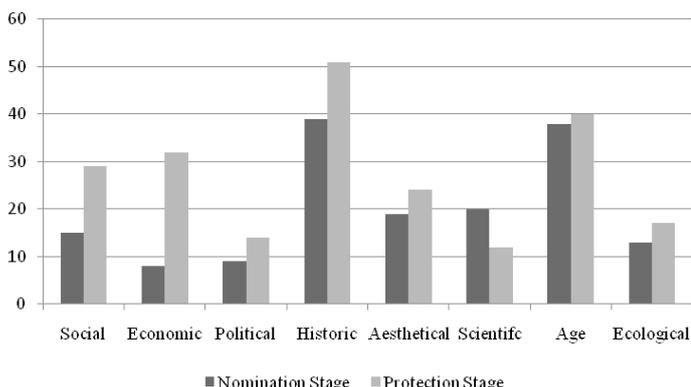


Figure 1: Indirect approach (Tarrafa da Silva and Pereira Roders, 2010)

The method used for the indirect approach revealed more complexity, once the identification of cultural values had to be done through the identification of the variables (primary values) in a wide random of documentation. Following the process of coding, all similar passages of text extracted from the documents have been marked and organized per primary values. Besides allowing “further comparison and analysis” (Gibbs and Taylor, 2005), this method also allowed to identify the broadness of primary values being mentioned and their rankings. Thus, in methodological terms the primary values were assumed as the “themes”, the secondary values as the “sub-themes”, and the quotations as the “indicators”.

Stage 2: Relation between documents and stakeholders

The data sources for stage 2 were mainly documentary and oral. The purpose was to verify the relation between what was being written (policy strategy), to the real practices and experiences of the involved stakeholders (policy implementation). Also, to cope with the difficulties on gaining access to all the relevant documentation, the surveyors would be integrated in the local conservation and/or planning team for a period of three months.

A comparison would also be made between the direct and indirect approach, as well as within the indirect approach. For a better illustration and faster perception of the results a specific colour was attributed to the primary values (Speckens et al. 2011). Respectively, social is orange, economic is purple, political is yellow, historic is pink, aesthetical is blue, scientific is red, age is dark green and ecological is light green. Moreover, such coding method has also allowed the identification of the attributes which would evidence the identified values. Figure 2 illustrates the resulting charts for two stakeholder interviews, in Willemstad, Curacao.

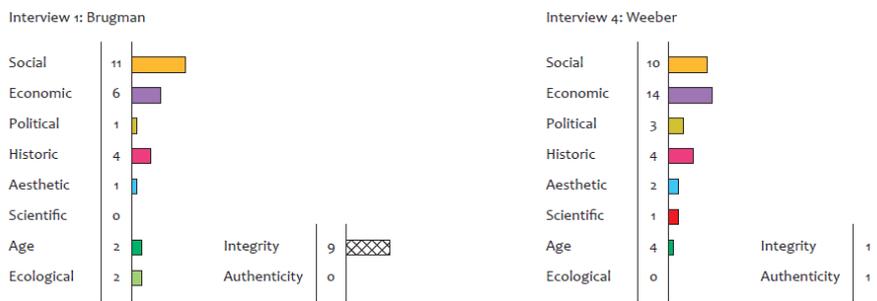


Figure 2: Oral Inventories; Brugman and Weber (Speckens 2011)

Stage 3: Relation between documents, stakeholders and the asset

The data sources for this stage were mostly documentary and physical. The surveyors have undertaken a similar research than the previous ones. Yet, there are few relevant changes which disable the direct comparison of results; but enable a more throughout understanding on the relations between the attributes, the values they convey and their nature – tangible and intangible.

Therefore, instead of counting how often the values would be mentioned, the survey has focused on understanding which exactly the “official” attributes identified were and check if those would or not be mentioned in the following documents. Those values would also reflect the values, and consequently, similar charters to the previous stages could be created. One of the advantages from this evolution, when comparing documents, is the immediate distinction between three sets of attributes: the “official” attributes in common, the attributes missing and the other attributes.

Such level of detail allows surveyors to get a general overview of the attributes and values conveyed in the cultural heritage asset. Though, it also enables further surveys to determine the authenticity and integrity of each one of the “official” attributes, based on mapping their location and evolution in time. Figure 3 illustrates the resulting charts from the comparison between the Advisory Body Evaluation report (ICOMOS 1988) and Development plan for Galle urban development area 2008-2025, Sri Lanka (UDA 2008).

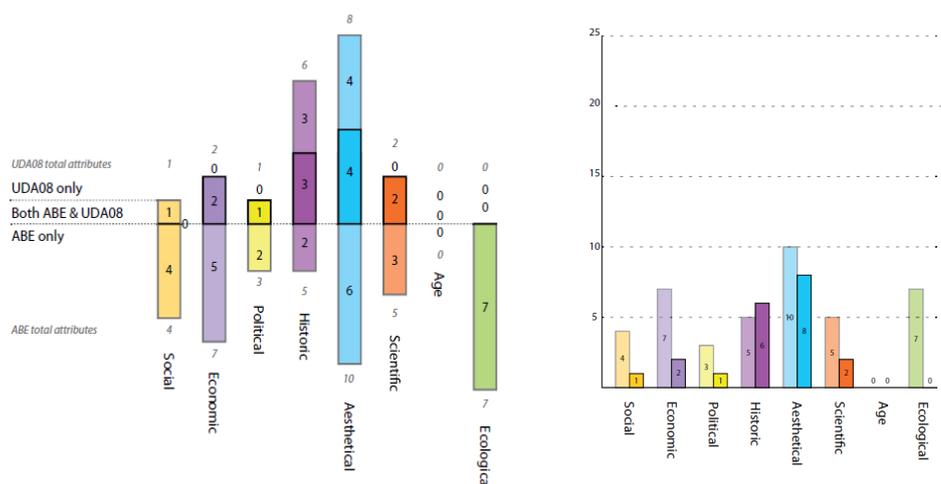


Figure 3: Documentary inventories; Advisory Body Evaluation and Development plan for Galle urban development area 2008-2025 (Boxem and Fuhren, 2011)

RESULTS AND DISCUSSION

The case-studies and its results have been used to draft a preliminary SWOT analysis, allowing future improvements to be implemented on following stages. The advantages of these method lay on the fact that the primary values are perfectly defined

and described (without losing its dynamic nature, as they can always be improved and added). That enables different users, even without familiarized with the context (outsiders) to be able to execute cultural significance assessments. Moreover, this list can increase the awareness of the site managers regarding to the variety of cultural values that can be conveyed by the cultural heritage assets they are entitled to manage, determine the adequacy of their current strategies and help them define further strategies towards a better protection. Also, the coding process would assist the cultural managers into synthesize information and make it countable, opening possibilities for comparative analysis (Gibbs and Taylor 2005) between different documents or assets.

Nonetheless, several weaknesses were also identified, mainly regarding to the permanence of the subjectivity, which limits yet, for instance, the comparison between the results obtained by different surveyors, and consequently its validation. Therefore the inexistence of an original terminology can result into the misunderstanding of the results.

As opportunities, this method has been proven so far to work as a key tool to support facility management on their tasks related to monitoring and assessing the impact of potential changes on the cultural heritage assets under their safeguard. By assisting them into the cultural significance assessment practices, by resumming and converting extensive data into more useful, reliable and adequate information, this method will help them to faster opt for evidenced-based decision making and improve the conservation and urban management plans accordingly, such as the EIAs.

Simultaneously, the tendentious obsession for quantitative data, mostly economic-oriented, by facility managers and the consequent lack of understanding for the need to merge both quantitative and qualitative data, as well as, considering a broader nature of values and their indicators might weaken both method and cultural significance of the cultural heritage assets, as the practice to assess the impact of strategies and decisions on these assets is still underdeveloped when compared with other assessments. Also, cultural significance will always remain naturally subjective (Hodder 2000) and interpretative, as regards no more than what assets society values as significant to be protected for future generations. It will keep on varying in time and per individual.

CONCLUSIONS AND RECOMMENDATIONS

As explained along the article, this method to assist heritage (impact) assessments has had three distinctive stages of evolution, towards broadening on the sources of data, objectivity and role of the surveyor on the heritage impact assessment process. Such evolution has been proven useful and beneficial to the outcome of the surveys.

The method, application and validation presented in this article can be very useful to facility managers dedicated to cultural heritage management, policy makers who regulate cultural heritage protection and planning processes, and technical experts performing heritage (impact) assessments. Besides raising awareness for heritage (impact) assessments, this method also expects to contribute to the increase of cultural heritage management practices that enhance cultural heritage and in turn enable the contribution of cultural heritage assets to the sustainable development of present and future generations.

Still, there is still much to improve. One recommendation would be to distinguish referenced from the assumed values, as well as, to identify values and attributes apart. This will result into a better understanding on the relation between attributes and values; e.g. the relation between attributes conveying varied values, as well as, values of similar natures conveyed in varied attributes. Moreover, by dethatching the attributes from the values; the attributes may raise on objectivity as no other than referenced attributes shall be considered in the survey. Thus, that would mitigate the bias of reaching different results by surveyors performing the same method.

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SIMULATIONS OF DESIGN MODIFICATIONS IN MILITARY HEALTH FACILITIES

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The United States Military Health System (MHS) facility inventory is aging and requires extensive facility management, renovations and replacement to maintain the environment of a high quality of care. Recent developments in sustainability and evidence-based design (EBD) have created additional requirements for the design and construction of facilities. Existing facilities in the MHS have been directed to undergo restoration and modernization by the U.S. Department of Defense (DoD). Hospital buildings are recognized as one of the highest energy intensity facilities out of all commercial building types, mainly due to the evolution of the deep-plan hospital. Within this scope, the design of the building envelope is the most lasting feature affecting the energy use of a hospital, as its service-life typically equaling the life of the facility. This study aims to quantify the impact of changes in building form to the building's energy consumption in two extreme climate zones—extreme hot and extreme cold weather conditions. For this purpose, four major EBD features were selected based on literature recommendations, and energy simulations were conducted for each of these four features. The study demonstrates the relationship between incorporating positive building occupant features, such as increased daylighting and views of nature, and efficient energy design choices.

Keywords: energy, facility management, green buildings, health, modelling

INTRODUCTION

Sustainability of energy resources is an important topic of global discussion. The United States consumes more energy per capita than any other nation. Within the U.S., the built environment consumes more energy resources than either the transportation or industrial sectors (U.S. EIA 2009a). Within the built environment are the commercial and residential sectors, where healthcare is a building typology within the commercial sector which although only occupying 4% of commercial built space, it accounts for 9% of commercial building energy consumption (U.S. EIA 2004). Sustainability efforts at state and national levels are targeting this large consumer with rigorous building codes and elevated standards of energy efficiency. The U.S. military health system (MHS) is undergoing significant capital investment in its healthcare facilities, as the MHS inventory is aging and in need of modernization.

The hospital building type consumes more energy per unit area than most any other type of commercial building type (U.S. EIA 2004). The hospital building typology is expected to undergo a growth trend. The national inventory of healthcare facilities is not sufficient to support the growing needs of the baby boom generation. The aging population utilizes inpatient services at a much higher rate than those younger, and 50% of the U.S. healthcare expenditures are spent on the current senior population (Bridgers et al. 2005). This need is only exaggerated by the advances in medicine which are lengthening the average lifespan of an American. The over-65 demographic is becoming a larger portion of the population, which is also the main portion of the population which utilizes the most inpatient and other healthcare services.

There is a movement in architectural design called evidence-based design (EBD) which focuses on applying research methods to the implementation of design features (Hamilton and Watkins, 2009). The design features which are shown to enhance the function of a space are quantitatively measured. The purpose of this movement is to provide additional rigor to the design process in disciplines other than the traditional engineering and business areas of influence. The intent is to achieve the best patient outcomes while using the most current research data in order to identify design features which directly support excellence in healthcare. EBD measures of performance within the healthcare realm focus on patient outcomes as well as hospital staff efficiency (Zimring et al. 2008). The MHS has embraced the concepts of EBD and is incorporating the principles into their design process.

Daylighting design and hospital staff efficiencies are reversing some of the trends of hospital design. With the development of

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technologies such as heating, ventilation and air-conditioning (HVAC) and lighting systems, hospitals have progressively become deep-plan buildings (Guenther and Vittori 2008), evolution which is mainly due to the lessened reliance on exterior windows for ventilation and lighting. The reintroduced concepts of patient and staff benefits from additional access to daylighting and other features will lead to hospitals with shallow plans and more exterior wall area.

The change in design of hospitals does not wholly align with the goal of energy sustainability in future designs. The elongation of building forms has the potential to increase heating/cooling loads on buildings which will be designed to more stringent energy codes (ASHRAE 2009a). The gains from the superior provision of healthcare are expected to lead to a higher throughput of patients and therefore energy efficiency gains in a “per patient” as opposed to a “per unit” area basis. Exactly how the introduction of these design features will impact the operation and energy consumption of hospitals has not been discussed in literature to date.

The EBD design measures being implemented in design are targeting the large portion of healthcare costs that can be categorized as patient and personnel. Whereby, energy consumption is a very small portion, only 6%, of the entire model of healthcare operation costs (Dell’Isola and Kirk 2003). Sustainability in the field of architecture is a movement that transcends the advances that can be made during the design and construction phases of a building. Buildings, such as hospitals, exist and remain in operation for many times longer than the short duration of initial construction. Hospitals can remain in service for as long as one hundred years. The costs of operating a facility during its service life can be mitigated by smarter investments during its design and construction. The most identifiable opportunity for savings is energy usage in the built environment. Sustainable buildings are designed to use less energy to support the same space as in a previous structure, by improving building systems and looking at a design holistically.

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) have authored the most widely used standard energy code. The ASHRAE 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings, underwent large changes to address the new federal legislation requiring improvements in energy performance in buildings. A major objective of the ASHRAE 90.1-2010 Standard is to achieve a 30% improvement in energy consumption over the 2004 energy standard. This standard has been referenced in numerous state and local governmental regulations and will become a major characteristic of federal construction projects.

RESEARCH METHODS

The research methods conducted in this study included the following:

1. Selection of EBD features that are supported by research findings and impact the building envelope construction. This was conducted by reviewing the existing literature on EBD, and categorizing it into the following five MHS categories: (1) Create a patient and family-centered environment that respects privacy and dignity and relieves suffering; (2) Improve the quality and safety of healthcare delivery; (3) Support care of the whole person, enhanced by contact with nature and positive distractions; (4) Create a positive work environment through ergonomics, efficiencies, lighting, and adjacencies; and (5) Design for maximum standardization and future flexibility and growth (Malone et al. 2007; Casscells et al. 2009)
2. Assessment of current United States Army hospital characteristics. The continental U.S. Army military hospitals were collected into a matrix with their characteristics, including: year of construction; square footage; hospital bed capacity; Department of Energy (DoE) climate zone (ASHRAE 2009b); and Energy usage intensity (EUI).
3. Simplified energy simulations of selected EBD features. This was accomplished using simplified building forms that represent portions or simple rudimentary designs. These simple forms were based on a visual survey of actual military hospitals and recognizing the basic shapes that are repeated throughout designs. The process of creating alternatives and then conducting analyses of energy performance and using it to drive the future design concepts was investigated. The major concepts and rules of thumb that are described in the literature search are applied to simple models to demonstrate the concepts in practical use.
4. Simulation of energy consumption of selected case-study facilities. Existing typical floor plans of two military hospital facilities were selected for the modelling and comparative analysis. The number of case studies was limited by the expected amount of effort (time and resources) for each case study by the researcher, as well as the intent to provide insight from various climate zones, facility sizes, and ages of facilities. The two hospitals selected for the case-studies are located in Alaska and in Texas, and therefore, represent extreme weather conditions.

FINDINGS

EBD FEATURES WHICH AFFECT BUILDING ENVELOPE CONSTRUCTION

The selection of design features to study was accomplished by a review of available literature and research in the field of hospital design. The current literature describes numerous design features related to improving healthcare performance measures. Using the framework established by Malone et al. (2007), design features can be categorized by their improvements to the environment in the following areas: patient and family-centered healthcare; quality and safety of healthcare; holistic individual care, including access to nature; staff work environment; and standardization and flexibility.

The existing literature discusses the multitude of design aspects which can affect these areas in a positive manner; however not all of these features would be expected to actually alter the structure and/or layout of the building. The many features discussed affect finish materials, furniture and equipment selection (FF&E), and otherwise the operational aspects of healthcare. The focus of this research is those features which will alter the shape and exterior characteristics of hospital construction.

There were 46 design features identified, of which 8 were assessed to affect the construction of the building envelope. These 8 features were: (1) Large single-bed rooms with family zones; (2) Maximize natural light throughout the building; (3) Operable windows in patient rooms; (4) Windows in staff break rooms; (5) Patient controls for light, glare and temperature; (6) Decentralized inpatient nursing support (alcoves near beds); (7) Providing secure access to nature and views (larger windows, gardens, roof gardens, internal courtyards); and (8) Decentralized staff support spaces (e.g. supplies and charting areas).

ASSESSMENT OF CURRENT U.S. ARMY HOSPITAL CHARACTERISTICS

The United States Army currently has 30 hospitals located within the continental United States. The following characteristics of these healthcare facilities were assessed: gross floor area; year of construction; climate zone location; hospital bed capacity; patient density (area per bed); energy usage intensity (EUI); perimeter; number of floors; building shape; and ratio of wall area to floor area.

The hospitals assessed range in size from approximately 64,000 to 2.6 million square feet (6,000 to 240,000 square meters) with the average area at 487,000 square feet (45,200 square meters). The facilities range in age from 54 years to 4 years (built between 1957 and 2007), with an average age of 36 years old. The hospitals' locations were plotted in the Department of Energy (DoE) eight climate zones of the United States. Almost three quarters of the hospitals fell within climate zone 3 and 4, with representation in all but climate zone 7.

The hospitals ranged in capacity from as little as 0 to as many as 236 patient beds, with an average capacity of 71 patient beds. Their energy usage intensity was not determined for all of the facilities due to a lack of data; however for the 12 facilities that had historical data it showed an average EUI of 184,000 BTU per square foot per year (equivalent to almost 2 million BTU per square meter per year).

The perimeter distances and the number of floors were recorded for each facility and used to calculate approximate exterior wall areas. The ratio of the exterior wall area of a facility to its gross floor area was determined using these factors. The facility exterior wall to floor area ratios range from 0.22 to 0.69 with an average ratio of 0.34. The hospitals were categorized in broad categories of shapes based off of visual assessment as rectilinear, L-shaped, and cross-shaped. The majority of the hospitals were grouped as deep-plan rectilinear buildings.

SIMPLIFIED ENERGY SIMULATIONS OF SELECTED EBD FEATURES

The simulation modelling process can become extremely long when using complex building designs. A series of energy simulations was performed using simplified design shapes to demonstrate the iterative changes in energy consumption for each modification of the design. Two baseline models were made of a square floor plan of 100,000 square foot sample space (9,300 square meters). The two models were simulated using location and weather data from two climate zones.

Figure 1 describes the overview of the phases of the simulation methodology. The benchmarking phase set the foundation for the rest of the simulations by creating benchmark models to compare subsequent modified designs to. The simple simulations were composed using the quick energy simulation tool (software) (eQUEST) energy simulation software and compliance with the guidance within recent ASHRAE 90.1-2010.

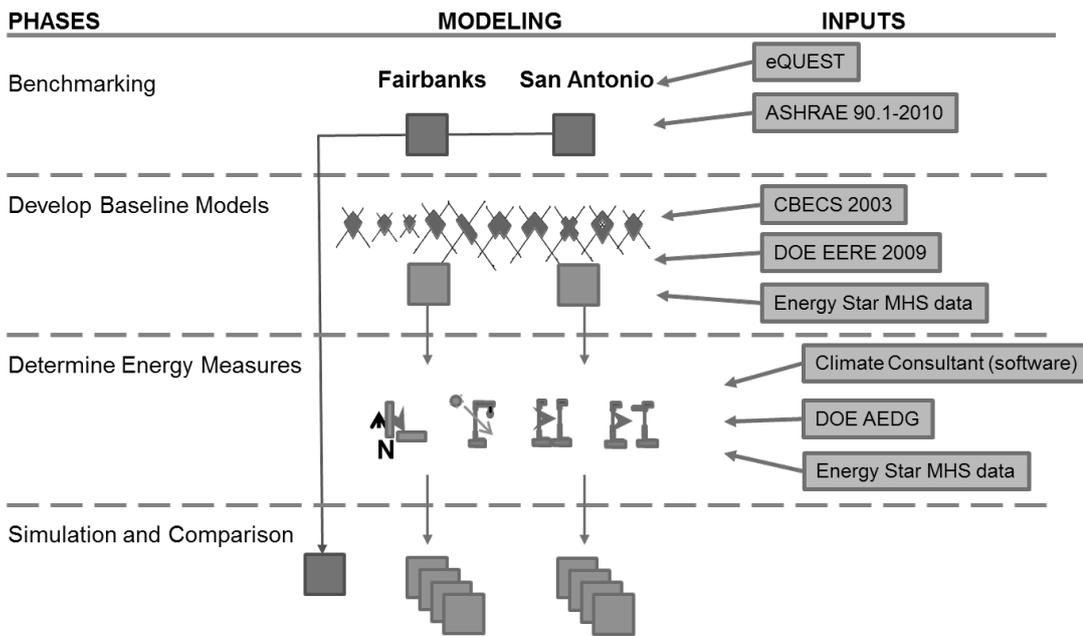


Figure 1: Diagram of the simulation modelling process

In the develop baseline models phase, simple simulations were composed using eQUEST energy simulation software and data and code inputs from Department of Energy (DoE) commercial building energy consumption surveys (CBECS) (U.S. EIA 2004). The baseline square model and 9 variations of shapes were simulated for each climate zone.

The determine energy measures phase, utilized existing research based design recommendations into the simulations. Energy design measures (EDMs) used in the research were: Orientation and elongation of plans according to their climatic location; Daylighting control systems; Limitations on ratio of window area to exterior wall area; and Exterior window overhanging shading devices. These design measures were selected from previous research in Climate Consultant software (Milne et al. 2007) and the ASHRAE Advanced Energy Design Guides for hospitals (ASHRAE 2009a).

The final modelling phase of simulation and comparison was the aggregation of the multiple simulations into tables in order to compare the results of each design modification. Figure 3 compares the energy intensity of the benchmark model against the baseline model and its 9 variations in floor plan. The shapes to the left of the solid bar are all single floor plans with rectilinear, L-shaped and X-shaped plans. The plans to the right of the solid bar are multi-floor plans, two and three storeys.

Figure 2 is an example of the many stacked bar graphs used which allowed the comparison of the types of energy consumption, such as lighting, heating, cooling or equipment. In the energy models, the only categories of energy consumption affected by the envelope changes were the space heating, ventilation fans, and space cooling. These categories in aggregate are 43% of the overall energy consumed in the baseline model. The “geometric ratio” as presented by Gilg and Valentine (2004) is validated by the increases in energy intensity in models with larger surface areas.

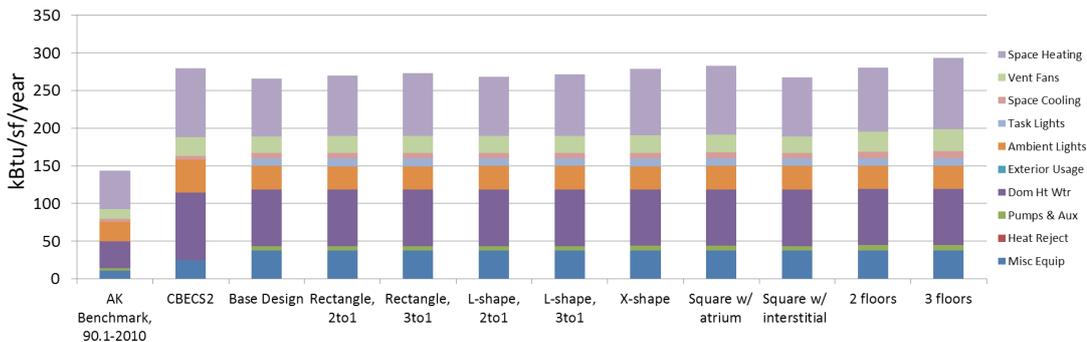


Figure 2: Comparison of Shapes w/all Energy Design Measures, Climate Zone-8

SIMULATION OF ENERGY CONSUMPTION OF SELECTED CASE-STUDY FACILITIES

The final study of two hospital facilities was conducted with the selection of two buildings in the U.S. Army inventory. The first facility was recently constructed in DoE climate zone 8, an extreme cold environment, and it is a relatively small facility with less than 270,000 square feet of space (25,000 square meters). The second facility, a medical center, was built within the last 20 years, in climate zone 2, a hot and humid environment, and is one of the largest in the inventory with more than 1.3 million square feet of space (over 120,000 square meters). It was expected that by selecting such different cases, the findings would offer a larger breadth of application.

The case study of these two selected facilities validated the design modifications tested in the simple models. The use of elongation and orientation to the sun, daylighting controls, limitation of window area to 40% or exterior wall area, and overhanging shade devices were all simulated. Each design measure was cumulatively added to the simulation to demonstrate the interaction of the modifications with each other.

Figure 3 shows the simulation results for the case-study facility in an extreme cold climate. The stacked bar graph shows the simulation results in energy intensity units, kBtu per square foot per year. The figure displays the graphic comparison of the following (from left to right): ASHRAE 90.1-2010 benchmark simulation model standard; the CBECS reported consumption of surveyed facilities of this type; baseline model consumption; and design modifications of orientation of the facility to the south, daylighting controls, limitation of window area to 40% of exterior wall, and overhanging shading devices.

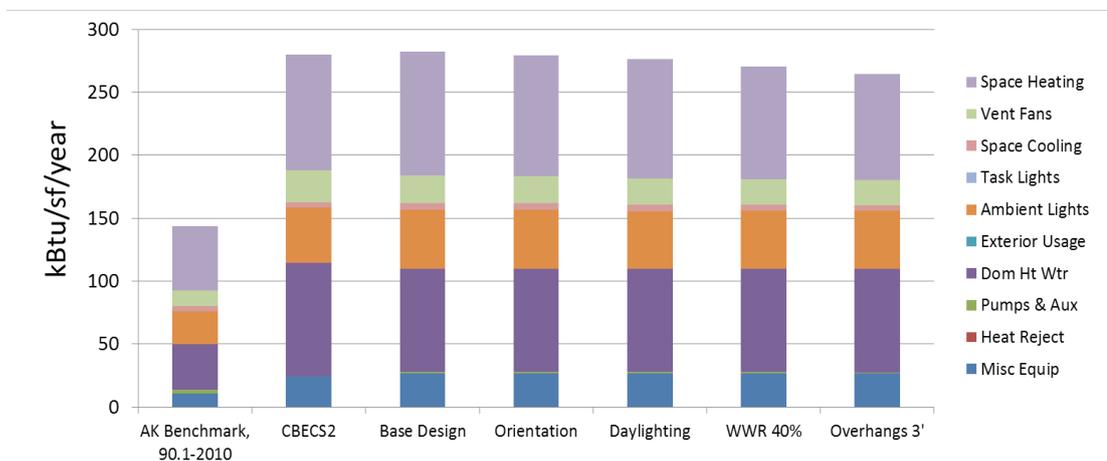


Figure 3: Energy Consumption of Hospital with EDMs, Climate Zone-8

CONCLUSIONS

Future design of healthcare facilities will take into account the potential operational savings in innovative layouts. Additionally, designers will incorporate design measures based on research findings that improve patient outcomes and ultimately the efficiency of the healthcare system. Some of these evidence-based design measures, such as daylighting and improvements in distributed logistics and administration, have the potential to increase other facility operations costs, such as energy. This research investigated the size of these increased facility operations resources, specifically the changes in energy consumption. The changes in energy consumption are minor as compared to the scale of the targeted savings in healthcare operations costs from implementing the measures.

The overall trend in energy consumption is that the more window area that a facility has the more heat transfer occurs and therefore the heating/cooling loads are increased. The overall trend in EBD is that the more windowed areas the better the patient outcomes, staff satisfaction, which consequently makes for a better facility. The conclusion is that future hospitals will have more windows and therefore the windows need to perform better to meet the requirements of the space. The authors anticipate increased window areas in future designs. The construction of window systems are constantly improving, and using state of the art systems in hospitals will be not only appropriate, but mandatory.

The general finding of this study is that the design features of EBD will result in hospital buildings that are shaped less efficiently

from an energy sustainability standpoint. Hospitals designed using EBD features will have shapes that are more energy intensive than existing facilities. The building shape however has been shown to have a somewhat minimal impact on the overall energy intensity of the building when compared to the mechanical systems and internal loads of a hospital. The simulations focused on the building envelope and therefore the heating, cooling and ventilation equipment consumption became the focus of this study; however these categories of consumption were only about 40% of the overall building's usage. This study while not directly addressing these other categories, illustrates the major opportunities for energy savings in the mechanical systems, the remaining 60%.

Architects designing future hospitals should partner early with other professionals to achieve EBD and sustainability goals. Collaboration with other professionals that are not typically involved early on or not at all in the design process will generate new designs to the challenges presented (Kiss 2011).

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FACILITY MANAGEMENT AND CORPORATE MOBILITY MANAGEMENT – A CASE STUDY

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Facility management is in a unique position to implement environmental sustainability and champion green operations for end-user organisations by providing sustainable services for the built environment. Regarding an end-user organization, commuting is also a major climate emissions producer in addition to the building itself. However, there seems to be no commonly accepted operator to manage the climate impacts from commuting. Corporate mobility management is a concept that can promote sustainable commuting. The aim of this study is to present a way for developing corporate mobility management and to show what benefits it can bring organizations. The purpose is also to show the potential role the facility manager may have in the process. The process is described as a case study. The results show that the illustrated operating model can be considered as a valid method for a green commuter plan. Facility management can be perceived as a vital operator in succeeding in this process, even though implementing the plan is not only the facility management's responsibility.

Keywords: green commuter plan, corporate mobility management

INTRODUCTION

Traditionally, the concept of facility management has been defined as a provider of narrowly defined variety of functional tasks that are delivered in a routinely manner to meet a specific requirement. However, facility management has changed to a more integrated management approach which acknowledges its role as a significant element of the whole corporate goal achievement (Pathirage et al. 2008).

As sustainability and environmental protection have gained enormous attention around the world, also the built environment sector has awakened to the potential it has in the fight against the climate change. When the built environment accounts for roughly 40% of the energy consumption and the consequent carbon emissions in Europe (UNEP 2007) and the US (USGBC 2010), the opportunities are evident. Sustainable or "green" facility management is a practice that has developed during recent years in response to the need for sustainable services for the built environment. Studies have shown that facility management is in a unique position to implement environmental sustainability and champion green operations (Hodges 2005; Roper and Beard 2006).

In addition to the built environment, the traffic sector also has a significant environmental impact. In Finland traffic accounts for 17% of the energy consumption and causes 19% of the greenhouse gases (ERA17 2010). A majority of these environmental impacts are caused by road traffic, which accounted for 91% of the Finnish traffic related energy consumption in 2005 (Statistics Finland 2006). The Finnish Ministry of Transport and Communications (2006) show that 18% of all traffic in Finland is work related, and that 79% of the work related traffic is carried out by car. Hence, workplaces can be interpreted as significant traffic generators. However, commuting is often neglected as a managerial task and related issues are dealt with at a problem solving level.

Facility management can support end-user organizations in their efforts to minimize their total environmental impact (Kyrö et al. 2010). Furthermore, facility management has been recognized as having a significant role in green building indicators and the environmental performance of buildings. As commuting is also a part of most green building rating systems (e.g. LEED and BREEAM), and commuting in the USA can use up to 30% more or even twice as much energy than the office building itself (Wilson and Navaro 2007), why should not the facility manager take the challenge of improving the efficiency of commuting traffic?

The aim of this study is to present a way to develop a mobility management plan and show what benefits it can bring to an organization. The purpose is also to show the potential role the facility manager can have in the process. The process is described as a case study. The case is an IT service company developing a corporate commuting plan in Finland.

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LITERATURE REVIEW

MOBILITY MANAGEMENT

There has been a sense of direction in Europe since the 1960's to develop public transport and cycling paths as an alternative mode of transport for car use. Mobility management has become a concept to manage this effort, and it is promoting sustainable transport. The primary intention of mobility management is not to offer additional transport services, but to satisfy the transport demand in a sustainable way by employing the existing infrastructure (YTV 2002). Consequently, mobility management is perceived as an encouraging effort to promote alternative transport and to reduce conventional car use. Mobility management should motivate people to use alternative transport, however, it should not restrict anyone's possibility to use any chosen method of transport (Vähä-Rahka and Virrankoski 2002). The aim is therefore to above all reduce private car use and to increase environmentally and socially sustainable modes of transport, such as walking, cycling, public transport, car-pooling and reasonable driving. These alternative transport modes are considered as beneficial, environmentally friendly and economical (Motiva 2010).

The employer can also apply mobility management to brace sustainable commuting at the workplace. Corporate mobility management (CMM) focuses generally on the employees' commuting and the corporate-specific car policy (Pöllänen et al. 2003). CMM strives to influence the employees' daily transport need and commuting modes.

Even though commuting can account for one of the largest parts of a company's environmental impact, it is seldom acknowledged in environmental programmes. In order to efficiently manage commuting and to gain both environmental and personnel related benefits, CMM should be incorporated in an environmental programme (Pöllänen et al. 2003).

FACILITY MANAGEMENT

Studies related to commuting in connection to facility management seem to focus on commuting related stress. Research (Cassidy 1992) has suggested that commuting is a source of stress in itself and also interferes in other aspects of life. Indicated effects are increased general stress levels, increased stress at home and at work, decreased life satisfaction and a disruption of social, leisure and home life. The point of departure for facility management has been that commuting creates uncertainty for organizations and can result in positive or negative outcomes (McLennan and Bennetts 2003). There are limited opportunities for facility managers to impact the experience of the journey to work. Some suggestions for this are managing the car parking at the site and extending the workplace to public transportation. From the organization perspective, car use and driving are time wasters, as no other productive activities can be achieved while driving (Dapson 2000), which provides further incentives for organizations to fully consider all the aspects of commuting.

A previous study has also shown that facility managers can promote teleworking in organizations (Karnowski and White 2002). Facility managers have been challenged to adapt new ways of working, like teleworking, and to address the changing work environment requirements (Harmon-Vaughan 1995).

A FRAMEWORK FOR DEVELOPING A CORPORATE MOBILITY MANAGEMENT PLAN

There are many single actions an employer can take in order to promote alternative commuting. These activities can be linked for example to economic or company car policies. These directing methods are usually managed in a company-specific green commuter plan (GCP), also known as corporate mobility management plan. The GCP is a tailor made plan for CMM and for improving sustainable transport and traffic safety.

Pöllänen et al. (2003) introduces an operating model for developing and maintaining CMM. This operating model can be described as a six-phase process that proceeds from identifying the needs carries on to monitoring the commuting environment (Figure 1). At the first phase, identifying the needs is a prerequisite for developing CMM. The needs can refer to some perceived problems in commuting or to legislation guidelines. In addition, the needs can also arise from the company's own environmental management principles or from the employees. (Pöllänen et al. 2003; Sinisalo 2006.)

The current commuting situation is assessed and mapped in the second phase. The facilities are reviewed and an occupant commute survey is conducted for reliable analyses and for setting realistic goals to the programme. The intention of this process is to get explicit information about the commuting distribution and behaviour (Pöllänen et al. 2003). In addition, the possible obstacles or reasons for using certain transport modes are identified (Sinisalo 2006). At this stage, mapping the environmental characteristics of commuting is done as well, and gathering additional information can be done through different surveys, meetings and interviews. For example, the prevailing attitudes towards commuting can be identified by conducting an attitudinal survey (Pöllänen et al. 2003).

Setting the goals for the programme is traditionally a managerial task, in which goals can be set for commuting safety, environmental impacts, energy consumption or other commuting related practices. It is essential that the organisation is fully committed and adequate resources are directed for achieving the goals (Pöllänen et al. 2003). These goals can be divided into primary goals and sub-goals (Sinisalo 2006). For example, CMM can be linked to a health and well-being programme, and the primary goal can be set for maintaining a healthy working environment as the sub-goal is to increase walking and biking as a commuting mode.

There is not a general set of actions that should be taken in successful CMM or to achieve the set goals. The company-specific activities are always carefully chosen and planned according to the desired result. The actions are evaluated according to their applicability, feasibility and influence on commuting. This set of actions is then co-ordinated in the tailored GCP. The schedule for the chosen actions, the persons in charge and the execution is determined in the GCP. It is also important to implement appropriate communicational and marketing channels for the GCP. (Pöllänen et al. 2003; Sinisalo 2006.) The execution of the actions adhere the detailed GCP. CMM is coordinated by the person or persons in charge, and informing the occupants beforehand about the possible changes is important to ensure motivation and for avoiding conflicts. A phased execution of the GCP is recommended and education might be needed for adapting the programme (Pöllänen et al. 2003).

As the final phase of implementing CMM, follow-up will monitor the commuting and assess the consequences of the chosen actions. The follow-up can be compared to the mapping phase, as it assesses the commuting behaviour and problems as well. New possibilities and needs are constantly mapped at the follow-up phase, and feedback is considered as a good tool for this. Feedback should also be given to the occupants.

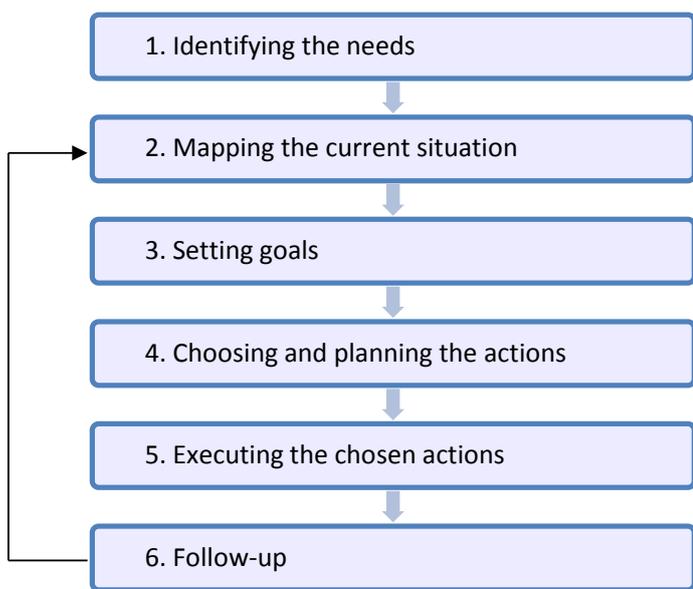


Figure 1: The operating model for creating and maintaining CMM (Pöllänen et al. 2003, p. 89)

RESEARCH APPROACH AND METHODOLOGY

This study comprises a literature review as well as empirical data from the case company. A literature review of mobility management practices and telecommuting studies was performed in order to identify the connection to facility management and the best practices for corporate mobility management.

The case study was used to test the CMM plan development in authentic settings. The case study was chosen as it is an “empirical investigation into contemporary phenomenon operating in a real-life context” (Yin 1994). The approach chosen to develop the corporate commuting plan was South Coast Air Quality Management District (SCAQMD) Rule 2202 On-road Motor Vehicle Mitigation Options (SCAQMD 2005). SCAQMD is an air pollution control agency and provides extensive guidance on collecting information about workers’ commuting behaviour. SCAQMD methodology is also approved for use in the LEED rating system.

According to the guidelines, every regular building occupant was asked to complete an occupant commute survey. The SCAQMD survey methodology suggests a response rate of at least 60%. The survey data was collected from five consecutive workdays, from Monday the 25th of January to Friday the 29th of January of 2010. This period reflects a typical work week, without any seasonal holidays. The conducted survey identifies the transportation modes from the survey period. The respondents chose a transportation mode for both arrival to the worksite and for departure from the worksite. This will result as accurate data and knowledge of the transportation modes. In addition for indicating the transportation modes, the employees had the possibility to suggest transportation improvements in the survey questionnaire.

The survey data can be used for calculating different commuting indicators, such as the Average Vehicle Ridership (AVR), and the commute statistics will help the company in improving their Employee Commute Reduction Program. The AVR will be calculated as advised, and based on the data obtained from the AQMD approved survey method.

The survey was carried out both as a printed questionnaire form and as an inquiry on the in-house intranet. To identify the personnel and to prevent double-counting the questionnaire asked for the name of the respondent along with the postal code and the expected length of the commute trip.

THE PROCESS DESCRIPTION

THE CASE COMPANY

The case company in this study is a socially and environmentally responsible company in the information technology industry. The company strives to reduce its premises' environmental impact and energy consumption. In the environmental impact evaluation process commuting was recognized as a significant factor, and therefore it was taken into a closer consideration.

The CMM process began with identifying the needs. At this stage the needs were identified from the company's environmental management policy perspective. There had not been a CMM plan before and identifying specific commuter related needs was therefore difficult. The commuting issues had previously been resolved case by case and only the lack of parking spaces could be seen as causing commuter-specific needs. Hence, resolving the lack of parking spaces and diminishing the environmental impact of commuting were set as general goals at this stage.

MAPPING THE COMMUTING CIRCUMSTANCES

Mapping the current commuting circumstances started off with assessing the office location and the commuting facilities. The assessment revealed that the location of the case company was easily achievable by car users and thus car use was common and the car park in heavy use. The location did also provide easy access by bus, as bus routes from the premises cover a broad range of connections through the Helsinki metropolitan area (see Table 1)

Table 1: Company and building parameters

COMPANY & BUILDING PARAMETERS	VALUE
Location	Espoo, Southern Finland (Northern Europe)
Employees	656
Parking spaces	450 (350 outdoor and 100 indoor parking spaces) Several outdoor bicycle parking spaces
Company cars	349
Dedicated parking	Only for visitors and handicapped
Public transport	4 bus stops within 100 m covering 12 bus routes 2 bus stops within 800m covering 26 bus routes
Other traffic connections	Pedestrian and bicycle paths
Changing rooms	3

The commuting was mapped using the SCAQMD occupant survey methodology, and the results were used for calculating the reduction in conventional commuting trips as well as for developing a Green Commuter Plan. To address self-selection bias, every regular building occupant was asked to complete the survey and the commuting behaviour was not extrapolated for the non-

respondents. The intention of the survey was to discover ways to reduce the environmental impacts of the commute trips made to and from the office building. The occupant commute survey results demonstrate how the green commuter plan could affect and reduce single occupant commute trips and increase alternative transportation. Alternative transportation methods include among others: telecommuting, compressed workweeks, public transport, walking, biking and car-pools.

The Occupant Commute Survey achieved a 75% response rate. According to the responses, most of the commute trips were made by driving a private car and the survey showed a 58% rate of private car use commuting. Because the responses were not extrapolated for the non-respondents and the non-respondents were assumed to commute alone by driving a car, the private car use rate used in the analyses was 68% (Figure 2). This assumption does have an impact on the total distribution and on other commuting analyses. According to this assumption, the second largest commuter group was public transport users, accounting for 10% of the commuters. Due to the employer's telecommuting program, 9% of the commute trips were avoided because of the possibility to telecommute.

In order to calculate the environmental impact of commuting, the employees had to make an estimate of their commute distance. The commute distance of all employees totalled 141 000 km per week, and the majority of this was accounted for driving alone (93 000 km). The employees travelled in all 108 000 km during the survey week (assuming the non-respondents were driving a car with the same average distance as the other single car users of 20.8 km single way commute distance) and telecommuting and absence lead to avoiding 33 000 km of commuting (see Figure 2).

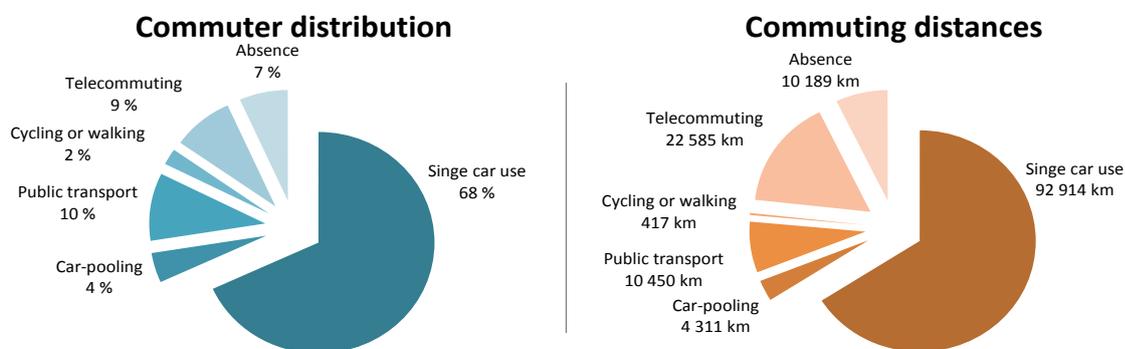


Figure 2: Commuter distribution and commuter distances when non-respondents are assumed to drive alone with the same average commuting distance as the responded single car users

Figure 2 illustrates that changing the current company cars to more environmental friendly vehicles will have a significant influence on the environmental impact of commuting, since the distance of almost 100 000 km is driven each working week. Renewing the company car policy will reduce the fleet by 37% and the average CO2 emission will drop from 183 g/km to 137 g/km.

The survey feedback gave a broader view on the commuting behaviour. The feedback showed that driving to work is necessary for some occupants. Car use was mainly reasoned by the commuting distance, insufficient public transport connections or by the need to drive the children to their schools or day care centres. Problems regarding driving were mainly caused by the lack of parking spaces and the rush hours. Also an arrangement improving car-pooling was preferred. This led to the idea of implementing a parking policy to improve these issues.

The feedback regarding public transport was numerous and very straight-forward. The employees required a company bus ticket for public transport. This seemed to be a general opinion and many occupants reported to use public transport if such a ticket was provided to them.

Cyclists and pedestrians indicated surprisingly that the changing rooms were considered as an obstacle for walking or cycling to work. The feedback implied that the changing rooms required improvements, and the number of lockers as well as drying cabinets did not meet the current demand. The survey respondents also desired their own lockers for storage. The cyclists also emphasized having a secure bicycle storage, preferably in the parking garage with an easy access to the changing rooms.

DISCUSSION AND CONCLUSIONS

Commuting is recognised to have a significant environmental impact and corporate mobility management (CMM) is a concept for companies to manage this effort and for promoting sustainable transport. This case study showed that CMM requires extensive preparations in several managerial areas. Change management is a key element for the occupants' to adapt new commuting behaviour, yet FM has an essential role in assessing the premises and implementing actions. Just creating favourable circumstances for alternative commuting can have a major impact on the commuting distribution. Implementing a commuter plan will increase liabilities of FM and redefine FM's role in the company's environmental strategy.

This study recognized objectives for the case company's mobility management and defined the methods for achieving them. The commuting as well as the physical workplace was evaluated at the case company. The evaluation illustrated among others the commute distribution, an estimate of the transport related CO₂ emissions and it gave also a conception of the premises as an indicator of whether it supports alternative transport or not. The defined methods in this case were constructed for promoting car-pooling and public transport, reconditioning the changing room and for adjusting the parking policy and the company car policy. The survey implied that many respondents would walk or cycle to work if the facilities could better meet their needs. In addition, parking arrangements could easily promote car-pooling, although the car-poolers would first need a forum for more easily arranging shared transport. To achieve more reduction in conventional commuting, the case company's GCP will strive to further improve the use of public transportation.

In addition to environmental benefits and social improvements, CMM can be used for green building rating systems, as they are becoming more and more popular. A commuting estimate is necessary in many rating systems and a successful GCP can help achieving a respectable rating. This study concluded that the illustrated operating model used in this case can be considered as a valid method for creating a commuter plan. However, implementing it is not only the Facility Manager's liability, and it requires endorsement and objectives management from the executive group as well. Nonetheless, the physical workplace has a key role in both assessing the needs and implementing the commuter plan, and therefore the Facility Manager can be perceived as a vital person for succeeding in this process. The operating model assigns a consistent method for developing and assessing the commuting behaviour, although the company mobility management plan is always developed as a company-specific program.

The CMM process described in this article included commuting behaviour only for the traffic between home and the workplace. However, it might be beneficial to include also business trips, as it would offer a more comprehensive account of the environmental impacts and transportation modes in total for the company. As the described process is relatively heavy, and it requires sufficient motivation and intangible and tangible resources, therefore it might not be suitable for smaller organizations with limited resources. Further study could concentrate in developing a lighter operating plan for smaller organizations.

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IMPROVING ECO-EFFICIENCY OF THE BUILT ENVIRONMENT – TOOLS FOR LOCAL ACTION

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Even if a single town or a lone neighbourhood seems insignificant in terms of global phenomena, climate change, biodiversity losses and burdens on nature's regenerative capacity are always the results of local action. Numerous rating tools and accounting methods are already available for measuring neighbourhood eco-efficiency, regional carbon footprints and pollution loads, immediate levels of particulates in the air and regional material, energy and waste flows. However, the local developers of the built environment may find it difficult to select the tools that apply to the local conditions. In addition, due to a lack of standardisation and transparency, different tools assessing the same sectors of eco-efficiency may produce remarkably discordant results. Thus, the purpose of this study was to examine how regional eco-efficiency evaluation results can be uniformly compared and how the available eco-tools respond to the demands of urban development projects in Finland, which acted as a case country of the study being one of the Nordic countries. A collection of 37 available tools was reviewed and a functional toolbox was composed according to the expectations of the designers and constructors involved in improving the eco-efficiency of the built environment. The qualitative research was based on a comprehensive literature review, and some of the methods reported in grounded theory were utilised for analysing the data. As a result of the study it was stated that not only the individual tools evaluating different sectors of regional eco-efficiency could be improved but also that the already available sophisticated accounting methods of material flows, energy use and pollution loads could be added to the rating systems of neighbourhood eco-efficiency and built environment sustainability. In addition, ensuring the adoption of the principles of life cycle thinking into the whole framework of measuring local sustainability and regional eco-efficiency was found to be essential.

Keywords: eco-efficiency, environmental impact, evaluation tool, regional scale, sustainability, urban development project

INTRODUCTION

Worldwide economic growth and our high standards of living have been reached at the expense of the Earth's ecosystem preconditions and the planet's ability to sustain life (UNEP 2007; Rockström et al. 2009). The volumes of global material use and waste generation have grown to a point where we now consume at a faster pace than Earth's natural ecosystems can regenerate (WWF 2010). The increasing pressures on water supplies and reductions in arable land endanger the survival of the promptly multiplying world population (WWF 2010). Therefore, all around the world occurring ecological limits and natural resource constraints force us to improve the eco-efficiency of our living and actions. As well as local consumption causes global impacts; improvements in local environmental performance can make a difference. For example the worldwide depletion of fossil fuels supplies combined with detrimental loads of greenhouse gas emissions resulting in the imminent climate change is closely related to the local urban structures (EU 2009; Dodman 2009; Glaeser and Kahn 2010; Heinonen and Junnila 2011).

Individual people can improve the overall eco-efficiency by personal consumption and lifestyle choices. However, people may not be able to choose how long distances they have to travel to work and daily services or how energy-efficient and water-wise their homes and neighbourhoods are. On the other hand, even if local planning authorities and construction contractors built carbon-neutral buildings and smart public transport facilities the effect is negligible if they are not to gain the support of the inhabitants and to form a functional entirety (Flora and Millman 2011; Linstroth et al. 2011).

The concept of regional eco-efficiency and the tools for measuring eco-indicators of the built environment at the state, municipality, city, town and neighbourhood levels can enable government developers, city councils, local planning authorities, private construction contractors and consultant planners to co-operate with local inhabitants and neighbourhood community organisations for creating new green lifestyles in functional sustainable communities. Therefore, the regional greenhouse gas emission reduction targets and other local environmental goals can be achieved without undermining the inhabitants' quality of life (Flora and Millman 2011; Linstroth et al. 2011).

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The commercial organizations providing international certification systems of the built environment, such as British BREEAM, American LEED, Japanese CASBEE and Australian Green Star, have already addressed the challenge by developing neighbourhood scale versions of their rating tools (BRE Global 2011; USGBC 2009; IBEC 2007; GBCA 2011). However, different regions of the world vary greatly with regard to climate, legislative, cultural and ecological conditions. Thus, in the Nordic countries the international certification systems and rating tools typically tend not to take local conditions sufficiently into account (Retzlaff 2008). In Finland even the prerequisites of BREEAM for Communities or LEED for Neighborhood Development certification are sometimes infeasible (Säynäjoki et al. 2011).

As well, in the Nordic countries numerous rating tools and accounting methods are already available for measuring local air and water pollution loads, regional carbon footprints and ozone depleting substance emissions, immediate levels of particulates in the air and the regional use of energy and material resources, as well as for rating the eco-efficiency of a development project as a whole. However, due to a lack of national standardisation and overall transparency, different tools may produce remarkably discordant results. Therefore, guidance and consistency at a national level is needed for the local designers and developers to be able to select the relevant tools that apply to the development project in question and produce reliable results.

The purpose of this study was to examine how the available eco-efficiency evaluation tools respond to the demands of urban development projects in the Nordic conditions. In addition, the transparency and reliability of the eco-efficiency evaluation results and territorial emissions calculations were examined. As one of the Nordic countries, Finland acted as the case country of the study. The precise aims of the research were (1) to review the relevant eco-efficiency evaluation tools that are available in Finland, (2) to arrange the selection into a functional toolbox and (3) to estimate if the toolbox composed has potential to respond to the expectations of the developers involved in improving the eco-efficiency of the built environment in the Nordic countries.

STUDY DESIGN

Since the aims of this research were to review objects (tools), to analyse the reliability of the objects (tools) and to compose a selection of objects (a toolbox), which responds to the specific demands, qualitative methodology was relevant for conducting the study (Creswell 2009; Bryman and Bell 2011). The framework of this study was based on a comprehensive literature review. Additional data were collected by interviewing the developers of the tools examined. Of commercial tools plenty of data was available but it could not be considered as scientific knowledge or even as objective information. Therefore, critical approach was essential to discover the facts. As for the data, which was publicly available of the tools that are used for scientific research in Finland, was valid but scarce. Thus, access to the private documentation of developing and using the scientific tools was needed and obtained.

Especially the practitioners of grounded theory stress the importance of allowing theoretical ideas to emerge out of the data collected (Bryman and Bell 2011). In this study grounded theory was not used as a leading research strategy but some of the methods it has reported were utilised for analysing the data, which consisted of the documentation of developing, using, marketing and criticising the regional eco-efficiency evaluation tools available in Finland. Multiple matrixes were availed for organising and analysing the data, in other words for reviewing, conceptualising and comparing the features of the tools. Since the criteria of the regional eco-efficiency are not unambiguous, it is essential to mention that the eco-indicators used in this study are based on the results of a recent Finnish regional eco-efficiency specification study, the report of which is to be published shortly (Lahti et al. 2011). The authors of this paper have participated in the specification research mentioned above.

REVIEWING THE AVAILABLE TOOLS

From a global point of view a myriad of rating tools and accounting methods is available for assessing regional eco-efficiency of the built environment. However, in the Nordic countries the reliability of the assessments requires the tools in use to apply to the local conditions. In addition, to be credible, the methods should be transparent and thoroughly examinable. Based on the two conditions mentioned above, altogether 37 eco-efficiency evaluation tools were listed to possibly have potential to be useful in Finland. Nevertheless, in some cases the lack of transparency was compensated by international esteem or the inadequate applicability to the Nordic conditions was set off by the potential of creating a Nordic version of the international rating tool in question.

The accounting methods were examined thoroughly and the features of the tools were arranged into a table, which specifies (1) what kind of development projects the tools apply to, (2) how the tools evaluate the eco-efficiency of the built environment, and (3) which environmental impacts caused and which utilities produced the tools can recognise. The table itemises for example the cognitions of site location, traffic, infrastructure availability, building procedures, energy efficiency, water management, material use, recycling and waste management, pollution, biodiversity, green zones, social services and safety issues. Altogether 40 features of each tool were

examined and recorded. The entire table of reviewing the available tools will be published in December 2011 as a part of a regional eco-efficiency assessment research project called KEKO – Regional eco-tools for Finnish cities and municipalities.

COMPOSING A FUNCTIONAL TOOLBOX

After the in depth examination of the tools they were arranged into a toolbox. A new table was divided into eight sections that represent the pigeonholes of a convenient toolbox. The column partition of the toolbox table refers to the specific eco-efficiency evaluation objects of the tools and is based on the recent Finnish specification study mentioned above (Lahti et al. 2011). The row partition, in turn, refers to the area broadness the tools apply to within the regional built environment scale and is based on the results of reviewing the available tools. The sections of the toolbox composed are shown in Table 1.

Table 1: The eight sections of the toolbox composed

The toolbox	(1) Total eco-efficiency	(2) Broader sustainability	(3) Material and energy flows	(4) Pollution loads and environmental impacts
Area level A	Section 1A	Section 2A	Section 3A	Section 4A
Area level B	Section 1B	Section 2B	Section 3B	Section 4B

Within this study (see Table 1), the difference between “(1) total eco-efficiency” and “(2) broader sustainability” is that the latter encompasses not only the environmental impacts caused in respect of the utilities produced but also some social and economic dimensions of sustainability. Since one function of the toolbox is to show all the alternatives that are relevant to a specific user’s request, the tools are allowed to lie in multiple sections.

The expectations of the potential users

For making the toolbox more functional advised information of the tools included was produced for the developers involved in improving the eco-efficiency of the built environment in Finland. Thus, a discussion meeting on the expectations of the potential users of the toolbox was organised in June 2011. In all, the Ministry of the Environment, the cities of Helsinki, Espoo, Vantaa, Tampere, Lahti, Kuopio and Joensuu, the construction companies Skanska and YIT, the Finnish Funding Agency for Technology and Innovation, the Technical Research Centre of Finland, Finnish Environment Institute and Aalto University were represented in the discussion. According to the results of the discussion the pieces of information of the tool features that were found to be most relevant for the designers and constructors involved in improving the eco-efficiency of the built environment were produced and attached into the toolbox table.

CRITIQUE OF THE TOOLBOX COMPOSED

The shortages and the imperfections of the toolbox were reviewed and analysed for critically estimating if the toolbox composed has potential to be used for improving the eco-efficiency of the built environment in Finland and in other Nordic countries. In this stage the features of individual tools were not analysed any longer but instead the composition of the toolbox was assessed closer.

FINDINGS

The findings consist of the results of three separate investigation stages that are described in more detail above in the study design section. The three stages are reviewing the available tools, composing a functional toolbox and critique of the toolbox composed.

REVIEWING THE AVAILABLE TOOLS

The 37 eco-tools found to possibly have potential to be useful in estimating and improving the regional eco-efficiency of various Nordic urban development projects are: Aalto hybrid LCA model, Beyond Vuores, BREEAM for Communities, CASBEE-City, CASBEE for Urban Development, CitySim, EcoBalance, Ecocity, Ecocity Evaluator, EcoProp, ECOREG, EkoPassi, ENVIMAT, EU GPP, EU Ecolabel, FRES, Green Star Communities, HEKO, KASVENER, KUHILAS, KULE, KulMaKunta, KylaPassi, LEED for Neighborhood Development, LIPASTO, MenTouGou, Metka, Nordic Ecolabel, PIMWAG, PromisE, Rakentajan Ekolaskuri, Seutukeke, SYNERGIA, Urban Zone, WinEtana, YKEVAKA and YKR.

What kind of development projects the tools apply to

In the review table the regional scale, to which the tools were expected to apply, is divided into five levels. The applicability of the 37 tools to these levels of regional eco-efficiency evaluation is shown in Table 2.

Table 2: The number of tools applying to the five levels of the regional scale

(1) State level: 12 tools	(2) City level: 17 tools	(3) Municipality level: 17 tools	(4) Town level: 22 tools	(5) Neighbourhood level: 24 tools
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Five tools were found not to apply to the regional scale at all, including SYNERGIA, EU GPP, EU Ecolabel, Nordic Ecolabel and Rakentajan Ekolaskuri. Therefore, they were rejected from further examination after the first investigation stage. Remarkably, virtually the same tools were found to apply either to all state, city and municipality levels or to both town and neighbourhood levels. Thus, for composing a toolbox, the first three levels were unified into (A) State, city and municipality level and the latter two levels into (B) Town and neighbourhood level.

How the tools evaluate the eco-efficiency of the built environment

Both residential and commercial buildings are included in the regional eco-efficiency evaluation by more than three quarters of the tools. The matrix of different tools covers inclusively maintenance and building retrofit as well as material use and recycling, waters and waste management, lightning, heating, cooling and additional use of electricity at all the five regional levels. Similarly, site location and traffic related issues are assessed by approximately three quarters of the tools, at least in some aspects, at all the regional levels. In addition to the environmental impact assessment, the tools evaluate the availability of public transport and the safety issues related to the local traffic conditions. However, only half of the tools observe the infrastructure available.

Which environmental impacts caused and utilities produced the tools can recognize

Of the environmental impact perpetrators energy efficiency, waste management and greenhouse gas emissions are covered by more than three quarters of the tools. In addition, other emissions than greenhouse gases, the share of renewable energy sources, material efficiency and biodiversity sensitiveness are covered by approximately half of the tools. In contrast, only one third of the tools were found to evaluate the utilities produced, that is to say the second half of regional eco-efficiency.

COMPOSING A FUNCTIONAL TOOLBOX

According to the results of the previous investigation stage, which was reviewing the available tools, 32 eco-tools were positioned into the eight sections of a new toolbox table, which is displayed as Table 3.

Table 3: The tools included in the toolbox

The toolbox	1: Total eco-efficiency	2: Broader sustainability	3: Material and energy flows	4: Pollution loads and environmental impacts
A – State, city and municipality level	KulMaKunta; Metka; YKEVAKA	CASBEE-City; ECOREG; Seutukeke	CitySim; ENVIMAT; FRES; KASVENER; KUHILAS; LIPASTO; YKR	Aalto Hybrid LCA, Ecocity Evaluator; ENVIMAT; FRES; KASVENER; KUHILAS; LIPASTO; Urban Zone
B – Town and neighbourhood level	EcoBalance; Ekopassi; HEKO; Kylapassi; PIMWAG	Beyond Vuores; BREEAM for Communities; CASBEE-UD; Ecocity; EcoProp; Green Star Communities; LEED-ND; MenTouGou; PromisE	KULE; WinEtana; YKR	Ecocity Evaluator; Urban Zone

Only a few tools apply to both A- and B-levels. However, many are found to have development potential to cover wider regional scale in the future. Table 3 shows that the total eco-efficiency rating tools and even broader targeted sustainable development assessment schemes cover sufficiently B-level and are swiftly spreading out to A-level. For example CASBEE published at first the UD-tool for B-level and at once the City-tool for A-level. In contrast, most of the accounting methods for measuring local energy, material and waste flows and regional carbon footprints and pollution loads have originally been developed for A-level and not yet been widely adopted to B-level, which requires more specific data and measurements.

According to the expectations discussion, which is described in more detail above in the study design section, the potential users of the toolbox appear to prioritize the effortless information of the function, the usability and the expenses of the alternative tools. In

In addition, the life-cycle perspective, the reliability and the uncertainties of the tools appear to be of the potential users' interest. Thus, of each tool a few sentences were written to answer to the questions that are shown in Table 4.

Table 4: The advised information the toolbox entails

The toolbox	1: Total eco-efficiency	2: Broader sustainability	3: Material and energy flows	4: Pollution loads and environmental impacts
Both A – State, city and municipality level and B – Town and neighbourhood level	What exactly can be evaluated by the application?		What exactly can be calculated by the application?	
	How does the application transform the different sectors of regional eco-efficiency to commensurate items?		How conscientiously does the method follow the principles of life cycle thinking?	
	What are the strengths and weaknesses of the tool? How can the reliability of the assessment be confirmed and what are the most significant uncertainties?			
	How simple and easy is the tool to use and what are the costs of the evaluation?			

According to the information the toolbox composed contains, each one of the tools could be improved. However, the most prominent finding was that the sophisticated methods for measuring material and energy flows, regional carbon footprints, other pollution loads and environmental impacts are not widely utilised in rating the total eco-efficiency or broader sustainability of the built environment. In addition, the life cycle thinking was found to be essential to adopt into the whole framework of rating regional eco-efficiency and sustainability.

CRITIQUE OF THE TOOLBOX COMPOSED

The toolbox composed is not a complete end product but a functional selection of what is already available for the designers and constructors involved in improving the eco-efficiency of the built environment. Most of the tools were found to have potential to be improved to better respond to the demands of Nordic urban development projects now and in the future. The advised information the toolbox entails of the function, the usability, the expenses, the life-cycle perspective, the reliability and the uncertainties of the tools as well as the contents of the first evaluation table, which was used for reviewing the available tools, can be utilised for improving the tools.

Majority of the eco-tools in the toolbox have been designed to apply to the Finnish conditions. Although, from a global point of view, the local conditions in all the other Nordic countries are rather similar to those in Finland. In general, the modifications that are needed for making the Finnish tools applicable to the other Nordic countries are minor to those that are essential for transforming the international rating systems to the forms that gracefully apply to the local conditions in the Northern Europe. Besides, the toolbox includes the most renowned international rating systems as well.

DISCUSSION

The purpose of this study was to investigate how the available eco-efficiency evaluation tools respond to the demands of urban development projects in the Nordic countries and to examine how transparent and reliable the eco-efficiency evaluation results are. There are several publications of the principles of measuring regional eco-efficiency in general (for example: Huppel and Ishikawa 2005; Kitzes et al. 2009; Li et al. 2010) as well as of continent specifications of the research field (for example: Wursthorn et al. 2011; Parshall et al. 2010) and of measuring eco-efficiency within case areas (for example: Schultz 2007; Penela and Villasante 2008). However, the Nordic point of view to the regional eco-efficiency assessment is not widely documented.

The results of this study both add to the scientific knowledge of measuring regional eco-efficiency and offer practical advice for the designers and constructors involved in improving the eco-efficiency of the built environment in the Nordic countries. Overall 37 eco-tools were found to possibly have potential to be useful for the Nordic urban development projects. 40 features of each tool were examined and documented to build a picture of the field. Based on the investigation a toolbox of 32 items was composed and described. Additional information of the tools' methodological and practical features was produced to make the toolbox more functional for the potential users. Eventually, the toolbox composed was judged not to be a complete end product but a functional selection of what is already available.

Since the life cycle thinking and a coherent allocation of the measurements of regional environmental loads to production and consumption based quantifications is not yet a standard in regional eco-efficiency evaluation methods, the toolbox composed in this study is not seamless. Nevertheless, the tools can be ranked and improved according to the analysis conducted. For example, as for the regional greenhouse gases, most of the assessing tools in the toolbox are already able to divide the emissions calculations to production and consumption based bodies. In addition, the recent improvements in eco-tool development seem to strengthen the life cycle point of view. However, the separated pieces of knowledge should be integrated into the overall rating systems of eco-efficiency and broader sustainability of the built environment. Therefore, the main objective for further research is to improve the quality and diminish the number of tools in the toolbox by combining the strengths of multiple methods.

According to Udo de Haes et al. (2004) creating one super tool with too many data and resource requirements is always a risk and thus composing a toolbox offers most flexibility regarding spatial and temporal information and the inclusion of multiple environmental impacts. Therefore, a safe option is to develop a seamless toolbox, which includes a few tools that can operate both solo and together.

A few issues are important to mention in revising the study. As for the different levels of the regional measurement scale, since the population density in the Nordic countries is extremely low the mentioned levels of state, municipality, city, town and neighbourhood representing the local setting are not of international standard. For example a Finnish town may have less than 1500 inhabitants (Regional Council of Ostrobothnia 2011). Besides, any toolbox composed is a product of temporary circumstances. However, the validity of the scientific knowledge produced aside is not to similarly get on. In addition, also incomplete and developable tools were selected into the toolbox to enhance the lifespan of the selection.

Recent improvements in regional greenhouse gas emissions measuring are remarkably widely documented (for example: Ramaswami et al. 2008; Brown et al. 2009; Salon et al. 2010; Heinonen et al. 2011). Since climate change has a privileged position in regional eco-efficiency evaluations there is a risk that the local actions for diminishing urban carbon footprints may cause environmental impacts we do not recognise. Therefore, stabilising the eco-efficiency evaluation toolboxes to cover more different sectors of eco-efficiency more comprehensively is essential for sincerely developing greener communities. Many of the greenhouse gas calculation tools have potential to be developed to measure multiple emissions and thus multiple environmental impacts.

CONCLUSIONS

The study suggests that since different regions of the world vary greatly with regard to climate, legislative, cultural and ecological conditions, it is worthwhile to survey and develop the scientific knowledge and practical tools that apply only to limited local conditions. As for improving regional eco-efficiency in the Nordic countries, the international rating systems can be benefited but local knowledge and precise tools are essential for a secure success.

Even the locality-focused research generally produces certain insights that add to the common knowledge of the eco-efficiency evaluation of the built environment. Besides, composing a local toolbox of the most relevant applications available is only the first step of learning to manage regional eco-efficiency. Additional scientific data of the details and the new aspects of improving regional eco-efficiency are produced perpetually (for example: Galli et al. 2001; Hauschild et al. 2011). The challenge for the small nations and communities is to adopt the voluminous beneficial international knowledge without losing the local focus.

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RECURRENT EMBODIED ENERGY AND ITS RELATIONSHIP WITH SERVICE LIFE AND LIFE CYCLE ENERGY: A REVIEW PAPER

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Total life cycle energy use in a building consists of two components: embodied and operational energy. Embodied energy is expended in the processes of building material production, transportation, construction, maintenance, renovation and final demolition. Operational energy is consumed in operating the buildings. Studies have revealed the growing significance of embodied energy inherent in buildings and have demonstrated its strong relationship to carbon emissions. The post-construction stages such as maintenance, replacement, renovation and retrofit of a built facility include use of building materials and processes that consume energy. This fraction of embodied energy is known as recurrent embodied energy. As facility managers directly deal with such processes they hold an important responsibility of reducing the recurrent energy embodied of a built facility. Facility management and practices strongly relate to building's recurrent embodied energy, as they involve decision-making regarding whether to renovate and retrofit or demolish a built facility. The literature suggests that the service life of facilities holds a positive relationship with the recurrent embodied energy. In addition, studies also suggested the use of long service life building materials and components to avoid frequent replacements. However, literature indicated that the recurrent energy embodied in a facility exhibits considerable variation across studies and with inconsistent and inaccurate data, decisions become hard to make for a facility manager. This paper performs a survey of existing literature to gather case studies of built facilities in order to analyze the relationship of recurrent energy with the building service life. It also intends to determine the amount of variation in the energy data of the case study facilities and discusses the factors causing the variations. The findings of this paper would motivate the facility management professionals to prefer long service life materials and components during the post construction phases of a built facility.

Keywords: maintenance and replacement, recurrent embodied energy, facilities management and sustainability, service life

INTRODUCTION

Buildings consume nearly 40% of global energy annually in their life cycle stages of construction, use, maintenance and demolition. This energy consumption occurs either in primary (e.g. natural gas, oil etc.) or delivered energy (e.g. electricity) form (Fay and Treloar, 1998). During building material and building production process both the primary and delivered energy are used, which are collectively known as embodied energy (Crowther, 1999). The primary and delivered energy is also used during the use phase of a building in the processes of space conditioning, lighting and powering building appliances and equipments. This energy is known as operational energy (Hegner, 2007). Compared to embodied energy, the operational energy constitutes a larger fraction of a building's life cycle energy (Hegner, 2007). However, recent research has acknowledged the importance of embodied energy and has indicated that with a growing number of energy efficient buildings the fraction of embodied energy would increase (Plank, 2008). Sartori and Hestnes (2007) determined that for a conventional building the embodied energy accounts for 2-38 percent of the total life cycle energy, whereas, for a low energy building, this range was 9-46 percent. Embodied energy can be categorized into three categories: initial, recurrent and demolition embodied energy (Cole & Wong, 1996; Cole and Kernan, 1996). The energy consumed in building material production, transportation, building assembly and construction is known as the initial embodied energy (IEE). Recurrent energy (REE) includes energy used in maintenance and replacement activities during the use phase of a building. At the end of its service life when a building is demolished and its materials are transported for recycling, incineration or disposal to landfills, the energy consumed is known as demolition energy (Dixit et al., 2010). The total recurrent life cycle embodied and operational energy depend on a building's service life (Chen et al., 2001). Moreover, individual building materials and components hold differing service lives that also affect the amount of recurrent embodied energy contained in a building (Cole, 1996; Chen et al., 2001; Chau et al., 2007; Winistorfer et al., 2005). Literature (such as Chen et al., 2001; Scheuer et al., 2003; Chau et al., 2007) has indicated that longer the service life of building components lesser is the need to replace them which eventually results in lower recurrent embodied energy. Some common building materials and components may not contain higher IEE but may hold larger REE due to frequent replacements or maintenance requirements (Cole, 1996).

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Previous studies of embodied energy analysis and computation exhibited variations (up to 30-50%) in embodied energy results owing to numerous factors (Lenzen, 2000; Ding, 2004; Plank, 2008). Studies also discussed the inaccuracy and incompleteness of existing embodied energy data belonging to buildings and building materials (Treloar, 1997; Lenzen, 2000; Pullen, 2000b). These problems with energy data made the comparison of building materials and products difficult in embodied energy terms (Dixit et al., 2010). According to Chau et al. (2007), selection of building products on the basis of replacement requirements during use phase is as important as during the design phase. Facility management and practices strongly relate to building's total embodied energy, as they involve decision-making regarding whether to renovate and retrofit or demolish a built facility. Facility management practices hold potential for reducing REE as they involved decisions such as selection of materials and products during building maintenance and replacement processes (Treloar et al., 1999). The involvement of facility management professionals during a facility's design and construction phase is also being emphasized (Erdener, 2003).

This paper reviews case studies from existing literature to investigate the relationship of service life of a building to that of its total REE and total life cycle embodied energy. In addition, we also show and determine the amount of variation that exists in the embodied energy results of the referred case studies. The findings of this paper would motivate the facility management professionals to prefer long service life materials and components during the post construction phases of a built facility.

REVIEW OF LITERATURE

EMBODIED ENERGY MODEL FOR A BUILDING

Buildings are constructed with a variety of building materials and products that involves energy consumption throughout their stages of manufacture, use and end of life. These stages consist of raw material extraction, transport, manufacture, construction, installation, disassembly, demolition and disposal. Miller (2001) reveals that, the term "embodied energy" has been interpreted in a variety of ways, and its published measurements are quite unclear. The total energy embodied in a building consists of a direct energy (on-site and offsite construction processes) and an indirect energy (e.g. manufacturing energy of building materials and equipment) fraction (Ding, 2004; Fay and Treloar, 1998). The total energy embodied in a building over its life cycle (service life) is known as the life cycle embodied energy (LCEE). The total of life cycle embodied and operational energy is called as the life cycle energy (LCE) of a building.

PROBLEM OF VARIATIONS IN EMBODIED ENERGY DATA

Existing studies of embodied energy analysis that performed energy calculations exhibit variation in embodied energy results owing to numerous factors (Ding, 2004; Plank, 2008). Dixit et al. (2010) determined a standard deviation of 1.56 GJ/m² and 5.4 GJ/m² in embodied energy values of residential and commercial buildings, respectively reported by Ding (2004). Pears (1996) discussed that current embodied energy databases are inconsistent and show significant variability. Studies have also pointed out errors and variations in embodied energy figures. Pears (1996) determined that the differing information sources and inclusion of either primary or delivered energy could result in 30 to 40 percent variation in reported embodied energy figures. Lenzen (2000) calculated a possible truncation error in the conventional process analysis, which could be as high as 50 percent, depending upon the product and its manufacturing process under consideration. The incompleteness in conventional process-based analysis could be as large as 20 percent (Treloar, 1997). Pullen (2000b) asserted that process analysis does not include upstream processes (raw materials extraction and transportation) and some of the downstream processes (transporting finished products to construction sites) and, thus, its results vary. Datasets that demonstrate variability cannot be compared and the goals of environmental labelling and low embodied energy material preference cannot be reached (Miller, 2001; Ding, 2004). Pullen (2000c) discussed that there is a need to create environmental information that can be used by building professionals such as designers and facilities managers for making informed decisions.

RECURRENT EMBODIED ENERGY

The building's use phase includes processes of building operations as well as maintenance, repair and replacement activities, which consume a large amount of energy and resources. Energy used in these recurring maintenance and replacement activities is known as recurrent embodied energy (REE) (Cole, 1996; Ding, 2007). According to Cole and Kernan (1996), a building material or component that is fully replaced (replaced 100%) is covered under the category of replacement and any replacement less than 100% is covered under maintenance. Building materials and components do not hold the similar service life as the building and require one or more replacements over the building's service life (Cole, 1996; Chen et al., 2001; Winistorfer et al., 2005; Chau et al., 2000). These maintenance and replacement activities require resources such as building materials and equipment and involve energy intensive construction processes (Utama and Gheewala, 2009). Each of these activities contributes to the recurrent embedded energy (Chen et al., 2001; Ding, 2007). Building components such as the envelope, finishes and the services, which may not possess a higher IEE,

may require a significant REE (3.2 times the IEE over 50 years service life) (Cole, 1996). According to Chen et al. (2001), if building services and systems are included in recurrent energy calculations the REE values would increase due to a shorter life span of these components. Cole (1996) calculated that for a service life of 25, 50 and 100 years, these components contained a REE that was 1.3, 3.2 and 7.3 times their IEE respectively. REE over 60 years of a building's service life could represent at least 72% of its life cycle embodied energy (Pullen, 1999). Pullen (2000a) calculated an annual REE as 1% of IEE that coincides well with the figures suggested by Adalberth (1997) and Treloar et al. (2000). In a study of 15 houses in the Adelaide region of Australia, Pullen and Perkins (1995) found that the REE (for an 80 year service life) is within a range of 36-84% of IEE. A replacement factor, which is the ratio of service life of a building to the average service life of a building material or a component, is important in determining the amount of REE (Chen et al., 2001; Chau et al., 2007). Replacement of building components occur mainly due to functional and aesthetic reasons. End of service life of an associated component is also a primary reason for most replacements occurring in a building (Winistorfer et al., 2005). Fashion is also seen as a main reason behind frequent replacements of building components such as furniture, fixtures and fittings (Treloar et al., 1999).

From the review of literature it is clear that the REE of a building over its service life, in most cases, could be equal to or more than its IEE (Ding, 2007). It is therefore important to select materials and equipment that require minimum maintenance and replacements during a building's design and use phase. In addition, there is a need to increase a building's service life so that the impact of its IEE can be distributed over a long span of time (Chen et al., 2001). Although, an increased service life means more replacement and maintenance activities resulting in an increased REE (Chen et al., 2001), its impact could be reduced by selecting low embodied energy and long service life materials.

RESEARCH PURPOSE AND METHODS

The main purpose of this paper is to investigate the relationship of a building's REE with its service life as well as with its life cycle embodied energy (LCEE). A building's REE may also show a positive relationship with its total life cycle energy (LCE). This relationship is also examined in this paper. It is expected that the REE is positively correlated with a building's service life, LCEE and LCE. This, if found true, could demonstrate that a building's REE has a major impact on its LCEE and LCE and facility managers who are primarily responsible for building maintenance and replacement activities have a significant potential for reducing the life cycle energy use in a building facility. A literature survey is performed to gather and analyze residential and commercial building case studies. The research method adopted is known as "Literature-based Discovery (LBD)" that is originally used for bio-medical science research. The LBD has been successfully applied to other fields also (Dixit et al., 2010). The case study buildings belong to various locations around the globe and possess different construction types (e.g. concrete, steel, wood, brick etc.). Hence, some of the amount of variations shown in REE values can be attributed to these differences also. The embodied energy results are presented in gigajoules per unit area of building (GJ/sq mt) and in annual mega joules per unit area (MJ/sq mt-Year). The variation in REE values across studies can be genuinely determined if these values are normalized to annual values. The relationship of REE with a building's service life, LCE and LCEE is illustrated by scatter graphs and is explained by providing correlation coefficients. In some case studies the service life is not mentioned and in such cases a 50-year service life is assumed.

FINDINGS

RESIDENTIAL BUILDINGS

Referred residential building facilities included a total of 64 single and multi-family structures belonging to Europe, Oceania and North America. The service life of the case study buildings ranged from 25-100 years with an average of 58 years. Most of the case study buildings are conventional residential structure, whereas some are energy efficient/green buildings. The materials used in energy efficient/green and conventional buildings may differ significantly. Therefore, correlation of REE with service life, LCEE and LCE is illustrated collectively and individually by conventional and green building type. The REE values are found to be strongly correlated to the building's service life in case of energy efficient/green residential buildings. The correlation coefficient (r) is calculated as 0.84 with coefficient of determination (r^2) as 0.7. The REE is determined to have a highly positive correlation with LCEE with $r = 0.98$ and a strong positive correlation with LCE with $r = 0.93$. In case of conventional buildings, the REE is found strongly correlated to building's service life with $r = 0.78$ and $r^2 = 0.61$. The correlation of REE of a conventional building with its LCEE and LCE is found strongly positive with $r = 0.94$ and $r = 0.68$ respectively. In case of all residential buildings, the REE showed strong positive correlation ($r = 0.71$, $r^2 = 0.5$) with building's service life, a high correlation ($r = 0.97$) with building's LCEE and a strong correlation ($r = 0.85$)

with building's LCE. Figure 1 illustrates the relationship of REE with building's service life and LCEE respectively. The annual REE figures demonstrated significant variations across referred case studies. In case of green buildings, the annual REE values varied with a standard deviation of 74.1. The annual REE values for conventional and all residential buildings possessed a standard deviation of 28.8 and 54.8 respectively.

COMMERCIAL BUILDINGS

The commercial building case studies that are referred in this section included 100 facilities from Asia, Europe, Oceania and North America. The service lives of these facilities were in the range of 40-100 years with an average of 71 years. The total REE values demonstrated a strong correlation with commercial building's service life with $r = 0.82$ and $r^2 = 0.67$.

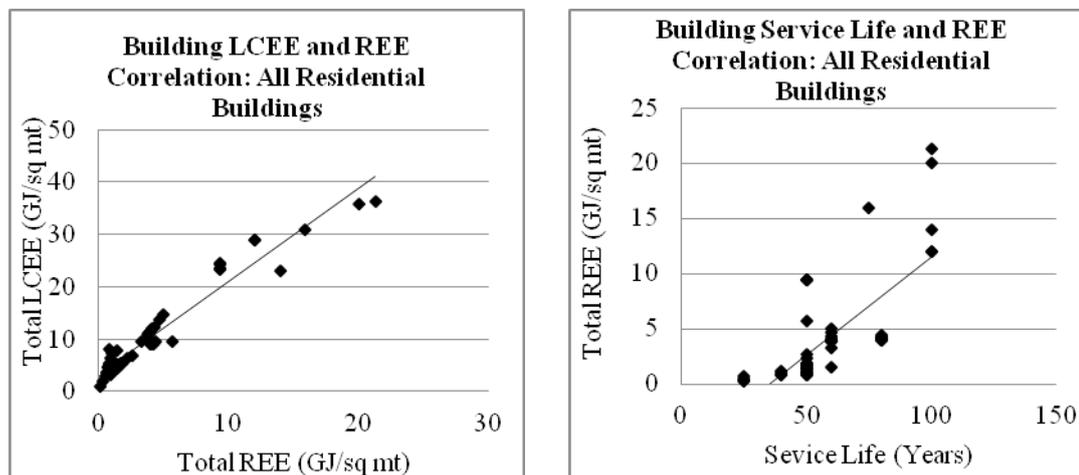


Figure 4. Building service life, LCEE and REE correlation for residential buildings

Figure 2 illustrates the correlation of total REE with service life and LCEE of the referred commercial buildings. From these figures, it can be seen that the recurring energy embodied in buildings is linearly related to the total life cycle embodied and life cycle energy. The total values of REE for commercial buildings are highly correlated to building's LCEE with $r = 0.98$ and $r^2 = 0.96$. In addition, the values of REE are found to be strongly correlated ($r = 0.91$) to the LCE values for the case study buildings. The annual REE values for the case study building ranged from 1.7 to 470 MJ/sq mt-year demonstrating a huge variation (std. deviation = 109).

DISCUSSION

The referred case studies were a combination of residential and commercial buildings. The annual REE requirements for the residential buildings vary from 8 to 213 MJ/sq mt-year with an average of 62 MJ/sq mt-year. The REE values calculated by Barnes and Rankin (1995) were the lowest among referred residential buildings. One reason for this may be the fixed percentage (0.9% of IEE) considered by the authors. Fay and Treloar (1998) calculated a higher (188-213 MJ/sq mt-year) REE value due to a wider system boundary that included maintenance and replacement requirements for not only building and its components but also the landscaping, major building appliances (stove, microwave oven, dishwasher, clothes washer and dryer, heater etc.) and other small items. The REE values ranged from 1.7 to 470 MJ/sq mt-year for commercial building with an average REE value of 157 MJ/sq mt-year. The lower annual REE values (1.7-3.6 MJ/sq mt-year) calculated by Page (2006) are due to the fact that only exterior wall and roof paint were included under the maintenance and replacement works. The annual REE values reported by Langston and Langston (2007) were significantly higher (up to 470 MJ/sq mt-year) due to a wider system boundary to include building, its components, services, fittings, site works and external services. They like Fay and Treloar (1998), also used input/output-based hybrid method to calculate the energy embodied, which usually results in higher energy figures (Crawford et al., 2002). The residential buildings included single and multi-family structures that may not contain complex building systems (building components and equipment) requiring higher maintenance and replacement work. Commercial buildings on the other hand may involve building systems that may not only be complex but also be larger in size. Such systems may need higher level of maintenance and replacement work (Scheuer et al., 2003). This may be one of the reasons why the annual average REE values (per unit area) for commercial buildings are over 2.5 times the annual average REE values for residential buildings.

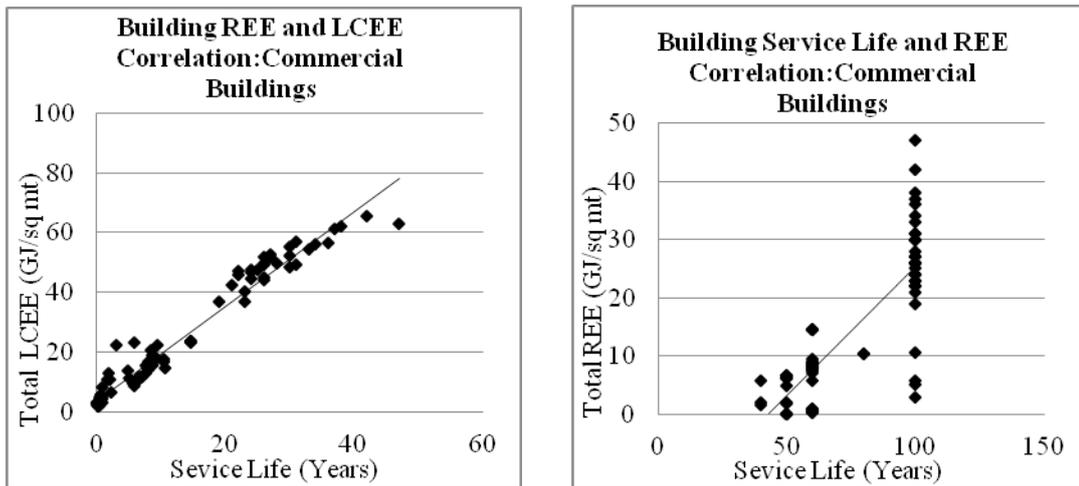


Figure 5. Building service life, LCEE and REE correlation for commercial buildings

The reported annual REE values for commercial buildings showed stronger correlation with service life than the residential buildings. One possible explanation for this may include the increased size and complexities of commercial buildings and their systems that may demand more maintenance and replacement works as buildings grow older. Similarly, the reported figures of total REE were highly correlated to the LCEE in both the residential and commercial buildings. This fact reveals the relative significance of REE in total energy embodied in a typical building over its entire life time. This fact coincides with the conclusions made by Cole (1996) according to whom the REE over a buildings life time could easily surpass its IEE. The reported REE values were also found to be strongly correlated with the total energy embodied in a building life cycle (LCE) in case of both the residential and commercial buildings. As one would expect, the operational energy reported by referred case studies showed a high correlation ($r = 0.97$ and 0.99 for residential and commercial buildings respectively). After comparing the correlation demonstrated by REE and operational energy to a building's total LCE, one can judge the significance of the building's REE.

The reported figures for REE for both the residential and commercial buildings demonstrated significant variations. The amount of energy embodied in recurring activities such as maintenance and replacement depends on type of building, its location, type of interior and exterior materials, and type of construction and function of the building. The referred facilities included the use of a variety of materials, equipment and products in various components such as structure, envelope, finishes and services. In addition, the construction processes are also different and depend on the type of materials and products preferred. As mentioned in the literature section, there are methodological and data quality parameters that differ across studies and cause significant variations. The large variations found in reported REE is possibly due to all these factors.

As suggested by literature (e.g. Plank, 2008), the operational energy of a building is being reduced due to the emergence of energy efficient building equipment, high performance building components and improved building design (to include passive strategies for daylighting and space conditioning). It can be envisaged that the operational energy requirements would be reduced to a greater degree in future. In such a case, the recurrent energy embodied in a building would greatly affect its total LCE. Since, operational as well as recurrent activities such as maintenance and replacements are among the primary responsibilities of facility management professionals, the potential for greater life cycle energy reduction lies with them.

CONCLUSIONS

A building consumes energy in two ways: in building operation (operational energy) and in its production, maintenance and demolition (collectively as embodied energy). Both the fractions of life cycle energy (embodied and operational) are important in significantly reducing the energy consumption by a building. As suggested in the review of literature section, a life cycle perspective is needed while performing energy consumption assessment of a facility. Recurrent embodied energy (REE) is one important fraction of a facility's total embodied energy. Literature suggested that the REE is correlated to a building's service life and has a major impact on its LCE.

In this paper, a review of literature was performed to collect and analyze residential as well as commercial buildings to examine the relationship of REE with a buildings service life. The relationship of the reported REE values and LCEE and LCE values were also examined. Moreover, the variability of annual REE values was determined and discussed. It was concluded that the annual REE values demonstrated strong correlation to building's service life. Their correlation with LCEE and LCE was also high that indicated significance of REE in reducing the embodied energy consumption. The reported annual REE values showed large variations and hence, need attention before using them for embodied energy analysis.

The facility management practices involve decisions that affect the operational as well as maintenance and replacement works occurring during the use phase of a building. The way facility management professionals make decisions during these works can greatly affect the magnitude of recurring energy embodied in a building. The amount of REE can be reduced by preferring low embodied energy materials that have long service life and require less maintenance. Facility managers should also be involved during a facility's pre-design, design and construction phases so that they can provide guidance on building material and equipment selection on the basis of functional, energy and service life aspects.

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FACILITIES MANAGERS' ATTITUDES TOWARDS ADAPTATION AND MITIGATION

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Climate change poses a significant challenge to existing built assets and facilities managers will play an important role in addressing the mitigation and adaptation agenda for these assets. Facilities managers' actions will in turn be informed by their attitudes to climate change uncertainties and risks and on how these are integrated in built asset management plans. This paper presents research findings from an extensive questionnaire survey of UK facilities managers' attitudes towards climate change risk and the mitigation and adaptation solutions available to them. The paper also examines the usefulness of existing built asset management toolkits to support strategic mitigation and adaptation plans as part of a coherent built asset management strategy. The paper concludes that there is a statistically significant relationship between an individual facilities manager's environmental inclination and their belief in anthropogenic climate change, and with their perception of climate risks, which are enhanced if they have previous experience of a climate related extreme weather event. The paper also concludes that mitigation is strategically driven through Corporate Social Responsibility strategies whilst adaptation remains reactive and occurs in response to already experienced extreme events. Finally the paper examines the ability of backcasting (as compared to forecasting) to support built asset management planning. Although a number of operational and managerial barriers were identified, including: facilities managers' attitudes to risk and uncertainty; limited confidence in the future needs analysis; the ability to project a built asset adaptation and mitigation journey; corporate perception and attitude to environmental issues; and personal characteristics and beliefs, the results suggest that facilities managers' demonstrate the fundamental characteristics and beliefs that would support such an approach.

Keywords: climate change adaptation, facilities management, risk perception

INTRODUCTION

The primary function of a building is to provide a secure and functional space by mediating the external environment to provide a comfortable internal environment to work and reside in. However, as a consequence of climate change, the external environment is changing, resulting in an overall warming of the planet and changing local weather patterns. It has been projected that this overall temperature (and sea level) rise will 'very likely' result in an increase in extreme weather events: with heat waves and heavy precipitation becoming more frequent; while storms, typhoons and hurricanes are likely to become more intense (IPCC 2007). Further, it is 'very likely' that these changes can be attributed to anthropogenic emissions as a result of the consumption of fossil fuels and associated release of green house gasses (IPCC 2007). In addressing climate change the Intergovernmental Panel on Climate Change (IPCC) propose two complimentary approaches, adaptation and mitigation. Adaptation involves 'Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities' whilst mitigation is 'An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases' (IPCC 2001). Both of these approaches pose challenges to those responsible for the management of built assets. As buildings are exposed to a wider range of climate stimuli so their ability to effectively mediate between the internal and external environment will be tested. As global solutions are sought to reduce green house gas emissions so the impact that buildings have on the environment will need to be reduced. The challenge to facilities managers is to develop effective asset management strategies to address adaptation and mitigation to ensure that the built assets they are responsible for do not become prematurely obsolete. However, it is unclear whether existing approaches to built asset management, which are based largely on a forward casting philosophy, can provide a suitable theoretical base for adaptation and mitigation. This is the focus of this paper.

IMPACT OF CLIMATE CHANGE ON BUILDINGS

In the UK the impact of climate change assumptions on local weather patterns (at a 4km grid level) can be assessed through the

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UKCIP02 scenarios and UKCP09 projections (<http://www.ukcip.org.uk/uk-impacts/>) and the UK Weather Generator (<http://ukclimateprojections.defra.gov.uk/content/view/736/690/>). These assessments predict a generic temperature rise of between 2°C and 3.5°C with increasing winter precipitation (decreasing snowfall) and more frequent extreme events such as heat waves and intense precipitation till 2080. Using these tools facilities managers will be able to predict the range of possible weather impacts that their buildings will experience and evaluate the implications of these on the performance of their buildings in-use.

The impacts of projected climate change on built assets will be twofold (Graves and Phillipson 2002). Increased cooling energy load (Markandya 2004), legislation and carbon reduction initiatives on energy management in built assets (Wittneben and Kiyar 2009) will place increased pressure on organisations to improve their operational (energy) efficiency and asset management approaches to reduce their CO₂ footprint, whilst the increased risk to the physical state of the built asset due to flooding, erosion, water penetration etc will increase maintenance and insurance costs (Camilleri et al. 2001; Liso et al. 2001; Salagnac 2004). Jones and Desai (2006) argued that a failure to address these issues through the effective integration of adaptation and mitigation into built asset management strategies would render many existing buildings obsolete, as they would no longer be able to satisfy the organisation's business needs.

Whilst there is an extensive knowledge base for mitigation of climate change in buildings: performance assessment tools (e.g. BREEAM In-Use); zero and low carbon energy generation; low energy equipment; façade retrofitting; energy labelling schemes; and behaviour change initiatives, the same cannot be said for adaptation, where approaches tend to be limited to risk assessment for flooding and overheating (Hacker et al. 2005; Roberts 2008) and solutions inhibited by the limitations of uncertainty, (real-life) monitoring, reliable performance projections, and operational management constraints (Kohler and Yang 2007). Further, whilst organisations (facilities managers) appear able to address the mitigation agenda through strategic level interventions (e.g. corporate goals, missions statements etc), they do not appear able to integrate adaptation into their routine built asset management (Desai and Jones 2010). As such, there is a danger that long-term mitigation solutions will be favoured in place of short-term adaption which could have a detrimental impact on both the performance of the building in-use and the well-being of its occupants.

FORECASTING V BACKCASTING

The ability of the current approach to built asset management to effectively accommodate changing user demands has been questioned by Jones and Desai (2006) who argued that the incremental nature of maintenance planning, based on forecasting from a current stock condition survey, was unable to address the complex interactions between buildings and users that is required if sustainability and climate change are to be addressed. This paper argues that an alternative approach based on backcasting is more likely to deliver a built asset management strategy to address the sustainability and climate change agendas. In essence, backcasting requires future needs (in this case of a building) to be established (20-25 years) and then an intervention journey to be planned, with short and medium term targets, that identify maintenance and refurbishment actions that are required to achieve the future position. This varies from the forecasting approach in as much as the facilities manager has to explicitly consider the whole journey from where they are today to where they want to be in the future. This process should result in a more integrated approach to built asset management where adaptation and mitigation solutions are considered alongside each other. However, for this to be achieved facilities managers need to: 1) have confidence in the future projections; 2) accept the presence of uncertainty and risk; 3) plan the journey and set interim targets and milestones; and 4) have the support of other business units to follow a path that might not deliver short term gains.

RESULTS – ACTION RESEARCH PROJECT

The backcasting approach to adaptation and mitigation built asset management planning was tested in a research project with a major commercial organisation (see Desai and Jones 2010 for methodology). Through attendance at meetings, interviews with facilities managers and front line operational managers, and document analyses the authors examined the organisation's attitudes and beliefs (manifested through strategic intent and organisational characteristics) to climate change and risk management. Whilst initial results confirmed the appropriateness of the general backcasting approach, a number of operational and managerial issues were identified that, unless addressed, would inhibit its widespread application. From an operational perspective individual facilities manager's attitudes to risk and uncertainty associated with business continuity planning, disaster recovery management, and levels of insurance cover limited confidence in the future needs analysis and the ability to project a built asset adaptation and mitigation journey. From a managerial perspective, corporate perception and attitude, along with personal (individual) characteristics were

critical in forming the organisational response to environmental issues. Managers took action for environmental issues depending upon how they related to them and the external pressure (time and resources) the action would attract. These findings are consistent with the findings of Strandholm et al. (2004) and Fernandez (2006). Therefore, if backcasting is to form the basis of adaptation and mitigation planning, these issues need to be better understood and a more clearly defined process needs to be developed which addresses these concerns within the built asset management process.

RESULTS – QUESTIONNAIRE SURVEY

In order to examine the general applicability of the backcasting approach to adaptation and mitigation planning an extensive questionnaire survey was undertaken with members of the British Institute of Facilities Managers (BIFM). Detailed self-administered questionnaires were sent to all BIFM members in the UK: 474 were returned and form the basis of this analysis. This represents a response rate of 10.8%. The questionnaire was divided into 4 sections that gathered quantitative and qualitative data on a) facilities managers' perception of climate change b) facilities managers' environmental inclination c) facilities managers' belief in climate change and d) existing approaches towards climate change mitigation and adaptation. This section presents a series of correlation analysis to test the following hypotheses:

- 1) A positive environmental inclination encourages belief in anthropogenic climate change.
- 2) Perception of risk is related to belief in anthropogenic climate change.
- 3) Experience of a climate related extreme event enhances perception of climate change as a risk.
- 4) Level of perceived risk (and through hypothesis three experience of an event) results in better identification of future climate change impacts.
- 5) The acceptance of future climate change impact results in pro-active inclusion in disaster recovery plans.
- 6) Mitigation measures are driven by Corporate Social Responsibility (legislation compliance) and financial gain (through reduced taxation and energy saving).

Hypothesis 1 – A positive environmental inclination encourages belief in anthropogenic climate change.

An individual's environmental inclination was measured using the new environment paradigm (NEP) scale (Dunlap et al. 2000). The NEP scale measures a respondent's agreement with a series of standard questions about the physical environment using a 5-point Likert scale (1 represented strong disagreement; 5 represented complete agreement). From these questions a respondent's NEP score can be calculated and compared to the mean for the NEP scale (a score of 28 indicates a neutral response). The majority of respondents to the survey scored between 23 and 36, indicating a generally environmentally aware facilities management community.

These results suggest that facilities managers agree that there are limited natural resources available and, that an appropriate and efficient use of these resources is important, but are not convinced that their collective efforts will result in an environmentally positive payback. The belief in anthropogenic climate change was also measured using a 5-point Likert scale. The score (mean = 3.31, Standard Deviation = 1.3) indicated that overall facilities managers were uncertain whether climate change is due to human activities or is a naturally occurring phenomenon. The relationship between the two variables was tested using the Spearman correlation test, which observed a positive correlation ($r = 0.440$, $N = 168$ and $P < 0.01$) with a coefficient of determination (r^2) of 0.193. This implies that a statistically significant relationship exists between the two variables albeit with only 19.3% of the variation in belief in anthropogenic climate change being explained by an individual's environmental inclination.

Hypothesis 2 – Perception of risk is related to belief in anthropogenic climate change

An individual's belief in anthropogenic climate change was compared to a 5-point Likert scale rating of their perception of risk. The mean score across all respondents was 3.39 and the Standard Deviation = 1.1. The results indicated that facilities managers neither agreed nor disagreed that climate change represents a risk to their organisation. The relationship between the two variables was tested using the Spearman correlation test, which observed a positive correlation ($r = 0.309$, $n = 166$, $P < 0.001$) with a coefficient of determination (r^2) of 0.095. This implies that a statistically significant relationship exists between the two variables albeit with only 9.5% of the variation in perception of risk being explained by an individual's environmental inclination.

Hypothesis 3 – Experience of a climate related extreme event enhances perception of climate change as a risk.

An individual's experience of a climate change related extreme weather event was compared to their perception of climate change as a risk. In total 212 (46%) participants had experienced climate related events affecting their working environment. The relationship between the two variables was tested using the Chi-square test which observed a statistically significant association between climate

change risk perception and experience of a climate related extreme weather event ($\chi^2 (1) = 4.261, P = 0.039 < 0.05$) with 49% of respondents who had experienced an extreme weather event rating their risk perception higher than those who had not and only 11% rating it lower.

Hypothesis 4 – Level of perceived risk (and through hypothesis three experience of an event) results in better identification of future climate change impacts.

An individual’s perception of climate change risk was compared to their acceptance (identification) of future weather scenarios. The effects of climate change were presented as a series of generic weather impacts and participants were asked to rate the level of impact that these would have on their organisational function. A five point ordinal scale was used. The majority of facilities managers did identify potential impacts to their properties with flooding, storm, hot summers and droughts (water shortage) and sea level rise being considered as potentially having a moderate to major impact on their built assets. The impacts due to winter rain, winter temperature, and decreased snowfall were considered to be moderate to minor. The relationship between the variables was tested using the Spearman correlation test and a positive relationship between perception of climate change risk and various climate impacts was observed (Table 1).

Table 1: Correlation matrix for perception of risk and climate change impacts

IMPACTS	STATISTICS
Impact due to more winter rain α Perception of risk	$r = 0.268, n = 81,$ $p = 0.016 < 0.05$
More frequent storms α Perception of risk	$r = 0.437, n = 82,$ $p = 0.0001 < 0.05$
Decreased snowfall α Perception of risk	$r = 0.347, n = 81$ $, p = 0.002 < 0.05$
Increased winter temperature α Perception of risk	$r = 0.251, n = 81,$ $p = 0.024 < 0.05$
Frequent and severe flooding α Perception of risk	$r = 0.365, n = 81,$ $p = 0.001 < 0.05$
More extreme hot summers α Perception of risk	$r = 0.293, n = 81,$ $p < 0.008 < 0.05$
More summer droughts α Perception of risk	$r = 0.242, n = 81,$ $P < 0.030 < 0.05$
Changes in seasonality α Perception of risk	$r = 0.270, n = 81,$ $p < 0.015 < 0.05$

Hypothesis 5 – The acceptance of future climate change impacts results in their inclusion in disaster recovery plans

The identification of climate change impacts were correlated against inclusion of climate change impacts in disaster recovery plans. Two hundred and fifty three (54%) respondents said that they did consider climate change impacts in their disaster recovery planning, 162 (35%) said they did not. The relationship between the variables was tested using the Chi-square test which showed a positive association between the variables ($\chi^2 (1) = 7.233, p = 0.007 < 0.05$) with 72% of respondents who identified the impacts as major or significant addressing them in disaster recovery plans. Taken together hypotheses 4 and 5 suggest that where perception of risk is high, the facilities manager is able to convert these risks into impacts and then integrate these into disaster recovery plans.

Hypothesis 6 – Mitigation is driven through CSR (legislation compliance) and financial gain (through reduced taxation and energy saving).

Fifty four percent of respondents said that mitigation measures were routinely considered as part of their facilities management strategy compared to 38% who indicated that mitigation was not. With regards to the reasons for taking mitigation action, Corporate Social Responsibility (CSR) in combination with legislative and business drivers emerged as prime reasons (80%) for mitigation actions. In an associated question about the financial gain, 44% of respondents were positive about mitigation measures resulting in financial benefit another 32% were not sure about any financial gain and 24% were certain that the mitigation measures had not resulted in any financial gain. The relationships between mitigation, importance of CSR and financial gain was examined

through a Chi square analysis of the respondents taking mitigation measures as a routine part of facilities management strategy and their business drivers. Two drivers were identified as statistically significant, financial saving ($\chi^2(1) = 7.197, p = 0.007 < 0.05$) and organisational CSR ($\chi^2(1) = 6.778, p = 0.009 < 0.05$). Fifty seven percent of respondents expected a financial benefit from mitigation actions whilst 93.3% of respondents indicated CSR as the primary mitigation driver (with no expectation of financial gain).

DISCUSSION OF RESULTS

The results from the statistical analyses support the view that facilities managers are individuals set in an organisational context whose awareness of the importance of the environment is one of the factors determining the environmental decisions of the organisation. This finding is in agreement with that reported by Del Brio and Junquera (2002). There was a statistically significant relationship between an individual facilities manager's environmental inclination and their belief in anthropogenic climate change, and with their perception of climate risks which are enhanced if they have previous experience of a climate related extreme weather event. For adaptation, those facilities managers that possess a high perception of climate risk can associate this with specific weather impacts and develop disaster recovery plans to deal with such eventualities. This said, there is also evidence of other factors that affect the decision making process. The degree of variance seen in the results suggests that the adaptation decision-making process is complex, with numerous factors (outside the scope of this study) coming together to influence the final decision. For mitigation, the main drivers appear to be strategic with CSR the over-riding reason for developing mitigation plans. There is an expectation amongst some facilities managers that mitigation action should provide a financial return.

The findings of this study are generally in agreement with other studies. Pelling (2008) concluded that the adaptive behaviour of an organisation emerges from the individual behaviours of its members, in this case facilities manager's beliefs and perception would be of importance. O'Conner et al. (1999) highlighted the association between risk perception and willingness to address climate change, suggesting that risk perception matters in predicting behavioural intention and that the behavioural intentions about climate change are complex – 'people are neither non-believers nor complete believers.' It has also been suggested that recognising the causes of global warming is a powerful predictor of behavioural intentions independent of belief in climate change. Risk perception and knowledge share a common ground with environmental beliefs and that increased knowledge should promote action even in presence of a 'weak signal' and uncertainty of climate change. Berkhout et al. (2006) suggested that in relation to adaptation to climate change organisations find it difficult to adapt in the absence of valid external or internal signals and that organisational adaptation can be possibly understood by looking at concepts of organisational learning.

Finally, it would appear that facilities managers do possess the attributes required to effectively apply backcasting as the basis for a new approach to built asset management planning. There would appear to be a general recognition of the problems of future climate change and an attitude to risk, which is able to view climate futures as weather impacts that will affect the performance of a built asset. Where such futures are predicted, facilities managers already possess the skills to develop disaster recovery plans and it is only a small step to move from a reactive disaster recovery plan to a pro-active built asset management plan. Indeed, the development of a built asset adaptation strategy based on backcasting is currently being developed and tested by the authors as part of a Technology Strategy Board project on adaptation of UK social housing to climate change.

CONCLUSIONS

This paper presents findings based on an action research study and questionnaire survey of facilities managers in the UK. There was a statistically significant relationship between an individual facilities manager's environmental inclination and their belief in anthropogenic climate change, and with their perception of climate risks, which are enhanced if they have previous experience of a climate related extreme weather event. There was also a statistically significant relationship between CSR and mitigation action and financial gain and mitigation action.

Mitigation is strategically driven as a result of legislative and other external drivers (maintaining stakeholder perception, financial gain). The mitigation targets set in CSR strategies help drive interventions and individual and organisational inclination / belief towards environment and anthropogenic climate change play a positive role. Being strategic, mitigation measures gain top-level support and appropriate resources. Adaptation has not received the same level of support as mitigation in many organisations. Much of the adaptation action remains reactive and occurs in response to already experienced extreme events. As such adaptation tends to

be seen as part of the business continuity planning or disaster recovery planning and is considered an operational activity which has to compete for funds with other day-to-day building interventions.

In principle backcasting could provide a theoretical approach to built asset management planning. Facilities managers' demonstrate the fundamental characteristics and beliefs that would support such an approach. At present a number of operational and managerial barriers exist to the use of backcasting, including: facilities managers' attitudes to risk and uncertainty; limited confidence in the future needs analysis; the ability to project a built asset adaptation and mitigation journey; corporate perception and attitude to environmental issues; and personal characteristics and beliefs. These issues are currently being examined in a separate study investigating the development of a built asset management adaptation strategy for UK social housing. The project is working with a single social housing provider and their professional advisors to predict climate change impacts (environmental, physical, social and economic) on their housing stock and then backcast from this an adaptation journey to ensure that the housing remains functional in the light of inevitable climate change. Through such an approach adaptation will become a strategic issue supported by long term plans rather than an operational issue that has to compete for limited, short term resources.

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A CONSUMPTION BASED FRAMEWORK FOR CITY CARBON MANAGEMENT

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The role of city level climate change mitigation strategies is crucial for the attempts to meet the mitigation targets on both global and national levels, but sustainable assessment frameworks are still pending. Current methods may often heavily underestimate the city level emissions as they tend to include only the emissions occurring within the geographic city boundaries, whereas the carbon intensive production tends to locate outside of the cities. Furthermore, an effective city level assessment framework should also recognize the negative discount factor on the temporal occurrence of the emissions. This study presents a concept for a comprehensive and sustainable city level carbon management framework based on a hybrid LCA approach. The two key features are the consumption perspective of the framework and its ability to distinguish the temporal occurrence of the emissions. The proposed framework is currently being developed for two Finnish cities of Helsinki and Vantaa. The paper both presents the assessment framework and demonstrates its utility in city carbon management. As examples, the study depicts that, when the time perspective is included in the analysis, construction of low-carbon buildings is a useless short term carbon mitigation strategy, and that the carbon mitigation effect of an increase in the density of the city structure is almost inexistent.

Keywords: climate change mitigation, greenhouse gas, city management, life cycle assessment, sustainability

INTRODUCTION

The role of city level climate change mitigation strategies is crucial for the attempts to meet the mitigation targets on both global and national levels. Cities are estimated to produce up to 80 % of all greenhouse gases (GHGs) globally (UN 2007). In addition, some recent studies indicate that the per capita carbon emissions might be higher in the cities compared to the surrounding areas (Heinonen and Junnila 2011a, Sovacool and Brown 2010), and even seem to rise as the size of the urbanization grows (Heinonen et al. 2011).

Different approaches for the city level carbon management have been suggested, but sustainable solutions are still urgently needed. While assessment models for city level GHGs are plenty (Säynäjoki et al., yet to be published), the assessment results differ heavily from each other depending on the qualities of the models. To give an example, the per capita carbon footprint in Helsinki, the Finnish capital, is reported as 4.3 tons of CO₂ equivalents (t CO₂e) by CO₂-report (CO₂-report 2010), somewhat over 6 t CO₂e by City of Helsinki (City of Helsinki 2007) and almost 13 t CO₂e by Heinonen and Junnila (2011b). This is due to a characteristic often related to cities globally, that a substantial share of all consumed goods is imported from outside of the city area (Schulz 2010, Ramaswami et al. 2008, Wiedmann et al. 2007). Yet many assessment models mainly account for the emissions occurring within the geographic city region leading to underestimation of the climate change burden a city is accountable for.

Furthermore, there is a negative discount factor on the temporal occurrence of the emissions (Schwartz 2011). Due to the very slow disappearance of the GHGs from the atmosphere and current unsustainable emission levels (IPCC 2007), the GHGs emitted now are more detrimental than those emitted in the future. This problematic brings along a need to take into account the temporal perspective on the emissions. For example, one prevailing conception is that construction of low-carbon buildings would be an effective mean to lower the city level carbon emissions (Ministry of the Environment 2008). However, recent results seem to refute this belief. When the time perspective is included in the analysis, the long carbon payback time of construction overrules the mitigation effect for up to decades (Heinonen et al. 2011b). Thus, the current city level carbon management frameworks seem to be unable to provide sufficient basis for effective mitigation strategies.

In this study we propose a concept for a comprehensive and sustainable city level carbon management framework. The two key concepts are the consumption perspective of the framework and its ability to distinguish the temporal occurrence of the emissions. Cities are consumption centres with a majority of all the emissions from the consumption actually generated elsewhere (Ramaswami

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et al. 2008, Schulz 2010, Heinonen et al. 2011a). Thus, only integration of the consumption perspective into the city level carbon management leads to sufficient understanding of the emission sources and globally sustainable mitigation solutions. Furthermore, virtually all the global GHGs can be traced down to the end-consumers purchasing and utilizing the produced goods and services. The framework we propose utilizes hybrid life cycle assessment approach and includes all emissions of private consumption. The framework allows scenario building and is suitable for global comparisons.

The proposed framework is currently being developed for two Finnish cities of Helsinki and Vantaa in a two-year research project that commenced in 2011, but earlier studies have tested the approach in several other Finnish contexts. The paper presents the concepts of the framework in general and gives examples from different earlier case studies in Finland. While the context of the paper is Finland, we argue in the course of the paper that similar approaches would be feasible elsewhere too.

The remainder of the paper is structured as follows. Section 2 explains the generally the method employed in the assessment. However, as the model exploits formerly developed models by the authors, some earlier publications are utilized as references and supplementary information for the interested. In Section 3 the design of the construction of the carbon management framework is depicted. Section 4 demonstrates the utilization of the model with some early results. Section 5 evaluates the model and discusses the qualities and needs for further development. In Section 6 the overall conclusions are presented.

METHOD

The carbon management framework employs an input-output (IO) based tiered hybrid lifecycle assessment (LCA) method (Suh et al. 2004, Crawford 2011). The method produces comprehensive assessments deriving from the general quality of IO based LCA models to assess an infinite number of upstream production and supply chain processes (Crawford 2011). Furthermore, the method exploits monetary inputs and previously defined output tables, qualities that make the method especially suitable for complex system level assessments. Monetary data are broadly collected and the assessments are fast to conduct. The method also accommodates local emissions data which increases the accuracy of the results.

In more detail, the proposed city carbon management framework combines two different models developed by the authors: a consumption based assessment model for the use phase, and a separate construction phase GHG assessment model. This quality of the framework allows temporal analyzes and drawing the attention to the temporal allocation of the emissions.

USE PHASE ASSESSMENT MODEL

The use phase model takes into account the lifecycle GHG emissions of all the private consumption, and creates thus a comprehensive understanding on the sources and relative magnitudes of the emissions. The included GHGs are (CO₂, CH₄, N₂O and HFC/PFCs), all of which are referred with carbon management in the paper.

Versions of the use phase model have been presented lately in several academic journals (Heinonen and Junnila 2011a-c, Heinonen et al. 2011a and b). The proposed framework employs the version of the model published in Heinonen et al. (2011a). The model utilizes the output tables of the Carnegie-Mellon University Economic Input-Output LCA (EIO-LCA) (Carnegie-Mellon University 2008) as the basis assuring a comprehensive WRI Scope 3 perspective (WRI 2009) on the emissions. The model utilizes local emissions data on the combustion phase emissions of local power generation, on the emissions of fuel combustion of private driving and on the full lifecycle emissions of public transport. These can be Finnish average data or more detailed regional, city or sub-city level data depending on the need.

For the use phase emissions assessments, the model exploits the Finnish Consumption survey data of Statistics Finland (2011), the current most recent survey being from 2006. The survey creates a very detailed picture of the consumption patterns of different types of consumers. The data includes the annual purchases of different goods and services in approximately 1,000 categories. Different basic consumer profiles can be created and incorporated in the model (e.g. average city resident, average dwelling resident, average one child family etc.), but arbitrary changes on different consumer characteristics are also possible. With these the consumers can be attached to a certain area or new residential development, or just simulate the changes in the emissions by altering different variables.

The use phase assessment model is also layered in the sense that not all the included emissions need to be shown in all the assessments. This quality is important as the potential to affect the carbon load from consumption of different goods and services of city carbon management varies significantly between different types of consumption. Choices on building qualities and local power generation

affect the emissions of the residents directly. Location and infrastructure, including public transport availability, affect the transport related emissions, but the relation is indirect. The choices of the residents will most likely have a predominant role anyway. The rest of the consumption related emissions are more difficult to affect by city level decisions. Local power generation affects the emissions related to all goods and services produced utilizing the energy, but the connection is again indirect and the quantification of the impact even more difficult to assess. However, it is important to understand the sources and the distribution of the emissions in city carbon management to be able to position the reduction targets and find the means to achieve them.

CONSTRUCTION PHASE ASSESSMENT MODEL

Similarly to the use phase, the construction phase assessment model utilized has been developed previously by the authors (Säynäjoki et al. 2011). The model has an areal perspective on new construction as in addition to the buildings, also the infrastructure construction is incorporated. Only residential construction is taken into account however, as the employed IO method in the use phase model allocates the emissions of retail and production facilities to the produced and sold goods and services (Hendrickson et al. 2006).

Deviating from the use phase model, the perspective in the construction phase emissions assessment is production based. The method is the same IO based tiered hybrid LCA, but the model exploits construction costs as the input data. The IO basis is formed by the EIO-LCA (Carnegie-Mellon University 2008) similar to above, as is the model's ability to accommodate local data. However, the construction phase model accommodates both monetary and quantity based local data. The local aspects incorporated in the model include energy similarly to the use phase model, and concrete and steel where the full lifecycle is covered with Finnish domestic data as the production of these is predominantly domestic.

The level of detail of the construction phase assessment can vary according to the input data. In the conducted assessments (Säynäjoki et al. 2011, Heinonen et al. 2011b) the overall construction costs have been disaggregated to 15 cost categories regarding the buildings and six categories regarding the infrastructure, both including a category Others. However, the model can be flexibly disaggregated further if data are available.

For the management framework, representative profiles can be created to simulate situations where no site-specific data are available. Alternatively all or just arbitrary characteristics can be replaced by actual project data or the outcomes simulated by altering the different variables.

RESEARCH DESIGN

This section concerns the current research project in which the two above described assessment models are combined and a user interface is being built to allow utilization of the framework in city level decision making. The project commenced during the summer of 2011 and is expected to take two years. The city partners in the project are Helsinki, the Finnish capital and Vantaa, a large city in Finnish context and a neighbour of Helsinki. Third partner in the project is Helsinki Region Environment Services (HSY). The objective of the project is to produce a comprehensive GHG emissions assessment framework to support city carbon management in early urban development strategic planning. The project is funded by the partners and the European Regional Development Fund (ERDF) and coordinated by Culminatium Ltd. The project is also part of a wider body called Sustainable Living and Working Environments (K-EASY) (<http://www.kestavaasuminen.fi/en>).

The background of the project lies in earlier development work on the two GHG assessment models by the authors at Aalto University Finland. The current project relies predominantly on the knowledge from that work as during the course of the project a thorough development of the assessment basis would not be possible. Thus even in the current early stage of the project, interesting results can be presented to simulate the utilization of the framework under construction.

The project started with data collection from case development projects of the partner cities. The selected projects are either finished or in a relatively mature stage. The aim is to assess the emissions of these projects based on real case specific data to build the framework and test its utilization in a real-life environment. This information combined to the data from earlier development with the assessment models allows later utilization of the management framework for scenario and simulation purposes without existing case data. As the project is currently partly still in this phase, the results presented later employ different cases.

During the autumn of 2011 the first version of the management framework will be constructed. With this beta version the selected case development projects' climate change impacts will be assessed by the authors. When the assessment is ready, the results will be

exploited to present the utilization of the framework for representatives of the partner organization. In this stage, scheduled to take place in January, input from the partners is gathered to develop a user interface for the framework. The partner representatives are presented the assessment results together with simulations of the effects of different low-carbon strategies. The representatives are asked to contribute to the variables they see the most important for them for arbitrary altering, as well as which should be constants behind the interface. While the primary target is to gather information for the next development stage, another aim is to teach the partner organizations to understand the carbon load caused by the city residents and the sources of the emissions.

During the spring of 2012 the first user interface will be developed utilizing the gathered information. The new version of the framework will be utilized to assess the GHGs in the environment where the framework is targeted: early development projects still in planning phase, when the most significant changes are possible. The partners will also run test assessments on their own and report their thoughts on the usability as well as on their understanding of the results. At this phase, the framework will also be equipped with a selection of predetermined consumer profiles, building types, power generation alternatives and other variables according to the needs of the users. Concurrently with the described development of the framework the assessment methods will be also developed further.

In the final phase of the project the finished framework will be put into the Internet to be used with a browser. The partner organizations are trained to use the framework and consultation on integrating the framework into their decision-making processes will be given to them. However, the target is broader utilization of the framework, and thus a possibility for other cities and counties in Finland to adopt the framework will be given.

UTILIZING THE MANAGEMENT FRAMEWORK

Even though the research project to create the carbon management framework described in earlier sections, interesting results have been achieved during the development of the assessment models of the framework. In this section some of these will be presented and the possibilities of the framework discussed based on the earlier assessments.

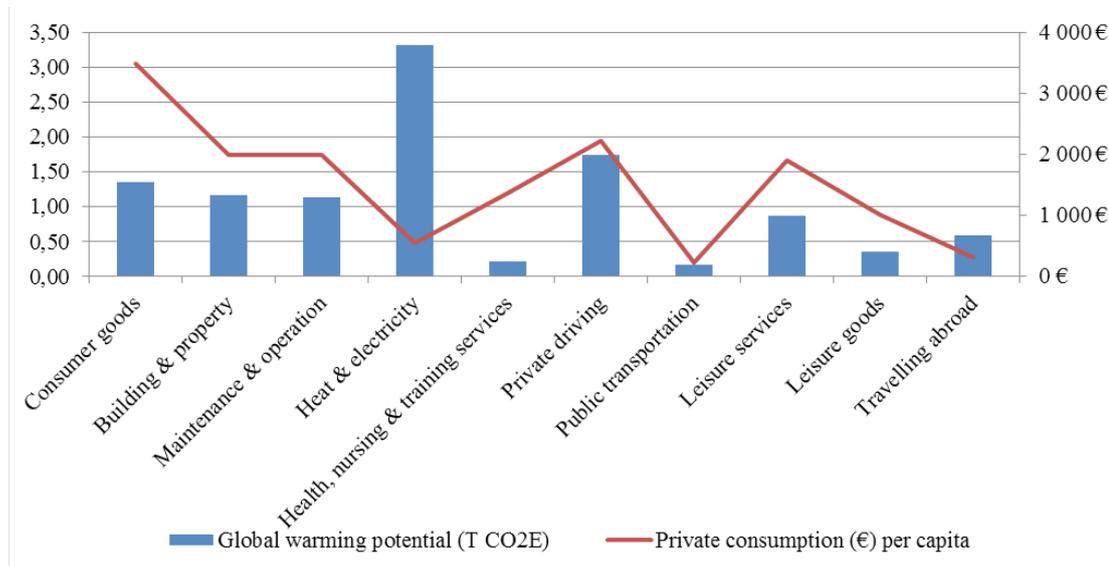


Figure 1. The GHG emissions of private consumption and private consumption in euros (Heinonen et al. 2011c)

CITY LEVEL CARBON MITIGATION STRATEGIES

When developing the use phase GHG assessment model we conducted a study for city of Tampere, an important inland city in Finland. Three different strategies aimed to reduce the carbon load caused by the city were analysed in the study (Heinonen et al. 2011d):

1. An increase in the share of renewable fuels to 30% and 80 % in the local power plant
2. Low-carbon new residential construction
3. Densification of the city structure
4. A reduction of private driving and increase in the share of public transportation.

Here we concentrate on the strategies 1, 3 and 4, as the employed model had no temporal perspective and was thus not able to demonstrate the detrimental effect of the construction phase emissions in the number two strategy.

In the first stage of the study we created an overall picture of the carbon consumption of an average resident, that is, the lifecycle GHGs related to all his/her consumption. The result of the assessment was 10.9 t CO₂e (Heinonen and Junnila 2011b). The consumption was grouped to 10 categories to demonstrate the distribution of the emissions. Figure 1 depicts this distribution. The monetary consumption volume was also added to the figure, since monetary transactions are one of the primary incentive sources when the carbon emissions reductions are intended to manage.

Figure 1 shows that the single most important source of emissions on city level in Tampere are the GHGs from energy use. However, the category is far from being the most important in monetary terms, which makes it problematic to support voluntary emissions reductions related to energy. Private driving and consumer goods are the second and third most important, but the first and second in monetary terms. A problem with these is that, the emissions from the consumption of consumer goods divide into huge amount of small sources, city can predominantly influence the consumer choices indirectly, and the consequences of alternative choices are difficult to assess and communicate. However, based on Figure 1, the strategies 1 and 4 would seem feasible.

When assessing the outcomes of the strategies, the 30% increase scenario in the share of renewable fuels (from close to zero (Finnish Energy Industries 2008) at the local power plant was found to reduce the carbon consumption of an average resident by 0.7 t CO₂e. When a share of 80 % was assumed, the result was a reduction of as much as 2.0 tons on the overall carbon consumption. In addition, the effect of the change was only assessed on housing energy, but the change would actually have a broader effect in the form of reduction in the emissions of other goods and services produced utilizing the energy. However, the assessment model was not able to take these into account.

The assessment model interestingly showed the other two strategies to have very little impact on the carbon consumption of an average resident. To assess the potential of the strategy number 3, we assumed a decrease in the density of the city structure leading to an increase in the daily private driving by 10 %. According to the model, the 10% increase would add only 0.2 t CO₂e to the carbon consumption of a resident. Furthermore, even this relatively small increase would only concern those whose driving would actually increase. Reversely, a similar shift of 10% from private driving to public transport in daily trip generation would, according to the model, reduce the overall GHGs by the same 0.2 t.

NEW RESIDENTIAL AREA DEVELOPMENT

The second demonstration on the utilization of the carbon management framework concerns a residential development project in Espoo, a city in Helsinki Metropolitan Area. New residential development is stated one of the key means to reduce the city/national level GHGs. The connection comes from a reduction in the housing energy consumption due to current significantly tighter regulation. The results of the study have published in Heinonen et al. (2011b).

Again the study begun with an assessment of the consumption phase carbon emissions of two defined typical consumers of the area planned for roughly 1,100 residents. Now, as the concern was a new residential area, the average use phase emissions resulting from construction activities were left out of the assessment. The annual energy purchases were also adjusted to match the energy efficiency of the buildings, approximately 50% below the city average. In addition, only the building related emissions, where the developer and the city have the most impact potential, were taken into account.

In the study the construction phase emissions were assessed separately to create a temporal perspective on the carbon load caused by the area as a whole. These were then combined to the use phase emissions similarly as will function the carbon management framework being created.

As in the Tampere case above, several carbon mitigation scenarios were created. In Figure 2 the results of the one assessing the outcomes with different building energy efficiency levels are shown on a 25-year life span.

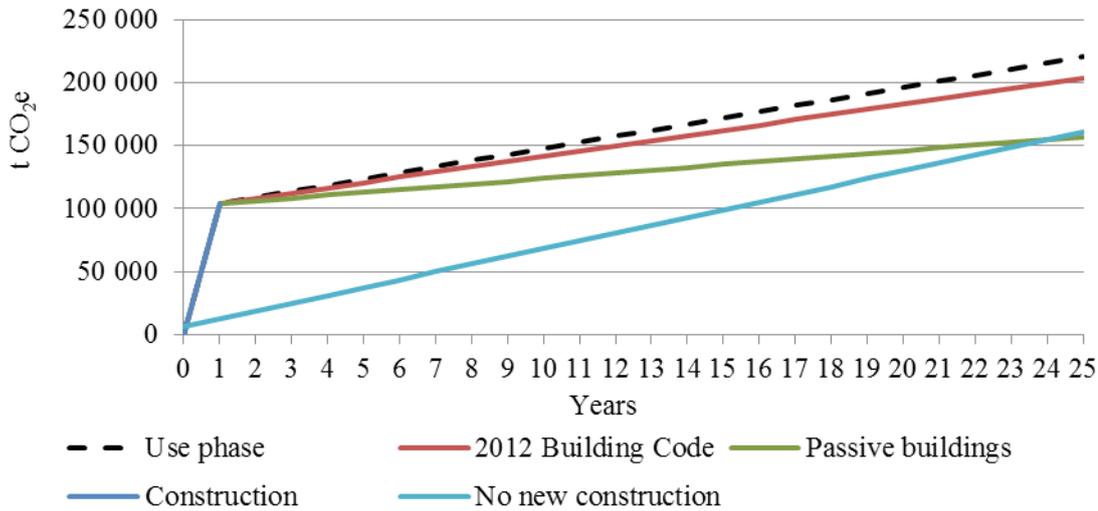


Figure 2. The life cycle emissions of the residential area with the different building energy efficiencies.

In Figure 2 the dashed line presents the basic scenario with 2010 National building Code energy efficiency of the buildings. The “No new construction” scenario gives perspective on the carbon spike from construction relative to the gains from reduced energy consumption. The results depict interestingly that the carbon payback time of the construction phase emissions is so long that even with passive buildings new construction can only aggravate reaching the mitigation targets in the near future. During the 25-year lifecycle, the share of the construction phase emissions is almost 50% in the basic scenario and approximately two thirds in the passive building scenario.

Furthermore, from the broader city perspective, it would be of high importance to analyse the effects of new construction on the city level as a whole. The management framework under construction will be able to demonstrate the effects on city level with arbitrary scenarios on the rate of renewal of the residential building stock. For example, with an annual renewal rate of 1% the GHGs begin to decline due to building energy efficiency, *ceteris paribus*, somewhere between 2030 and 2050 depending on the other assumptions (Säynäjoki et al. 2011b).

DISCUSSION

This paper argued the need for consumption based LCA frameworks for city level carbon management, and presented a project where such a framework is being developed. Moreover, it was argued that a very important perspective in such a framework would be ability to accommodate temporal analyses, as the temporal occurrence of the emissions is of high importance, but has been ignored by many assessment models.

The method section of the paper presented in general the important features of both a consumption based LCA approach and the grounds for the temporal allocation of the emissions. The framework under construction exploits two different LCA models developed by the authors, and thus a profound discussion about the details of both models was passed with references to previous academic publications of the development of the models.

Since the project developing the proposed management framework is yet not finished, as described in Research design section, the results presented were retrieved from earlier studies. With these the utility and possible applications of the framework were depicted. The first case, city of Tampere, showed that of three potential city level carbon mitigation strategies only low-carbon local energy production produced significant change. In the 80% renewables scenario the annual average carbon footprint of the city resident was reduced by 2.0 t CO₂e, almost 20%. Density and the share of public transport were found to affect the carbon emissions very little.

The second case concerned a new residential area in Espoo. In the referred study the area level carbon emissions were assessed in 25-year lifespan taking into account the temporal allocation of the overall carbon load (Heinonen et al. 2011b). Of the scenarios assessed in the particular study, the results on altering the building energy efficiency were shown to demonstrate a couple of important perspectives for city level carbon management. First, the construction phase emissions rise significantly in importance when the temporal allocation of the emissions is taken into account. In the presented case the GHGs from construction resulted in

approximately 10 times the overall annual use phase emissions of the area. Second, the carbon payback time was found to be so long that achieving the near future climate change mitigation targets can only be aggravated with new residential construction regardless of the building energy efficiency level.

The type of framework described in the paper would be of high importance for cities aiming for low-carbon development. Production based information about the emissions occurring within city borders help in creating strategies to reduce the emissions from carbon intensive industries. However, these types of assessments give no grounds for comparisons between cities as different types of industries are located somewhat randomly between cities. In addition, outsourcing of the emissions outside of the city borders with for example relocation of production facilities cannot be taken into account, and would show success in reducing the emissions, but in reality the global outcome might be even just the reverse (Turner and Hanley 2010). Cities often rely heavily on production taking place outside of the city (Schulz 2010, Ramaswami et al. 2008) making consumption based assessments the only way to create comparable and globally reliable carbon balances.

Of high importance would also be the ability of a carbon management framework to be able to take into account the temporal allocation of the emissions. There is a negative temporal discount factor in carbon emissions, that is, emissions occurring now are more detrimental than those occurring in the future (Schwietzke et al. 2011). While in the presented combination of the two assessment models this perspective is highly simplified, work is underway to incorporate new variables and increase the reliability of the temporal analyses.

CONCLUSIONS

Sustainable city level carbon management cannot rely on the traditional production based and geographically restricted GHG assessment methods. As a majority of the goods consumed within a city are often imported, the assessments should as well include the outsourced emissions. With two examples we demonstrated the utility of a GHG assessment framework that has a consumption perspective and that can distinguish the effect of the temporal allocation of the GHG emissions. We argue that the type of assessment framework presented here will be of high importance in city level carbon management in the future.

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ACHIEVING LOW CARBON SOCIAL HOUSING THROUGH INNOVATION

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Achieving a low carbon future continues to be one of the most challenging issues facing today's built environment professionals. While significant advances have been made in the area of new build, the same cannot be said for the existing housing stock. In the UK 70% of the housing that will exist in 2050 has already been built. If the UK is to have any chance of meeting its 2050 carbon reduction targets, effective refurbishment strategies that significantly reduce the carbon footprint of existing housing need to be developed. However, whilst it is generally acknowledged that retrofit to existing buildings is more complicated than new build, the issues that need to be addressed are not primarily technical, but organisational and managerial. The combination of attitudes towards risk and awareness of innovative solutions result in organisational barriers to the wide uptake of low/zero carbon technologies.

This paper presents the findings of a research study into the level of perceived organisational sustainability and factors that influence refurbishment decision making amongst 57 UK social housing providers. It identifies a range of maturity indicators from Initiation, through Contagion and Control, to Maturity that can be used to distinguish between approaches to sustainable refurbishment. A research questionnaire was used to establish the level of maturity (in the sustainability innovation context) and decision making characteristics of the responding organisation along with their experiences of sustainable refurbishment of their housing stock. The paper identifies a range of organisational characteristics and maps these against the organisation's position along a "general" innovation journey through an S curve maturity model. The paper identifies a shift from national level drivers and barriers to local level interpretation of the wider sustainability agenda as the key differences between Initiator and Mature organisations. The paper concludes that it is possible to profile UK social housing providers and develop management instruments to accelerate their journey along the sustainable innovation curve. This in turn will accelerate the uptake of sustainable refurbishment programmes.

Keywords: sustainability, housing, refurbishment, existing stock, innovation, low carbon housing

INTRODUCTION

The UK housing stock comprises approximately 21,333,000 dwellings of which 14,537,000 are privately owned, 3,159,000 are private rented and 3,637,000 are social housing (DCLG 2011). It is considered to be inefficient (as measured through the Standard Assessment Procedure) and, despite improvements to its thermal insulation over the past 35 years, achieving a meaningful reduction in associated CO₂ emissions will require the greater uptake of innovative technologies (BRE 2008). Further, given the low rate of demolition and new build, approximately 70% of the dwellings that will exist in 2050 have already been built (SDC 2006). As such, if the UK Government is to reach its stated 80% reduction in CO₂ emissions by 2050 (Climate Change Act 2008) it will have to do so by addressing the contribution that existing housing makes. Whilst it is generally accepted that retro-fitting low or zero carbon (LZC) solutions to existing buildings is more complicated than installing them in 'New Build', these complications are largely socio-economic rather than technical (Broadman 2007). Whilst it is true that certain LZC technologies require consequential changes to be made to the building fabric or services (e.g. ground source heat pumps) these changes are not beyond our current technological abilities. More importantly it is the potential impact that retro-fitting LZC technologies have on the economic and social well-being of the occupant, and for private and public rented accommodation, on the landlord organisation where there is a disjuncture between who pays for, and who benefits from, LZC technologies, that is the real barrier to widespread uptake. Thus, understanding these barriers and identifying suitable drivers that can overcome them is essential if the UK housing sector is to have any chance of reducing its CO₂ emissions in line with Government targets.

In the owner occupied sector the UK Government has identified initial cost of procuring and installing LZCs as the major barrier to their uptake and has developed the 'Green Deal' as a fiscal driver to overcome it (DECC 2010). The Green Deal will allow home-owners to off-set the initial costs against a long term payback through an increased tariff on their energy bills. The initial funding for the LZCs will be provided by third-party organisations (at the time of writing it is unclear exactly who will constitute a third-party organisation,

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but the expectation is that energy supply companies and high street retailers will provide the majority of funding) who will then receive a return on their investment through increased meter tariffs. Homeowners will be able to use the energy they generate and sell any surplus back to the grid and, as such, they should see a decrease in real terms in their fuel bills. This latter scenario however will only be realised if the energy generated reduces fuel bills by more than the increased tariff. This condition is known as the 'Golden Rule' and an initial assessment needs to be made by the home owner as to whether their particular house satisfies this rule (ibid).

Whilst the Green Deal was initially intended for the owner-occupier sector, it could also prove attractive for social sector landlords. In the social sector, whilst initial costs are seen as a barrier to LZC refurbishment they are not the only issues that landlords consider when making refurbishment decisions. Attitudes to innovation and risk, impact on tenants' quality of life (both during the refurbishment period and over the operational lifecycle), return on investment, legislation and knowledge/skills have all been identified as barriers to the uptake of LZC technologies (Kaluarachchi & Jones 2008). However, these barriers are not consistent across public sector landlords with a number of landlords delivering ambitious LZC refurbishment projects whilst others undertake only minimal projects to satisfy basic legislation.

The project reported in this paper explored the reasons for these different approaches. The aim of the project was to explore the decision making process for sustainable refurbishment in the UK social housing sector. In particular the project sought to: understand the role that sustainability played in refurbishment decision making; identify the drivers and barriers to sustainable refurbishment; and relate these drivers and barriers to other influencing factors in the refurbishment decision making process.

The research identified a series of organisational characteristics that were associated with an organisation's position along the innovation journey from which management interventions could be developed to help accelerate the uptake of LZC technologies in the UK social housing sector. The project formed part of a much bigger multi-disciplinary Sustainable Urban Environment project which examined the role of Innovation in the Design, Construction and Operation of buildings for People (IDCOP) funded by the UK Engineering and Physical Sciences Research Council.

THE INNOVATION JOURNEY

There are numerous theories that seek to explain the innovation process. The Carbon Trust Business Model of innovation identifies four parallel journeys (technology, company, market and regulation) that must be completed if LZC solutions are to be effectively integrated into organisations. At each stage of these journeys, barriers need to be overcome before the journey can continue. As such, achieving successful innovation is a complex mix of competing activities where a step forward in one journey often requires a preceding step forward in a parallel journey (Carbon Trust 2008).

Rogers (2003) examined the factors that governed the uptake of innovation, identifying: the degree of relative advantage; compatibility with existing values and practices; simplicity and ease of use; trialability; and observable results as key drivers that influence the speed of uptake of innovative solutions. Rogers (2003) also identified five different population segments (innovators, early adopters, early majority, late majority and laggards) and suggested that an innovation would need to appeal to generic characteristics of those in each segment if it was to achieve a wide uptake (Robinson 2009). Earl (1989) applied a similar approach to Rogers (2003) when he investigated the uptake of Information Technology in data processing organisations.

Earl (1989) identified a multiple S curve model to describe uptake of the then innovative technology, attributing positions along the S curve to stages of organisational maturity (Initiation, Contagion, Control and Maturity). By observing organisational characteristics at each stage of the S curve Earl (1989) identified operational and strategic policies and management orientations that governed the degree to which IT had effectively been integrated into the business. Where Earl's (1989) view differs from Rogers's (2003) is that Earl suggests an organisation can move through each stage of the maturity curve whereas Rogers argued that an individual is pre-disposed to be in a specific stage. As such Earl (1989) argued that that management intervention could be used as a driver to accelerate the innovation journey. Finally, Hinks et al (2007) applied the S curve model to facilities management, using it to distinguish between sustaining and disruptive innovation.

Hinks et al. (2007) argued that if innovation follows a continuous S curve (sustaining innovation) then it can only produce innovation that is incremental on what has gone before. As an innovation reaches the end of the S curve journey then the ability of the next incremental improvement to deliver meaningful advantage will diminish and as such its uptake rate will decline. At some point a

step change will be required (disruptive innovation) if continuous improvement is to be maintained. At this point innovation ‘jumps’ from one journey (sustaining) to another journey (disruptive) and the S curve cycle starts again. These theories were combined in this project to investigate the uptake of sustainable technologies in the refurbishment of UK social housing.

METHODOLOGY

A questionnaire survey was undertaken in 2008 to identify the role that innovative technologies and processes played in the sustainable refurbishment of UK social housing. The questionnaire, which was sent to Chief Executive Officers of Registered Social Landlords and Heads of Estates for Local Authorities, examined the barriers and drivers to sustainable refurbishment projects and related these to organisational characteristics and management attributes. In particular the questionnaire sought to measure level of organisational maturity (as far as sustainability was concerned) and establish whether this was an appropriate tool for profiling the effectiveness of sustainable (refurbishment) built asset management. To this end organisations were asked to indicate where they believed they were located on an innovation S curve (Figure 1). As a guide, qualitative statements were attached to each stage of the S curve.

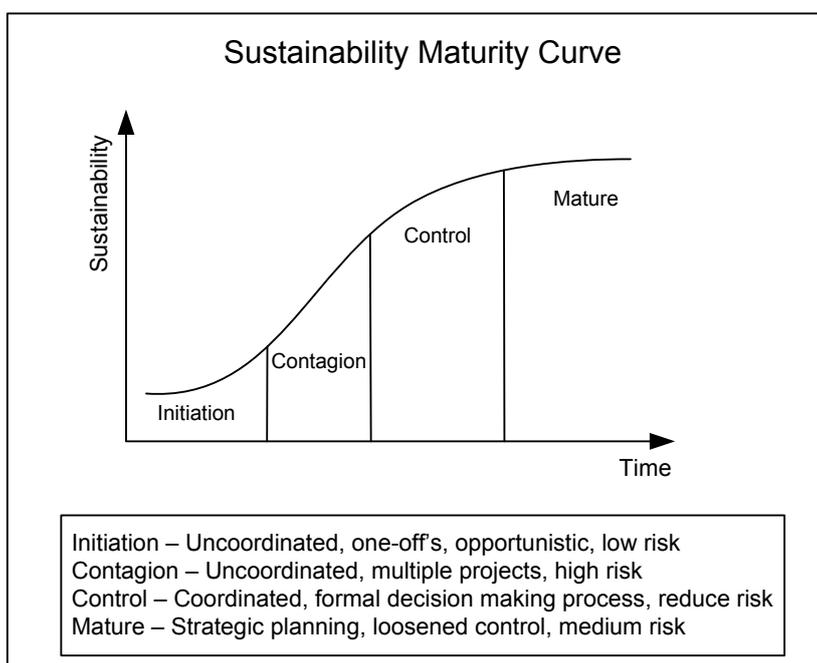


Figure 1: Sustainability Maturity Curve

The questionnaire comprised 15 questions covering: interpretation of the sustainability agenda; formal policies and business procedures; perceived drivers and barriers to sustainable refurbishment; and the decision making process / business case for action. A total of 500 questionnaires were distributed and 57 responses were received, representing the response rate of 11.4 %.

RESULTS

Of the 57 respondents, 17 placed themselves at the Initiation Stage; 20 at the Contagion Stage; 14 at the Control Stage and 2 at the Mature Stage. Four respondents avoided answering this question and they have been excluded from the analysis presented in this paper.

MEANING OF SUSTAINABILITY

Respondents were asked a series of questions about their understanding of sustainability and the relative importance that they believed each attribute should contribute towards a sustainability assessment. All respondents identified that sustainability was about balancing environmental, social and economic performance of their housing stock, but the relative importance that they attached to each attribute varied depending on where they placed themselves on the sustainability maturity curve.

Those at the Initiation Stage tended to rate each attribute as of equal importance (environmental – 34%; social – 33%; economic – 35% in levels of importance) when assessing whether a solution was sustainable, whilst those at the Contagion and Control Stages placed more importance on economic (39% and 31% respectively) and social (38% at both stages) attributes. Those at the Mature Stage had the most unequal balance between the attributes, rating environmental attributes lowest (20%) and social attributes highest (45%).

THE ROLE OF SUSTAINABILITY POLICIES

Eighty-seven percent of respondents had a formal sustainability policy within their organisation. Of those that didn't, all placed themselves as at the Initiation or very early Contagion Stage of the sustainability maturity curve. Although a few respondents had had a policy for many years, the majority had implemented their policy between 2006 and 2008. Whilst all the distributions followed a similar pattern (no pattern can be determined for Mature organisations due to low numbers) the distributions for both Contagion and Control Stages appeared offset to the Initiation Stage suggesting a possible relationship between time and level of maturity. However, the shift was not as pronounced as expected and as such could indicate that factors other than time were affecting levels of maturity.

THE ROLE OF STRATEGIES AND POLICIES

Of those organisations that had a sustainability policy, 19.3% ranked it as 'very important' and 24.6% as 'moderately important' when making decisions about refurbishment options. This was particularly true of those organisations that placed themselves at the Initiation Stage of the sustainability maturity curve who tended to use their sustainability policy as the most important decision making criterion whereas those at the Contagion and Control Stages took a more balanced view, considering their sustainability policy alongside other policies and strategies.

Those organisations that classed themselves as Mature used a range of policies and strategies of roughly equal importance when making refurbishment decisions. For those organisations where the sustainability policy was not the primary driver: legislation; tenant satisfaction; and the overall business case were all identified as either equally, or more important, than the sustainability policy when making refurbishment decisions. Other factors identified as important when funding refurbishment programs included: lifecycle analysis; commercial return; available finance and environmental impact (note: this was free text data and, as such, relative importance between the factors cannot be determined).

DRIVERS AND BARRIERS FOR SUSTAINABLE REFURBISHMENT

Respondents were asked to indicate which of nine potential drivers and ten potential barriers (listed in the questionnaire) they believed were relevant to their refurbishment decisions and to rank these in priority order. The most important drivers were: tenant satisfaction (20.5%); government policy (20%); available funding/business support (13.9%); legislative support (9.4%); and education/knowledge (9.4%).

With regards to the barriers for sustainable refurbishment: lack of funding [17.7%]; high initial capital cost [17.3%]; long payback periods [13.8%]; value for money [12.1%]; fear of risk [8.3%]; and lack of knowledge [8.3%] were perceived as major barriers. An analysis of the drivers and barriers across the maturity stages (Table 1) shows variations in the relative importance of each attribute at each stage. With regards to the drivers, the further along the sustainability maturity curve an organisation is, the more important locally focused drivers become. Whilst a similar trend can be seen for the barriers, access to funding was an issue for all respondents.

Table 1: Drivers and Barriers to Sustainable Refurbishment

Stage	Drivers (1 – most important)	Barriers (1 – most important)
Initiation	1. Government policy; 2. Funding support; 3. Tenant satisfaction; 4. Legislation.	1. Capital cost; 2. Lack of funding; 3. Legislation; 4. Long payback periods
Contagion	1. Government policies; 2. Tenant satisfaction; 3. Funding support.	1. Lack of funding; 2. Capital cost; 3. Long payback periods; 4. Value for money; 5. Fear of risks.
Control	1. Tenant satisfaction; 2. Government policies; 3. Organisational hierarchy; 4. Funding support; 5. Legislation.	1. Lack of funding; 2. Capital costs; 3. Value for money; 4. Lack of knowledge.
Maturity	1. Tenant satisfaction; 2. Other – Life cycle performance; 3. Government policy.	1. Capital cost, value for money; 2. Funding; 3. Long payback periods.

GOVERNING FACTORS FOR SUSTAINABLE REFURBISHMENT

Respondents were asked to identify the governing factors that determined the level of sustainable refurbishment that they believed was required (Table 2). Eighty percent of respondents identified the state of their housing stock followed by organisational leadership (56%), return on investment (56%), tenant buy-in (52%), and confidence in the solution (52%) as the most important factors when identifying which sustainable refurbishment projects to undertake. Whilst this pattern is similar at all stages of the sustainability maturity curve it appears more pronounced amongst mature organisations, where a combination of local and community issues, rather than organisational issues, govern their decision making.

Table 2: Governing Factors Affecting Sustainable Refurbishment

	INITIATION	CONTAGION	CONTROL	MATURE
Deprivation	23%	35%	56%	50%
Housing state	69%	82%	89%	100%
Confidence	54%	53%	56	0
Legislative support	38%	18%	50%	0
Tenant buy-in	38%	47%	67%	50%
Organisational focus	62%	41%	72%	0
Return on investment	77%	47%	50%	0

DECISION-MAKING PROCESS

The final section of the questionnaire sought to identify differences in the decision-making hierarchy or implementation routes between organisations at different stages of the sustainability maturity curve (Table 3). It appears that, whilst many management and decision making attributes are common to all respondents, the degree to which they influence sustainable refurbishment decisions varies.

At the Initiation, Contagion and Mature Stages decision-making is devolved and reporting/monitoring is relaxed. At the Control Stage, management approaches are more prescriptive and reporting more formal.

Table 3: Management Systems for Sustainable Refurbishment

Stage	Decision making process
Initiation	Organisations at the lowest level of the Initiation Stage had no executive manager responsible for overall delivery of sustainable refurbishment.
Contagion	Organisations in the Contagion Stage had: overall responsibility for sustainable refurbishment located at the executive level: a short development time between board level decisions and local implementation: based their decisions on the outcomes of a stock condition process: a long term plan and vision for their housing.
Control	Organisations at the lower end of the Control Stage had: begun to devolve responsibility for decisions to lower-level technical managers; developed specific procurement routes for innovative technologies; begun to involve tenants in decision making; a semi structured option appraisal process in place to distinguish priorities. Organisations at the midrange of the Control Stage had: devolved decision making to mid-management teams with formal reporting mechanisms back to senior management; a consistent decision making process with formalized procedures (e.g. lifecycle analyses); an agreed annual program for sustainable refurbishment activities. Organisations at the top end of the Control Stage had: fully devolved decision making to the operational level with formal reporting mechanisms to senior management and board level staff; engaged tenants in most phases of the decision making process; initial feasibility assessments that identified key performance indicators and formalized progress monitoring; some level of end of project review.
Maturity	Organisations in the Mature Stage had: a senior-level manager responsible for the overall delivery of the sustainability activities; devolved operational issues to operational teams; a short period between strategic decisions and on-site implementation; high levels of tenant involvement throughout the process; individual project monitoring against a long term asset management plans.

DISCUSSION

A detailed questionnaire survey of 53 UK-based social housing landlords identified a number of organisational and managerial characteristics that differentiated landlords' attitudes and approaches to sustainable refurbishment. These characteristics are summarized in Table 4.

Those organisations at the Initiation Stage of the sustainability maturity curve sought to achieve an equal balance between the three sustainability attributes, relying heavily on national drivers and organisational aspirations to identify sustainable refurbishment options. Decisions on whether to include sustainability in a refurbishment project were primarily tactical, with little senior management or tenant involvement. No systematic monitoring of the performance of the sustainable refurbishment was undertaken and no long-term strategies or plans existed.

Those organisations at the Contagion Stage of the sustainability maturity curve placed high importance on the economic and social attributes of sustainability (compared to the environmental attribute), but were still largely governed by national drivers and organisational focus when making sustainable refurbishment decisions. Management of projects tended to be at the executive level with some monitoring of post project performance being undertaken against embryonic long term plans. There was some tenant involvement in the decision making process.

Those organisations at the Control Stage of the sustainability maturity curve placed high importance on social and environmental attributes of sustainability (compared to the economic attribute) when making sustainable refurbishment decisions. Long term sustainability plans had been developed and decisions about which projects to pursue were beginning to be devolved to local managers. Multiple policy drivers, including local drivers, tended to inform the decision making process and formal reporting mechanisms were in place to monitor project performance. Increased tenant involvement, particularly initiatives for tenant buy-in, was considered important.

Those organisations at the Mature Stage of the sustainability maturity curve placed highest importance on the social attribute of sustainability (compared to economic and environmental attributes) and although they had a formal sustainability policy in place, this tended to be only one of a number of policies that they used to inform their sustainable refurbishment decisions. In interpreting the social needs of their tenants, these landlords demonstrated a community focus with long term strategic objectives informed by tenant involvement at all stages of the sustainable refurbishment decision making process. Their vision was strategic and their monitoring was against long-term benchmarks.

Table 4: Management Characteristics Associated With Each Stage of the Sustainability Maturity Curve

Characteristic	Initiation	Contagion	Control	Mature	
Balance of sustainability attributes	Equal	Economic/ Social	Social/ Environmental	Social	
Sustainability Policy	x	✓	✓	✓	
Importance of sustainability policy	Higher	-----		Lower	
Drivers	National	-----		Local	
Barriers	National	-----		Local	
Governing factors	Organisation focus		-----		Community focus
Decision making	Tactical	Executive	Devolved	Strategic	
Monitoring	None	Limited	Formal (short term)	Formal (Long term)	
Tenant involvement	None	-----		High	
Long term plans	None	-----		Strategic	

CONCLUSIONS

Whilst the findings in this paper suggest that the uptake of sustainable technology can be understood by the use of innovation theory, the relatively low response rate and the UK focus of the study would need to be taken into account before generalised conclusions

can be drawn. This said however, from the results of the questionnaire survey it does appear possible to differentiate management characteristics of UK social landlords in their attitudes toward sustainable refurbishment depending upon their position along the sustainability maturity curve. Initially, an organisations uptake of sustainable innovative technology is governed by ad hoc decisions made against national level drivers. There is little strategic focus and no long-term evaluation of the performance of the technology in use. There is also no tenant involvement in decision-making. As organisations become more familiar with sustainable innovative technology their decision making process evolves. At this stage organisations have a formal sustainability policy which differentiates between the level of importance of the economic, social and environmental drivers. The decision making is focused towards local needs and solutions informed by tenants and the community. Formal monitoring of the performance of the technology is made against long term plans. Organisations that are experienced users of innovative sustainable technology demonstrate a maturity of decision making in which decisions are made against long term strategic objectives, informed by tenants' and community needs, and not driven by national edict or organisational imperative. As such, it is possible for an organisation to identify where it is on the sustainability maturity curve and develop appropriate interventions that could accelerate their journey from their current position to a more mature status. Given the current low-level of sustainable housing refurbishment in the UK this should increase the speed of uptake of innovative technologies and support the UK in achieving lower carbon emissions associated with the social housing sector. In this way UK social landlords will truly benefit from their investment in LZC technologies. This said, the existence of barriers, particularly financial, cannot be underestimated and a solution to provide access to funding is needed alongside management interventions. The Green Deal, if effectively applied to social landlords, could provide such fiscal stimulus.

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GENERATING LOW-ENERGY ALTERNATIVES FOR NEIGHBOURHOOD-SCALE URBAN RESIDENTIAL REFURBISHMENT THROUGH OCCUPANT INVOLVEMENT

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This research focuses on the process of creating a collaboration model for initiating and conducting neighbourhood-scale residential refurbishment and redevelopment in owner-occupied apartment buildings. Experiences are drawn from a real life refurbishment project, which aimed at refurbishing a 1970's neighbourhood located in Helsinki, Finland into a low-energy development. While the benefits of the Public, Private, People Partnership (4P) collaboration model in a refurbishment project have been presented in previous studies, this study seeks to describe the 4P collaboration process itself, and attempts to analyse what led to the positive outcomes, as well as what proved challenging. The study is qualitative in nature and uses transcripts of interviews and meetings, along with archived data to analyse, interpret, and describe the process. The findings of the paper suggest that it is indeed possible to form a functional partnership between the three parties: Public, Private, and People, and to generate common aims. However, it appears that employing a representative of the People instead of direct occupant involvement, eases the negotiations. The 4P process provides a viable alternative to traditional tender-based procurement of refurbishment works. Whereas the case is located within a Scandinavian legislative framework and market environment, the conceptual results are applicable also elsewhere.

Keywords: housing, occupant, partnership, refurbishment, 4P

INTRODUCTION

The need for refurbishment of aged apartment buildings combined with the current knowledge of the climate impacts of housing energy use has generated a lot of interest in exploring different options for low-energy retrofitting. During the late 1960's and 1970's, the majority of Finnish suburbs were developed with the aim to provide approximately 500,000 dwellings for new urban residents. Buildings from this era represent approximately a third of the Finnish residential building stock (Statistics Finland 2008) and are – or will soon be – facing refurbishments. Besides other technical and aesthetical renovation needs, buildings from the era are not up-to-date with current building codes with regard to energy efficiency. In fact, apartment buildings from 1960's and 70's are estimated to consume roughly 20% more heating energy than those built before the 1950's or after 2000 (City of Helsinki 2008). Therefore this portion of the housing stock plays an important role from the climate change perspective as well, and one of the main issues requiring attention in conjunction with refurbishments is energy efficiency. Of particular interest is the commercial viability of low-energy solutions.

This study analyses the refurbishment project of a medium-sized residential area first developed in the late 1960's in Helsinki, Finland. The area is also subject to an entire research program, entitled "Agile Renovation Project". The main aim of the program, financed by the Confederation of Finnish Construction Industries to enhance new business, was to assist the neighbourhood in undergoing major refurbishment, as the housing companies were struggling to carry the costs. Infill- and redevelopment was introduced as a potential source of equity to finance the refurbishment.

In connection with the research program, the case area has previously been researched from several different viewpoints: combining energy-efficient refurbishment and infill development to partially finance the refurbishment (Kuronen et al. 2011b, Luoma-Halkola et al 2010), stakeholder relationships within the redevelopment process (Kuronen et al 2011a), as well as the current state of energy efficiency (Kyrö et al 2011). As the results of the 4P collaboration in the case have been reported in several publications, this study concentrates on describing the process itself, and in identifying how the common aims between the home-owners, the potential developer, and the local authorities were established via a common focus group. In addition to the focus group work, workshops organised as means to further involve the individual occupants, are described and analysed.

The study finds that focus group and resident meetings can be a fruitful platform for collaboration and finding new, low-energy

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alternatives for the refurbishments. The process provides a viable alternative to traditional tender-based procurement of refurbishment works. The viability corresponds with the building rights, held by the home-owners in the case, and their relative price compared to construction costs. The homeowners can be considered key decision makers, and also the primary investors in the refurbishments. However, the layman board of a housing company is faced with an unequalled challenge, beyond their experience, when they confront the needs of these large renovations. It is essential that all the parties involved in the refurbishment projects, that is, owners, building companies, and public administration are collaborating equally to achieve a partnership that benefits all.

The remainder of the paper is structured, as follows. The following section introduces the study design, also presenting the case area in detail. The process is then described in the next section and subchapters, and the outcomes analysed in the Discussion section. Finally, a few main conclusions are drawn at the end of the paper.

STUDY DESIGN

The research approach in this study was entirely qualitative. Qualitative methods are considered particularly appropriate when the phenomenon under study is not well known, and at the early stage of research (Edmondson & McManus 2007). Furthermore, a single-case design is used in order to retrieve detailed empirical data on the studied phenomenon (Yin 2009).

This study uses mostly data collected earlier in the research program for the analysis. The data comprise transcriptions of interviews, minutes of focus group workshop meetings, as well recordings and statistics of occupant meetings. Most of the data was retrieved from a common database compiled for the purpose of the retrofitting research program. In addition to the existing data, occupant workshops were held to provide additional data for this study. The resident meetings were recorded and documented. The meetings provided detailed information on the wants and needs of the residents.

CASE NEIGHBOURHOOD

The studied residential area comprises 44 buildings and seven different housing companies with altogether 981 apartments, 64,251 square meters and 1,650 occupants. All buildings are low-rise, either two or three-story, multi-family dwellings. The apartments are all privately owned, and most are owner-occupied. The housing companies are connected to the municipal combined heat and power (CHP) district heating system, as are 91% of households in Helsinki and 49% of all Finnish households (Energiateollisuus 2008).

The demography of the case neighbourhood differs slightly from other parts of Helsinki. The main difference is that there are more inhabitants over 50 years of age and more inhabitants between 16-19 years than in neighbouring residential areas within the Helsinki Metropolitan Area. Respectively, inhabitants in the age groups of 20-29 years and 30-39 years are fewer than in the neighbouring residential areas, which are newer and have more families with small children.

The seven housing companies in the area have been managed by the same housing management company since first developed. The management company is specific to the area and only serves the seven housing companies. The role of the management company is both to manage and maintain the buildings and related finance. Housing companies are a management system applied similarly to condominiums or owners' associations in owner-occupied multi-family dwellings. The home-owners are shareholders in the housing companies, in other words, they control their own housing unit. Respectively, the stakeholders also share the costs of housing management and potential refurbishments. Each home-owners' share of the costs is calculated based on the quantity of their apartment's square meters. The management cost also includes the heating energy, which means that in the present situation the home-owners are not charged by the amount of energy they consume but by the size of their home.

The planned refurbishment costs for the case area are estimated to be seven (7) per cent higher if a low-energy alternative is chosen (Luoma-Halkola et al. 2010). Consequently, the housing companies were faced with a decision to either do only the required minimum in increasing energy efficiency, or choose the more expensive low-energy option.

TOWARDS LOW-ENERGY RETROFITTING WITH 4P COLLABORATION

A fairly novel but previously introduced approach, 4P collaboration for multi-stakeholder urban development environments, is employed also here. The 4P approach employs concepts of systems thinking, the main shared concepts being system borders, system

components (the “parties” in 4P) and interaction between the components, as well as the evolution of the system. A more detailed description of the 4P model can be found in e.g. Majamaa (2008) or Kuronen (2011).

The system borders are determined by identifying the stakeholders and the physical limits of the area to be developed. As Healey (1995) points out, development and redevelopment projects are always multi-stakeholder environments. For this case neighbourhood, the stakeholders in the research phase were limited only by interest, and the physical border was the neighbourhood in need of refurbishment.

The three parties for this case are the City of Helsinki with several different departments (the most relevant ones are City Planning Department, Real Estate Department and City Council as the highest strategic organ) representing the “Public”; developers, construction companies, and financiers as the “Private”; and finally the owner-occupiers, housing companies, as well as a management company owned by the housing companies as a representative of the “People”. The 4P approach underlines the interdependency of all parties and investigates not only the parties but also their interactions.

The 4P approach assumes that all stakeholders are grouped in these three parties, and the parties enter the partnership in order to succeed in meeting their own targets, which generally fall into the following categories:

- Delivering and executing decisions according to strategies (Public);
- Achieving economic profit (Private); and
- Gaining a better living environment (People).

As mentioned earlier, the positive effects of delivering low-energy solutions and empowering the People in the 4P collaboration have been identified in previous studies, while this study aims at describing the process itself and attempts to analyse what led to the positive outcomes. Furthermore, the hurdles that were faced are identified.

The participation of the People is especially important in owner-occupied existing neighbourhoods. In the case neighbourhood the importance is further amplified, as the housing companies own both the buildings and the land plots. Consequently, within the 4P context this study focuses on the interaction between the People and the other two parties. The other two parties form an administrative subsystem and operate on professional and economical values, whereas the previous studies (Kuronen et al. 2011a, Kuronen 2011) identified that People do not share the same values, which poses a challenge to successful urban development process.

Several extended focus group meetings and three focus group workshops were the main means of the 4P collaboration in the case. The core focus group comprised eight professionals, including a representative of the residents, local authority, developers and researchers. The meetings and workshops organized in the course of two years resulted in different scenarios of redevelopment (Luoma-Halkola et al. 2010, Kuronen et al. 2011). The extended focus group comprised the focus group extended with researchers and more private sector participants. However, the extended focus group, acting also as the steering board for the research project, wanted to have more information on the residents’ wants and needs for the future development of the area. Therefore a sub-project focused on resident involvement was commissioned and is described in the following subchapter.

FURTHER INVOLVEMENT OF THE 4TH P – PEOPLE

In the previous stages of the research program the People, i.e., the housing companies, were represented by the housing management company, which participated in the focus group work. Thus, one limitation of the focus group approach was that in a sense, only owner-occupiers were represented – and only through representative democracy.

In order to involve the individual occupants and to communicate their wishes and preferences in the refurbishment process, three workshops were organized for this second stage of the research program. For these meetings, also tenant-occupants were invited. The first two workshops had similar programs and two different groups of residents were invited. The third workshop was more summarising in nature, and it was targeted at those who had taken part in one of the first ones. The two first workshops were organized in the spring of 2011 and the third in September 2011. At the time of writing, it has been decided that there will be a fourth workshop in February 2012. For the fourth workshop, the focus will be on describing the needed renovations and their costs to the residents.

The invitations to the first two workshops were mailed to all the homes but there were no mandatory enrolments to the events. Furthermore, the participants to the first workshop were not registered in order to keep the readiness to participate as unrestrained as possible. Both workshops had around forty participants. For the third workshop the invitations were posted on the notice board of

the corridors, and around 50 occupants participated. The participants were asked to fill out questionnaires and 31 were returned. The answers verified the observation that the participants were mostly senior citizens: 22 of the respondents were over 51 years.

The first two workshops were organized with the help of a multidisciplinary research group called MIND, based at BIT Research Centre of Department of Industrial Engineering and Management, Aalto University School of Science. One of the main interests of MIND is to help professionals with their strategic innovations processes, and to study user centric service design. During the first workshop, group work methods and innovation tools to non-professionals developed by MIND were implemented to enable the residents with different backgrounds to innovate how they would like their neighbourhood to look like in the year 2025.

In the workshops the residents were asked to perform some practical assignments. First, they were asked to individually think and write down, using adjectives, what their neighbourhood would look like in 2025 if it were the best place in the world. Like for all the practical assignments, the residents were given only limited time to answer, typically ten minutes. In addition to the assignments, architectural plans and ideas for their neighbourhood, designed as student works, were presented at the workshop. Furthermore, an architect from the city planning office presented the stage of the on-going planning process.

To conclude, the residents were asked to form groups and the groups had to elaborate the individuals' ideas and dreams into shared dreams describing the future of their neighbourhood. They could use maps, pictures and 3D modelling with Lego-bricks to help their work. Finally, all groups presented their visions, which were then discussed. Additionally, the third workshop included a presentation on the costs of the planned renovations.

The residents were also asked to fill in a questionnaire regarding their preferences concerning the means for seeking their opinions. Based on the results of the questionnaire, the residents favoured the questionnaire over interviews, modelling, and usability through walks, workshops, or try-outs as a method for seeking the residents' opinion.

The residents also voted during the third workshop on the order of importance of their dreams. The ten most important dreams for the future were:

1. Nature and green areas;
2. Spaciousness;
3. Elevators for the seniors;
4. Gardens and greenhouses;
5. Own house like living in an apartment building;
6. Noise barrier against the motorway noise;
7. Public transport with tramway;
8. Recreation possibilities along the riverside;
9. New café, and
10. Common banqueting hall.

The output of the workshops suggests that the occupants are quite content with the present situation. They valued the nature and spaciousness of their neighbourhood and were not ready to accept any infill development of supplemental housing. Nevertheless the residents did have concerns over the disappearance of services such as the hairdresser, pharmacy, post office and some public services. They were also concerned of the condition of their apartments and the prospective refurbishment costs. The energy-efficiency of the buildings did not come up as a concern in the workshops at all.

As a conclusion, it seems that the residents found the situation that prevailed on the 1970's and 1980's ideal, and did not expect the renovation project to bring about any improvements to their neighbourhood. More particularly, they were not willing to have the city authorities plan more permitted building volume, even though this would mean profit to the housing companies and thus to the owner-occupiers.

During the workshops it was further observed that the occupants had a lack of trust for both the city authorities and the building companies and developers. Nonetheless, the relationship with the housing management company was experienced as good and direct.

DISCUSSION

The motivation of the study was to describe the process and explain how the common aims between the homeowners; the potential developer and the local authorities were established via a common focus group and occupant involvement. New ways to finance the low-energy refurbishment were discovered in the 4P collaboration, as reported by Kuronen et al. (2011b). This is where the collaboration was identified as being the most fruitful. All stakeholders included in the 4P should benefit from the collaboration, which can also be considered a prerequisite for the collaboration to function. One of the most significant benefits is the benefit of scale, achieved by initiating the refurbishment simultaneously for the entire neighbourhood and considering the area as a whole.

For this case, the City of Helsinki is the local authority responsible for zoning, approving the development plans and providing infrastructure. One of the goals of the Public is to implement policies, including those related to climate change (Kuronen et al. 2011a). It is therefore not surprising that the initiative for incorporating the low-energy alternative to the refurbishment came from the Public, i.e., the local authority. In turn, for the People, financial issues are usually the most decisive. The housing companies favour retrofitting to the point where it is financially viable.

Housing management was employed as a representative of the People with the aim to simplify and ease negotiations between the parties. However, as the results of the resident workshops show, this form of representative democracy entails some deficiencies as well. Based on the workshops, the individual occupants did not seem to be pleased with the innovation of the focus group work, i.e., using infill development as a means to finance the refurbishment. It appears that the goals of the housing companies as a whole, as represented by the housing management in the focus group work, differ quite significantly of the preferences of the individual occupant. Therefore, referring to these two as one stakeholder, "People" is perhaps misleading. The similarities and differences in the hopes and needs of the different stakeholders and their relations to the others' are depicted in Figure 1.

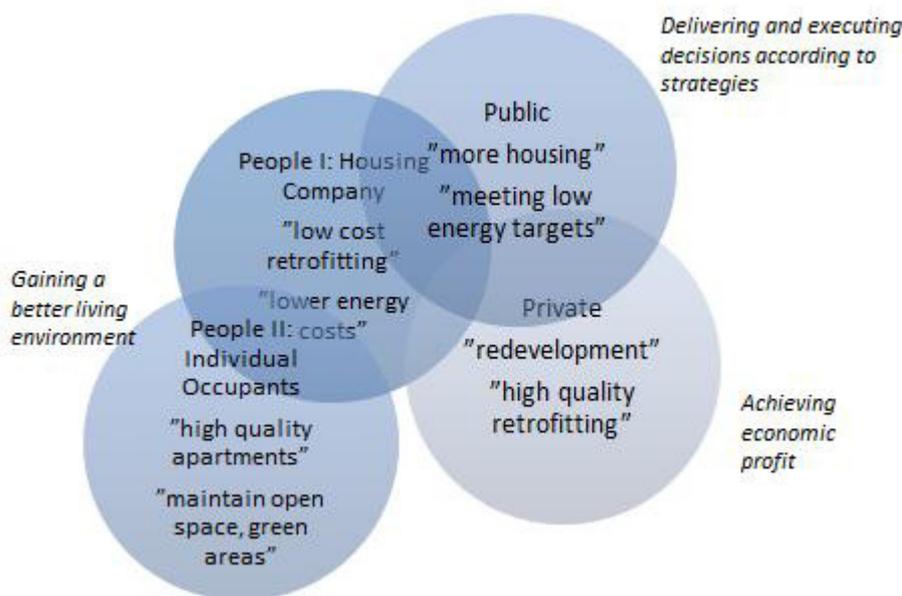


Figure 1: Stakeholders in the collaboration model

That said, involving the individual occupants might be problematic and, even when specific effort is put in engaging the occupants there is always risk that certain demographic types are overrepresented at the meetings while others remain passive. This holds true also for the workshops arranged during the studied process. The workshops did not succeed very well in reaching occupants in active work-life or with small children, because they are not willing to spend their spare time in meetings. However, for this case the age distribution in the workshops does present fairly well the age distribution of the area, which is a little unusual compared to neighbouring areas. It further seems that the current occupants have difficulties in evaluating the long-term effects of their preferences. In other words, they cannot be expected to know or care of the needs and preferences of the future inhabitants, even though they are making important decisions concerning the future. It could therefore be argued that via the housing companies

the occupants as a whole have balanced and equal representation when negotiating of the refurbishing and redeveloping options of their existing and future neighbourhood. This is supported by that the notion that individual occupants expressed trust and ability to communicate with the housing management.

The usefulness and benefits from the 4P model stem from the effective collaboration, communication, and interaction between the different parties with differing goals. It is evident that when the decisions are pending on an individual owner-occupier, it is crucial that the other parties understand the motives of the occupants, in addition to communicating very clearly on the implications of the owners-occupants' decisions. This study identified a lack of trust between the occupants and the "Private" and "Public". Trust between the occupants and the actors conducting the refurbishment has been found to be essential for a low-energy refurbishment process to be successful (Buvik 2011). The results of the paper suggest that it is possible to form a partnership between the parties and generate common aims thorough a process, which provides a viable alternative to traditional tender-based procurement of refurbishment works. Despite the carefully planned partnership process, however, the communication routes were not flawless, and a conflict between the results of the 4P process and the individual occupants' hopes for their neighbourhood emerged.

When interpreting the results, it should be noted that qualitative research in general and descriptive in particular, is always value-embedded (Cronon 1992) and dependant on the pre-understanding of the authors. Moreover, only one case study, within a specific legislative framework and market environment, was studied. This naturally limits the generalisation of the results to other countries. However, the conceptual results may be applicable also elsewhere.

CONCLUSIONS

Could more interaction and collaboration lead to more low-energy refurbishment alternatives? It appears focus group and resident meetings can be a fruitful platform for collaboration and finding new, low-energy alternatives. In this case, the 4P collaboration process brought about inventive means to finance the low-energy refurbishment. However, when further involving the individual occupants in the process, they failed to see the benefits of said innovation. Occupants, even owner-occupiers, tend to base their decision on financial issues and short-term individual preferences. Therefore, while the active participation of the People is underlined, the role of the Public in the partnership was identified as crucial with regard to energy efficiency goals. Furthermore, it appears that employing housing management as a representative of the People eases negotiations. Nevertheless, care should be taken so as not to turn the occupant participation into a "democracy wash", where everyone is entitled to express their opinion, but decisions are made regardless.

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URBAN GROWTH IN AGEING SOCIETIES

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The ageing of the European population is progressing rapidly. It influences the everyday lives of citizens and changes in urban growth. Though the senior housing industry has grown substantially in the last 20 years the growth was not considered as an important component of changing urban structures. In order to maintain a vital society in a vital town of inhabitants who are proud to have lived a long life, it is necessary to develop new economic and social conditions and a new kind of facility management. Housing needs of aged persons are satisfied if the housing is specifically designed to meet the physical, emotional, recreational, medical and social needs of aged persons. In the European Union, Member States are responsible for the planning, funding and administration of social protection systems for the ageing population. In supporting Member States in their reform efforts, the Union recommends three long-term objectives, which should be pursued in parallel (a) Ensure good access to health care and social services, (b) Improve the quality of care (c) Ensure the sustainability of the financing. In this context, how to ensure sustainable financing of the elder population is an important question. This paper will present how improving reverse mortgage systems embedded in a network of senior housing industries in towns can improve the results of the senior housing industry and the satisfaction of inhabitants, in the case of Slovenia as a member state of the European Union.

Keywords: ageing, housing, reverse mortgage, eldercare, accessibility, urban growth, property development, risk

INTRODUCTION

URBAN GROWTH OVER THE PAST TWO CENTURIES

In “Global age-friendly cities”, WHO (2007) starts its guide with the statement that population ageing and urbanization are two global trends that together comprise a major force shaping the 21st century. The main characteristic of demographic drivers in the 19th and beginning of the 20th century was a growing birth rate and declining mortality rate, which had influenced the overpopulation of rural areas and therefore forced migration from rural areas to newly industrialized towns. This phenomenon had influenced urban growth and the creation of wealth of towns by the growing value of urban land. Across the globe the share of urban population increased from less than 5 % in 1800 to more than 50 % in 2010. Those cities who recognized the opportunities of these trends built adequate infrastructure which facilitated industrial activities, which induced flows of goods, which in turn attracted flows of people. In this way cities have been able to extract the rent on their land, which powered the further growth of cities, the development of banking systems and capital markets for their benefits. We cannot imagine the development of the modern banking system without land as collateral for advancing the loans. The amount of mortgage is based on the value of real estate which is used as collateral. The major share of these loans has been reinvested in the urban space in the form of industrial buildings, commercial centres, office towers and condominium buildings. Taxes on these projects financed the development of infrastructure in the towns. As the consequence of this process the value of land, which was used as collateral, has been growing throughout the 19th and 20th century, creating repeating new cycles of investments in land development and potential growth. Each cycle has attracted new migration inflows from rural areas and other less successful towns. In this growth of build environment financial services have been important enablers of the growth by channelling funds from individual savers to industrious developers. This process enabled a large part of the urban population to become property owners. In-coming population was able to buy properties – in most cases residential properties – with low down payment and long repayment periods. Through these processes parents in the family were able to become debt-free property owners by the time of retirement. In this way residential property become the most valuable asset of the average retiree. In some countries, like in Slovenia, there are more than 80 % of retirees who own their own home.

LIVING IN THE WATERSHED TIME

We are living in the watershed time when the main drivers of economy, especially financial services, are falling into crises and should change their strategies. Also now, similar to the above-described period of the first transition over the last two centuries, the driver of value creation is demography. Decreasing fertility decreased population growth, while in contrast increasing life expectancy

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increased the population growth and also a demand for housing units. But the needs of this sector of the population are different, which should be reflected in the designing and renewal of towns. The EU27 population is projected to increase from 495 million in the beginning of 2008 to 521 million in 2035, and thereafter gradually decline to 506 million in 2060. The population of EU27 is also projected to continue to grow older, with the share of the population aged 65 years and over rising from 17 % in 2008 to 30 % in 2060. Following the results in the IIASA report from the ERD database presented in Table 1 (IIASA, 2002) we can see that it is estimated that Europe will have more than 91 million people aged 75 and over by 2050 which will present more than 14 % of the European population and nearly 82 million people aged from 65 up to 75, which will present more than 13 % of the European population. The most problematic area is the region of Mediterranean countries, where this percentage is rising to over 32 % and migration is lower than in the rest of Europe (see Figure 1), but also problems connected with an ageing population are higher in central and eastern Europe than in the western part of Europe.

Table 1a: Europe: population by age (in 1000) (Source: http://www.iiasa.ac.at/Research/ERD/DB/data/hum/dem/dem_2.htm)

	1950	1970	1995	2025	2050
Age 0-14	143,175	166,367	139,464	103,212	90,430
Age 15-64	359,162	421,432	487,110	451,599	364,277
Age 65+	44,981	68,642	101,338	147,524	172,985
Age 75+	14,553	22,762	38,139	63,663	91,343
Total	547,318	656,441	727,912	702,335	627,691

Table 1b: Europe: population by age (in % of population) (Source: http://www.iiasa.ac.at/Research/ERD/DB/data/hum/dem/dem_2.htm)

	1950	1970	1995	2025	2050
Age 0-14	26.2	25.3	19.2	14.7	14.4
Age 15-64	65.6	64.2	66.9	64.3	58.0
Age 65+	8.2	10.5	13.9	21.0	27.6
Age 75+	2.7	3.5	5.2	9.1	14.6
Total	100.0	100.0	100.0	100.0	100.0

Problems of social security for the elderly in Europe are described in details in National strategy reports (2005). Alongside pensions, ownership of real estate, especially residential property, is often an important pillar of social security of the elderly in Europe. Incomes of inhabitants usually decrease after retirement. To preserve the level of quality of life from the working period before retirement, income from pension is seldom enough.

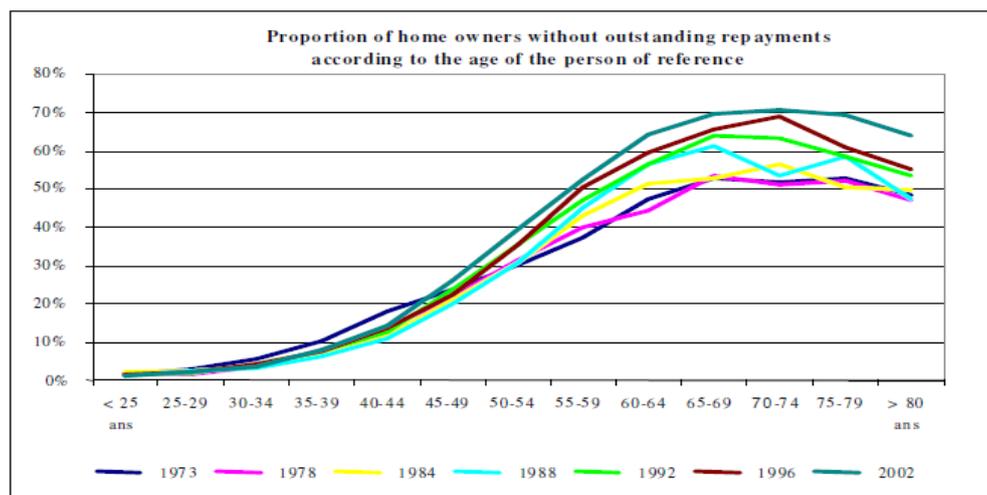
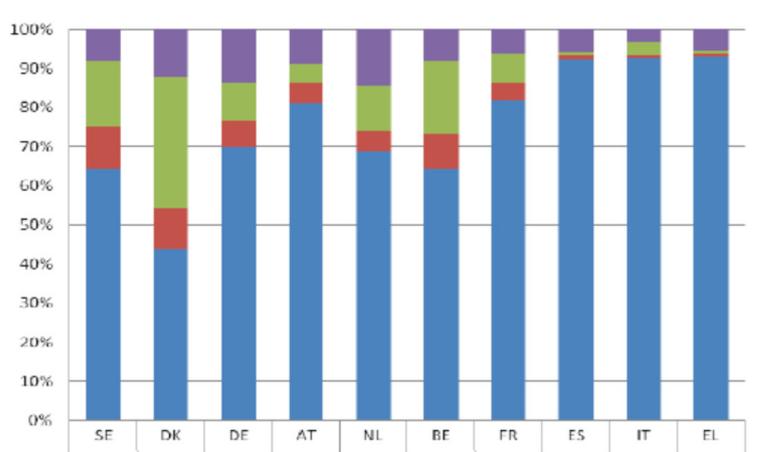


Figure 1: Share of residential units occupied by owners by age in Europe (Source: INSEE)

Beside the pensions, ownership of real estate is the most important asset of the average retiree. According to a study of the Institut für Finanzdienstleistungen E.V., Hamburg (Reifner, 2009) the share of residents that own residential housing units in Europe was in 2007 between 43% in Germany and 98% in Romania. On the decreasing rank list Slovenia was in 8th place with 84% of residential units occupied by owners. The dynamics of the share of residential units occupied by owners by age is presented in Figure 1.

According to the study of DEMHOW (2009) the share of owner-occupiers in developed countries is rising with the age of the population and is the highest in the age group 65-80. Therefore in developed countries the elderly have, alongside benefits from pay-as-you-go pensions, the following structure of assets, which are presented in Figure 2



bank account; securities; private pensions; residential real estate

Figure 2: Structure of savings of elderly according to asset type in some European countries (Source: DEMHOW, 2010).

The estimates in Table 1 are warning us that there will be a demand for properly built housing for the elderly, and there exists a risk that the supply of adequate dwelling places for the elderly will not be sufficient. At the same time the use of houses for the population under 65 will decrease from 1995 to 2025 by nearly 12 % and from 1995 to 2050 by nearly 28 %. If the spatial standard (size of homes) will remain the same, to meet the demand nearly one third of existing housing stock in the next 50 years will need to be transformed into dwellings for assisted living and facilities for servicing and caring for the elderly.

Income from state pension is barely covering living expenses of the elderly and is not high enough to allow for investments in housing units so the elderly will need some form of financing for this metamorphosis of towns, where the residential units will be remodelled to become fully accessible for elderly citizens with impaired mobility. The demographic structure could change if Europe opened its borders for young immigrants, but after the decline of employment needs in the crises we do not forecast substantial new demand for human resources. Even in the time of a fast growing economy the in-flows have been weak, especially into the South and East of Europe, where ageing is even faster than in the North, as presented in Figure 3.

he primary interest of seniors is to continue to live independently in the community as long as possible and preferably in their own homes. In most countries, the older people get, the smaller their household becomes. Their own homes become too big for old people. When they retire, they work less and therefore less work results in more leisure time. They are looking for some amenities which are available in towns but have not been frequently used during their employment. Ageing after sixties also goes hand in hand with the declining mobility of residents and health problems are increasing. After their seventies or eighties, citizens are willing to use a smaller and smaller action radius and they are more dependent on public transport. The built environment in towns is placing barriers on the ageing population, having functional limitations.

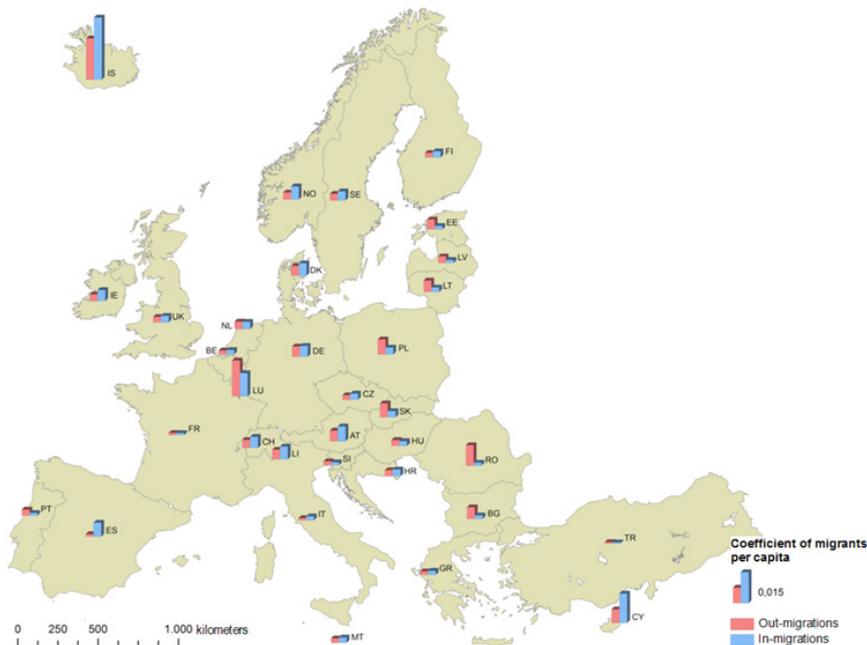


Figure 3: In-migrations and out-migrations per capita in EU and some candidate countries in 2006 (Source: Bogataj et al, 2011)

During the last century many adaptations have been made to improve accessibility of European homes and services to citizens, but all these actions have not been systematically arranged. The properly built homes and accessibility in a familiar environment should be the main concern for town architects who consider the ageing population in the design process of urban growth and renewal of previously industrial towns.

THE DIRECTIONS WHICH ARE DETERMINING THE METAMORPHOSIS OF TOWNS

When nearly one third of housing stock needs to be transformed to homes and facilities for services for the elderly, substantial financial resources are needed for this metamorphosis of towns. There could be two main directions of designs: (a) segregation of seniors in senior cities and (b) universality of cities including adaptability of central places and suburbs. Both directions require substantial financial sources.

ENSURING INFRASTRUCTURE AND SERVICES IN TOWNS

In the near future more than one in ten inhabitants will need long-term care which brings together a range of medical and social services. Their needs will differ also according to age cohorts. There will be a range of more or less dependent persons which will need help with basic activities of daily living, caused by physical or mental disability, but who can still live in their own home if suitable care and assistance can be provided in their homes and if buildings in which they live are universal and can be adapted to people with impaired mobility. Universal buildings are such that are appropriate for a wide range of people with and without impaired mobility. Long-term care in the form a combination of health care and social care provided to persons with physical or mental handicaps requires the development of different new private and public organisations of health care and social care, mostly on the municipality level. Careful introduction of universality and adaptability in the towns will allow for a greater mobility of the elderly that will enable them to stay longer in their homes and postpone reallocation to long-term care facilities.

Though in the European Union, Member States are responsible for the planning, funding and administration of health care and social protection systems, the most appropriate level for organization of this activities are towns on NUTS 5 (municipality) level. The needs are growing not only because the ageing population is increasing but also because the elderly are becoming more demanding. To face these problems the Union recommends three long-term objectives for national care systems, which should be pursued in parallel: (1) ensure good access to health care and social services, (2) improve the quality of care and (3) ensure the sustainability of the financing. In order to achieve these objectives not only the social system needs to be improved, but also the built environment will need to be adopted for such an ageing society. A new approach to spatial planning needs to be taken and new financial services should be introduced, to cope with these tasks, to increase universality and adaptability as well as special housing for the elderly.

UNIVERSALITY AND ADAPTABILITY

The directions determined by the 'United Nations Standard Rules on the Equalization of Opportunities for Persons with Disabilities' (United Nations,1993), according to which urban designers in the member states should design houses and build environment that will allow the integration of the elderly and people with functional limitations and also provide equal opportunities for retired cohorts. The guidelines address the needs of people with physical limitations to provide them a safe and functional environment. The guidelines for design require (a) equitable use, where the design is used by and marketable to people with diverse abilities; (b) Flexibility in use so that the design accommodates a wide range of individual preferences and abilities; (c) Simple and easy understanding of use, regardless of the user's experience, knowledge, language skills or current concentration level; (d) Providing perceptible information regardless of ambient conditions or the user's sensory abilities; (e) Minimisation of hazards and the adverse consequences of accidental or unintended actions; (f) Efficient use with low physical effort and (g) The appropriate size and space for approach and use regardless of the user's body size and mobility (see the details in Demirkan, 2007). The standards for the benefit of people with mobility limitations specify accessible or adaptable design Requirements. The universal design approach targets citizen of all ages. Many limitations in these guidelines are not useful for all people, especially not for those with minor or even no physical limitations.

SPECIAL HOUSING DIRECTIONS FOR SENIORS

Assisted housing for the elderly where less intensive long-term care can be delivered is developing in three distinct directions:

Segregation in senior cities far from the city centre of existing towns: Just a minority of European seniors have a preference for a senior city. Most elderly over their sixties do not wish to live among peers at a distance from universal services. The concept of a senior city, in which housing is built for a single age group at a distance from services in the urban area, has not been part of government policy in the European Union so far, though there are some good experiences in USA.

Integration in urban society: The share of the retired population in new construction projects in city centres with all kind of amenities around has increased in Europe in the last decades. Many developers decided to construct expensive, relatively small, high-rise units in city centres. Their target group are seniors, with a relatively high-accumulated wealth.

Ground-level dwellings outside the city are close to existing homes. In cooperation with long term care and social care suppliers, the tendency is to build many relatively inexpensive accessible and small apartments in the centres of smaller towns. Their activities could be regulated by better fiscal policy. A government role is to allocate building land in cluster areas through means of granting legal permission for building plans. Therefore it is very often the case that clusters of dwellings are built on the outskirts of the city rather than in the city centres, where more amenities would be available and the cost of care can be lower due to economy of scale. But the government has also included requirements for the accessibility of housing, to make these properties more suitable for the disabled. This concerns requirements for indoor and outdoor accessibility of housing and its suitability for the provision of care. For intensive long-term care the elderly have to move to long-term care facilities. Here they receive better support, medical and social care than in the previous stage (in the period of assisted living). The more the built environment encourages the mobility of the elderly and providing of care in the period of assisted living in concerned residential units, the longer the elderly can keep their independence and delay relocation to long-term care facilities.

THE MULTIPLE DECREMENT MODELS IN URBAN PLANING

In the paper of Haberman (1983) multiple decrement tables and the measurement of morbidity have been developed which can be of use and also could present the basis for our future approach to modelling urban growth and forecasting the housing demand of citizens in the 21st century. Very few work age citizens approaching retirement and seniors are owners of dwellings which are specially built for assisted living. The share of privately built new housing for elderly is negligible. After retirement the elderly could stay in their homes or the value that seniors have accumulated in their properties can be released to fund purchases of new housing units that are suitable for their current requirements. But there are limited private constructions for seniors. One of the reasons for limited private construction is that many seniors lack the energy and health for private construction work. Seniors are subject to various changes of health and mobility during their life that affect their housing, recreation, entertainment and health requirements and therefore also determine their choice of dwelling. Most seniors have pay-as-you-go pensions from state sponsored pension schemes that are proportional to earnings from employment during their working lives. Many seniors are owners of residential property so that in many cases the majority of their wealth is tied up in their housing unit. Usually wealth of elderly property owners is also increasing independent of their activities due to rising real estate prices driven by public investments and spatial planning policies which influence shortage of supply.

From residential property they own, seniors often need to move to more suitable assisted living residential housing units for several reasons: (a) in case of a shortage of money to take care of over-sized houses, they should purchase smaller residential units to keep the money for other needs and to have lower real estate taxes, (b) for special needs for medical care and assistance in case of declining health and the need to have easy access to social care and public amenities. In such cases locality and suitability for impaired mobility is more important than the size of dwelling. The majority of seniors are then more likely to move to an accessible apartment close to the required services and amenities. Some prefer ground-level dwellings with gardens but most of them wish to stay accessible to the families and neighbours of their old home. Just some of them prefer to be in a 'senior city' with peers around. But mostly they do not like to move far from their previous home. It means that in Europe the problem should be solved inside NUTS 5 regions (municipality level) or at least on NUTS 3 level. These facts should influence planning of housing supply for seniors on the municipality level, which is the level on which supply should be in line with demand. Healthy persons with above-average income and those requiring care have more cultural and recreational needs and have a desire to be (autonomously) mobile. The healthy ones in this category would like single- or multi-family owner-occupied housing (not supported housing), while those requiring care would like an accessible rented or owner-occupied apartment and will organize their own care. In order to increase the chances of a senior city being successful, it is therefore important to build various types of housing in a neighbourhood with services and public transport.

Qualitative characteristics of the housing demand of inhabitants are changing due to ageing and also preference in the same cohort could be different. Seniors at different ages and different stage of mobility and action radius place specific requirements on a dwelling, surrounding amenities and the location of the dwelling relative to necessary services, like care facilities, shops and infrastructure. Instead of preparing a "hospital" environment for all houses it is better to provide financial services which will enable ageing people more frequent changing of their home with no unreasonable costs of such movement. Therefore a new model of housing market should be introduced, based on multiple decrement tables for forecasting the dynamics of the housing needs of retired and incapacitated homeowners. The state diagrams for multiple decrement models should be introduced like the example presented in Figure 6. The model is able to forecast not only the demand for housing units for assisted living and intensive long-term care facilities but also the surplus of ordinary housing units. On these bases the city will be able to plan the transformation of part of ordinary residential housing units into assisted living communities and intensive long-term care facilities long in advance.

Depending on the financial abilities and preferences of the elderly, as well as on mobility, we can use the following categories and notation of the model, presented in Figure 4:

1. Segregation in senior cities: SSC (Independent: ISSC, assistance living: ASSC);
5. Integration in urban society (the share of retired population in new construction projects of smaller units in city centres with all kind of amenities around): SUUS (Independent: ISUUS, assistance living: ASUUS);
6. Ground-level and other accessible dwellings outside the city centre close to existing homes (inexpensive accessible and small apartments and small houses in suburbs in cooperation with elder care and social care suppliers):GLD (Independent: IGLD, assistance living: AGLD);
7. Long-term intensive care facilities LTC in nursing homes or hospitals.

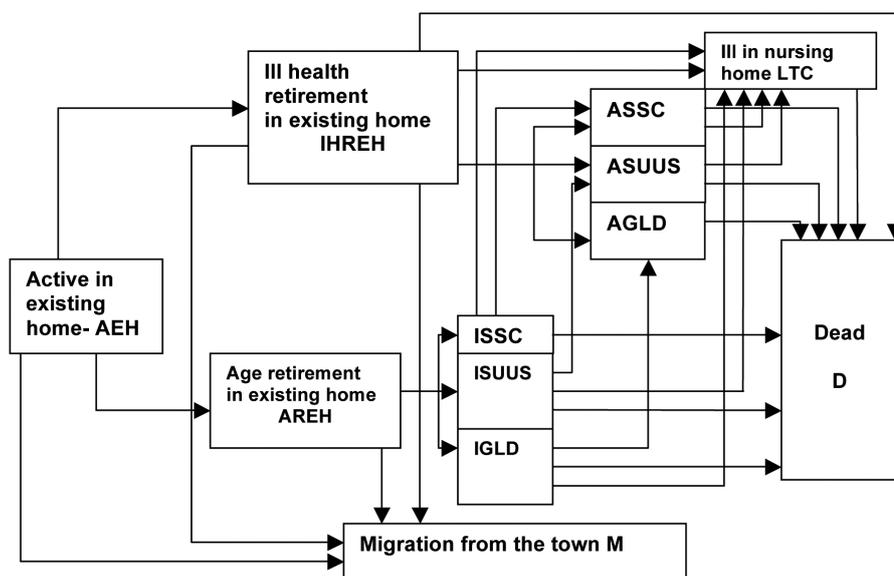


Figure 4: State diagram for housing in the multiple decrement modelling

FINANCING THE GROWTH OF CITIES AND SMALLER TOWNS FOR AN AGEING SOCIETY

For this reason we have to investigate whether the ageing society has accumulated enough wealth in the towns to provide for housing and a variety of different services for the elderly (not only medical – skilled – care but also nonmedical – social care and accessibility to different kind of amenities and entertainment). We also have to investigate if the financial system is sufficiently developed to enable the mobilization of all available assets of the ageing population for a higher quality of their life.

Equity Release Schemes (ERS) transform fixed assets in owner-occupied dwellings into liquid assets for private pensions. They thus enable a homeowner to access the wealth accumulated in the form of their home, while being able to continue to live in it. This is the way that an illiquid asset becomes a source of liquidity, mainly for consumption purposes (Reifner et al. 2009).

Up to now ERS takes two different forms: (a) Loan Model or reverse mortgage which provide a loan that will eventually be repaid from the sale proceeds of the property after death and (b) Sale Model, which involves an immediate sale of the property but provides for the right to remain in occupation and to use the cash price for income in retirement. To be able to follow the dynamics of retiree needs, as presented in the scheme in Figure 5, from newly constructed smaller units in city centres with all kind of amenities around, or inexpensive, accessible and small apartments and houses in suburbs in cooperation with elder care and social care suppliers, or segregated senior cities, having independent or assisted living, or long-term intensive care facilities in nursing homes or hospitals, these basic two forms, in combination with ordinary pensions and medical insurances, should be rearranged in the near future.

For the successful development of a Europe-wide ERS which would be able to support urban growth we need to develop a four tier risk management system that would be able to jointly manage: (a) risk of ill health, (b) longevity risk; (c) interest rate risk and (d) residential real estate market risk. This risk management system should be embedded in Equity Release Schemes (ERS) to enable transformation of fixed assets in owner-occupied dwellings into liquid assets for private pensions.

ERS has to enable a homeowner to access the wealth accumulated in the form of their home, while being able to continue to live in it and even change the dwelling according to the health and mobility of the homeowner. This is the way that an illiquid asset becomes a source of liquidity, mainly for consumption purposes, and also enables the financial institution to make profitable long-term investments with reliable repayment of advanced funds. The risk management system will also provide urban planners with data regarding expected long term demand for housing units of different functionality for different cohorts of retirees. This approach will give a framework for maintaining stable prices of housing units and mitigate the risk of another real estate market crash. ERS must therefore: (1) be an additional financial service for the housing of retirees; (2) be a source of liquidity for the future; (3) contain a strong entitlement to assure appropriate housing of the elderly; and (4) rely solely on the sale of the property for repayment/payment of the funds released to be used as a retirement pension and changed needs of housing.

For financing ERS one possible way is the development of a unified European market for mortgage back securities that would include securities backed by reverse mortgages. This will ensure a pooling of risks from the total European territory and enable the attainment of the lowest possible interest rate.

Mobilization of loans and collateral in secondary mortgage markets should be investigated. The key elements of this investigation include:

- The fact that the mortgage is accessory to the loan claims, so that the assignment of the loan claims involves the transfer of the mortgage that secures them
- The rules on the set-off of any amounts due by the borrower and by the lender. This involves complying with formalities for the transfer of the mortgage
- The mitigation of rules on claw-back, applicable in case of insolvency of the lender; and
- The development of rules to facilitate the mobilization of collateral through mortgage funding schemes. For instance, securitization laws could provide for shorter claw-back periods or for simplified rules on the transfer of mortgages as a pool. The ability to transfer collateral from one party to another through mortgage funding models creates economic and legal links, with the fund providers being given some forms of right or interest in the underlying mortgage loans. Legal frameworks should adequately reflect such links to protect financial stability, for instance, by earmarking mortgage payments to the mortgage or by legally prescribed overcollateralization requirements. Further, legal arrangements should align legal forms with the economic substance of these links and mitigate distorted incentives or informational asymmetries (IMF 2011).

Therefore at least the following activities need to be taken:

1. Housing financial services will need to reinvent themselves and shift a part of their activities from financing new developments to drawing the liquid funds from illiquid real estate assets of retirees;
2. To find proper long- term real estate valuation, real estate management and risk management process using the multiple decrement model as presented above;
3. The services should be developed on the city level bases under the European directives and Member State legislative framework.

REVERSE MORTGAGE BASED ON MULTIPLE DECREMENT MODELLING IN SLOVENIA

The ageing of the Slovenian population is very rapid as presented in Table 2.

Table 2: Share of population in Slovenian Census reports according to the age groups and ageing index (1869-2008) (source: SURS, 2011)

Year	Age groups			Ageing index
	0-14	15-64	65+	
1869	32,9	62,1	5,0	15,2
1910	34,8	58,5	6,7	19,3
1931	30,5	62,5	7,0	23,0
1953	27,7	65	7,3	26,4
1991	20,8	68	11,2	53,1
2002	15,3	70	14,7	96,3
2008	14,0	69,6	16,4	117,1

There is little possibility that the elderly in Slovenia will be able to extract liquidity and finance changing of dwellings according to their needs in distinct central places on NUTS 3 level, without introducing legal framework for reverse mortgages which protect elderly and their most valuable asset.

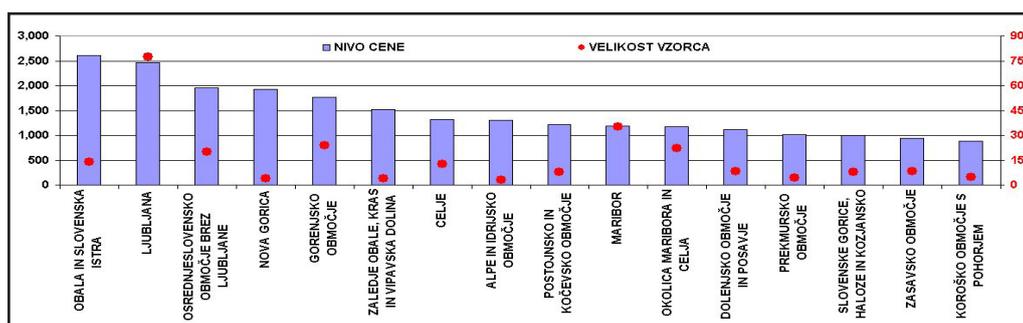
There were 838,252 residential units at the end of 2009 in Slovenia in almost 500,000 buildings. Since the end of 2009 that number has increased by more than 33,600. The average size of a single residential unit was little less than 80 m². More than half of these residential units were located in urban agglomerations and the average size of a single residential unit in urban agglomeration was around 70 m².

Residential units are mostly in good condition and around 80% of residential units have central heating, which increases the value of a residential unit. Table 2 presents the number of dwellings in NUTS 3 regions in Slovenia according to the year of construction in 2009.

Table 3: The number of dwellings in NUTS 3 regions in Slovenia according to the year of construction in 2009 (Source: Statistical office of the Republic of Slovenia).

Regions	Year of construction								
	Total	Before 1918	1919 – 1945	1946 – 1960	1961 – 1970	1971 – 1980	1981 – 1990	1991 – 2000	2001 – 2009
SLOVENIJA	838,252	119,817	61,332	87,871	132,364	185,340	127,494	54,946	69,088
Pomurska	48,439	5,181	4,174	5,919	7,662	11,201	7,833	3,502	2,967
Podravska	137,184	20,163	9,760	13,914	21,919	28,303	20,301	9,664	13,160
Koroška	28,325	3,798	1,363	3,512	4,584	6,177	4,661	2,080	2,150
Savinjska	102,445	15,271	5,501	11,472	15,698	25,002	15,912	7,138	6,451
Zasavska	18,748	2,534	1,675	3,624	3,150	3,274	3,149	735	607
Spodnjeposavska	29,773	3,794	2,122	3,977	4,368	6,683	5,120	2069	1,640
Jugovzhodna Slovenija	59,120	8,348	3,963	6,514	8,554	13,502	9,753	4,508	3,978
Osrednjeslovenska	211,164	22,517	16,355	20,102	39,353	48,131	31,199	13,558	19,949
Gorenjska	80,929	10,363	6,326	9,465	13,615	17,331	12,588	4,372	6,869
Notranjsko-kraška	21,594	4,902	1,766	2,175	2,646	4,113	3,224	1,188	1,580
Goriška	50,904	10,891	5,934	4,106	5,610	11,250	6,067	2,982	4,064
Obalno-kraška	49,627	12,055	2,393	3,091	5,205	10,373	7,687	3,150	5,673

Figure 5 below presents the prices of residential units.



size of sample (•)

Figure 5: The average price of dwellings (in €/m² blue column) and the size of sample in 2010 (Source: GURS, 2011)

If we take into consideration that the ratio of owner-occupiers between ages 30-64 years old and age group of 65 or older is 3 : 7, as is given in Figure 3 for Europe, then we can calculate the share of housing stock that belongs on average to elderly citizens of 65 years and older. In Slovenia we get 43 % ($= 0.7 \cdot 338,265 / (0.3 \cdot (1,372,208 - 338,265) + 0.7 \cdot 338,265)$) from where it follows that the value of housing stock from which elderly citizens could draw ready cash for financing living cost is around €47 billion or 140,000 € per person. The value of housing stock is unevenly distributed by region in such a way that the Osrednjeslovenska region holds one third of housing stock by value (€15.3 billion or almost 183,000 € per elderly citizen), while the Zasavska region holds only €0.5 billion worth of housing stock or a little bit more than 62,000 € per elderly citizen. Nevertheless this is an important asset of elderly citizens that could offer liquid sources which are able to considerably raise the quality of life in retirement. Of course these are rough approximations because the variability in market prices of residential units is considerable and dependent on many factors which are considered by location theory. This needs to be considered in detail also for Slovenia. Breaking down Slovenia into assessment areas (<http://prostor3.gov.si/zvn/>) is not exactly enough to assess the real estate in ownership of individual retirees. But it is sufficient that we can make a decision regarding merits for the development of a reverse mortgage financing system in Slovenia.

CONCLUSIONS

We have seen that the ageing of the European and also Slovenian population is rapidly progressing. It influences the everyday lives of citizens and changes in urban growth. The systematic senior housing industry requires new approaches to spatial planning on the bases of the multiple decrement model, known in actuarial studies which will substantially influence changes in urban structures.

In order to maintain a vital society in a vital town of inhabitants who are proud to have lived a long life, it is necessary to develop such a model in the urban planning and growth for an ageing society. The parameters of the decrement housing model should be investigated on NUTS 5 (municipality) or at least on NUTS 3 level. In this context sustainable financing of the elder population requires more intensive work on the products of reverse mortgage, which will ensure higher liquidity of assets and better quality of life for the elder population. The reverse mortgage and other equity release products market is at the very beginning in Europe. In Slovenia it has not yet been introduced. We believe that there is a need for enhanced protection for people using such products on the state and local government level. Reverse mortgages let older homeowners borrow against the value of their property to increase their income, but they can risk losing their homes when they sign up for reverse mortgages without good advice. Mortgage brokers could encourage the elderly to take out loans for more than they need in a particular moment. Borrowing the maximum amount on the base of an equity release product can constrain elderly financial circumstances later on in retirement when they might need to enter a nursing home or invest some capital in changing or moving to a more appropriate flat or when the retiree might need to pay for expensive operational procedures. A reverse mortgage, which is still often considered as “spending the kids’ inheritance now” should be considered as complementary money to spend in all phases of old peoples’ lives, from retirement on, as presented in the State diagram for housing in the multiple decrement model. Therefore Each region on NUTS 3 level needs to establish a Council on the Ageing, consisting of branches from each municipal unit on NUTS 5 level as a regional policy arm of the region, being focussed on national policy issues from the perspective of the elderly and seek to promote, improve and protect the circumstances and wellbeing of older people in towns and surroundings.

At the moment the property taxes will be introduced in the fiscal system of Slovenia, which will bring additional problems to elderly citizens who are owners of houses but have low pensions. At least the part of the budget which will be based on property taxes should be used to introduce the mechanisms for correct and useful reverse mortgage and other services in all phases of old peoples’ lives from retirement on as presented in the State diagram for housing in the multiple decrement model, in a way that urban growth and housing needs of aged persons will be satisfied so that the housing will be also specifically designed to meet physical, emotional, recreational, medical and social needs of aged persons.

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(Footnotes)

1. A Norwegian public advisory and supportive agency promoting environmentally friendly restructuring of energy consumption and energy generation. Give financial and consultancy support.

SESSION 8

PUBLIC PRIVATE PARTNERSHIP

ANALYSIS OF CRITICAL SUCESS FACTORS FOR PPP ROAD PROJECTS IN SLOVENIA

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Public Private Partnerships (PPPs), although have its fair share of criticisms, appear to be one of the main methods of procurement for infrastructure development during these times of economic turbulence. However, PPP adoption and implementation is yet to pick up in the Slovenian context. The idea of this paper is, therefore, to: identify the factors and expectations which are most important for the decision to start a project under PPP procedure; verify the consistence of these expectations with existing law regulation; and investigate the benevolence of Slovenian economic environment for the models we could use. These will be discussed using an in-depth literature review. The results of the paper are based on a doctoral study, which is at its first stages. The main focus of the study will be on road projects that are procured through Public Private Partnerships. The main target of the work is an intention to make an appropriate model which could help in a decision making policies for a future PPP projects in a field of road investments. The comparisons will mainly be drawn on the different successful and unsuccessful PPP projects in different countries. The target would not be only a road projects, but all infrastructure projects which could help to find out the CSF. This will be done through a questionnaire survey. Expectations from public private projects and their efficiency could show a problem of inappropriate planning and procurement activities to make a PPP projects successfull. Expected contribution to knowledge would be shown in that way, that the recommendations for future PPP projects in Slovenia could be implemented in law regulation and avoid mistakes already known from existing foreign projects.

Keywords: critical success factors, public private partnerships (PPPs), road projects, Slovenia

INTRODUCTION

Public Private Partnerships (PPPs), although have its fair share of criticisms, appear to be one of the main methods of procurement for infrastructure development during these times of economic turbulence. However, PPP adoption and implementation is yet to pick up in the Slovenian context. Like many other countries, Slovenia has been severely affected by the global economic downturn and recession. Thus, there remains an appetite to finance PPP projects in Slovenia amidst the current economic conditions that have created liquidity constraints affecting the availability of finance for large transactions. The idea of this paper is, therefore, to: identify the factors and expectations which are most important for the decision to start a project under PPP procedure; verify the consistence of these expectations with existing law regulation; and investigate the benevolence of Slovenian economic environment for the models we could use. These will be discussed using an in-depth literature review. The results of the paper are based on a doctoral study, which is at its first stages. The main focus of the study will be on road projects that are procured through Public Private Partnerships.

FINANCING ROAD PROJECTS IN SLOVENIA

On 1st of January 2007, Slovenia joined the EMU (European Economic and Monetary Union) as the first new EU Member State. According to the statistics of the Bank of Slovenia (Banka Slovenije, 2011), currently 20 banks are operating in Slovenia. After the fall of communism at the beginning of the 1990s, the countries of Central and Eastern Europe began the process of the transition to market economies. At that time the highway network was limited and in poor condition and that was one of the obstacles for a market development. In Table 1 it is shown the total length of motorways and the density related to country area and the growth from 1990 to 2008.

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Table 1: Total lengths motorways and density related to country area (Carpintero 2009)

Central-East European Country	1990		2008	
	Total length (km)	Density related to country area (km/1000 km ²)	Total length (km)	Density related to country area (km/1000 km ²)
Bulgaria	273	2,46	460	4,14
Croatia	291	5,15	1.182	20,90
Czech Republic	326	4,13	688	8,72
Hungary	283	3,04	913	9,81
Poland	257	0,82	764	2,44
Estonia	62	1.37	99	2,19
Latvia	0	0	142	2,20
Lithuania	394	6,03	4,17	6,39
Slovakia	198	4,04	310	6,32
Slovenia	268	13,23	607	29,97
Romania	113	0,47	263	1,10
Macedonia			193	7,76
Serbia			492	6,35
Bosnia and Hercegovina			37	0,73
AVERAGE EU-15		17,39		36,15

According to the table given above, it is apparent that Slovenia has made a remarkable progress within the last two decades and has the most density length of highways related to country area amongst the central European countries. This was mainly supported by the National Highway Programme (Nacionalni program izgradnje avtocest, NPJA 1994), which was one of the biggest investment programmes Slovenia had at the time. The other main infrastructure investment projects on-going during that time period were schools, hydro-electrical power plants and hospital projects. The financing of such infrastructure projects were made by ‘budget money’, a term used by the Slovenian Government to describe the finance of public projects with a credit guaranteed by the state.

Investments in road and transport infrastructure are often financial, economical and technical demanding projects. The planning of such projects needs careful consideration thus requires the involvement of experts, state institutions, new technologies and financial resources. In 1994 The National Program (NPJA 1994) planned a realisation of 499.3 km of four-lanes, two-lanes and connections on highways for approximately 2.170 million USD. In 1998, the National Parliament made changes to the National program (SDNPJA 1998), in which the planning realisation was changed in 553.7 km of highways for almost 4.100 million USD. At the end, in 2004 a new resolution about National program for highway construction (RENPIA 2004) increased a realisation on 572.6 km for 5.651 million USD.

Table 2: National program

NATIONAL PROGRAM	LENGTH OF HIGHWAYS	INVESTMENTS COSTS – MILLION USD	PERCENT OF LENGTH INCREASE	PERCENT OF BUDGET INCREASE
NPJA 1994	499,3 km	2.170	100,00 %	100,00 %
SDNPJA 1998	553,7 km	4.100	110,98 %	188,94 %
RENPIA 2004	572,6 km	5.651	114,68 %	260,41 %

The majority of the works of the aforementioned ‘National Highway Programme’ were carried out by a major Slovenian Construction Company. They built a “cross” of more than 600km of highways for almost 17 years, however, the major problem was that the eventual cost was a lot more than (more than 200%) the budget that was originally planned for the programme. After the completion of the National Highway Programme there were many debates on the investments costs for highways in Slovenia. This led in making future plans for identifying best ways in financing and management of infrastructure projects such as roads. Within these plans, the adaptation and implementation of a PPP model was seen as one of the ways forward for infrastructure projects. One of the main reasons for this was that, best value for money occasionally comes when private sector manages the risks of financing, design, build and delivery (operate and maintain) of the service facility. Generally, there is no payment until the facility is delivered and maintained at agreed service levels and standards.

SLOVENIAN LEGISLATIVE FRAMEWORK

Slovenia has passed specific legislation relating to PPPs and public procurement. The legislative framework is based on the Public-Private Partnership Act (the **PPP Act (Ur. l. RS, št. 127/2006)**) and the Public Utilities Act, while the public procurement aspects are regulated by the Public Procurement Act (Ur. l. RS, št. Ur.l. RS, št. 128/2006, 16/2008, 19/2010) and, in relation to review procedures, the Act on the Auditing of Public Procurement (Ur. l. RS, št. 78/99 s spremembami).

'Public-private partnership' is a legal term under the PPP Act, defined as a relationship involving private investment in public projects and/or public co-financing of private projects that are in the public interest, which relationship is formed between public and private partners in connection with the construction, maintenance and operation of public infrastructure or other projects that are in the public interest, and in connection with the associated provision of commercial and other public services or activities provided in a way and under the conditions applicable to commercial public services, or of other activities the provision of which is in the public interest, or other investment of private or private and public funds in the construction of structures and facilities that are in part or entirely in the public interest, or in activities the provision of which is in the public interest. (Ferk and Ferk 2008)

In summary, PPP is a joint venture of two or more entities - at least one public and one private - investing money and/or assets, intended for the performance of a joint business that shares the profits, losses and risks (Green Paper 2004). The fundamental principles applicable to PPPs are equality, transparency, proportionality, risk sharing/transfer, competition, procedural autonomy, ancillary liability and cooperation. Concerning these fundamental, there are two main forms of PPP models (PPP Acts Slovenia):

- relationships of a contractual partnership; and
- relationships of an institutional or equity partnership

The procedure of creating a PPP model generally consists of (PPP Acts Slovenia):

- preliminary procedure, having the purpose of determining whether the economic, legal, technical or other preconditions for PPP are fulfilled,
- drafting an instrument establishing PPP (the PPP Instrument), where the subject, rights and obligations of a PPP, the procedure for selecting the private partner and other elements of an individual PPP relationship are determined, obligatory only if the private partner obtains a special or exclusive right to perform a commercial public service or other activity in the public interest,
- public tender,
- selection of the private partner granting of the relevant rights and executing the relevant documentation (i.e. concession or PPP contract), and
- creation of the PPP relationship

Generally, the PPP Act prescribes two possible types of public subjects as having the authority to contract on the public side:

- i. A **public partner** is the State or a self-governing local community, which in a PPP relationship, within the framework of its real and local jurisdiction, establishes a PPP in which it also grants the right and obligation to perform activities. At the State level, the public partner is the State, represented by the government of the Republic of Slovenia.
- ii. Other public partner (a public institution, public agency, public foundation and the like) is a legal person of public law established by the state or self-governing local community or by another person that performs public procurement pursuant to the provisions of the Public Procurement Act, and may establish PPPs only where provided by an act or a regulation issued on the basis thereof. Unless otherwise expressly provided by law, other public partners are governed by the same rights and obligations that apply to a public partner.

The other public partner may take decisions determining the public interest in establishing a PPP and on implementing projects in one of the PPP forms only on the basis of the agreement of the founder or of an authorisation provided by law. PPP contracts are adopted by other public partners only after obtaining the consent of the founder. With regard to the above, generally, the most often procedure used in Slovenia is still Public Procurement procedure. Public procurement matters are regulated by the Public Procurement Act and the Public Procurement in Water Management, Energy, Transport and Postal Services Area Act. Public procurement entails actions of the public authority aimed at the purchase of goods, services or construction work.

THE REASONS FOR SLOW ADOPTION OF THE PPP MODEL IN SLOVENIAN

The only road concession contract started in 2004, when a state company DARS (Company for highways in Republic of Slovenia) became responsible for building and operating for national highways for at least 20 years. (Ficko 2010) This change occurred just few month before Slovenia became an EU member State and this was seen as a right move for the Slovenian State to open doors to an 'open market'. Other than this, according to the PPP Report (Ministry of Finance 2010), there are no PPP road projects in Slovenia. There are three main reasons why no road infrastructure projects were built through PPPs in Slovenia: The road transport and transport connections were very much under developed in Slovenia during the time of independence. Almost all of the national projects were financed by the State, and part of the finance was covered/collected through the price of oil. Any private initiative was, therefore, unwanted as due to the fact that the "national interest" was very strong. Therefore, as mentioned in previous sections, a State policy made a decision to build road infrastructure projects in Slovenia with budget and credit money. The Slovenian construction companies were also not keen on getting involved in any concessions or PPP projects. The second very common reason, talking about PPP investments in roads, was low expected traffic volumes and the resulting pressure for tolls. Tolls should be too high to be economically practical and on the other hand, not be politically sustainable. However, looking back, analysing the road traffic statistics, the second reason for not adoption PPPs could not be justified. This is especially evident on 5th corridor (Barcelona-Kiev) in Slovenian National Highway Programme as the traffic volumes were much higher than expected and toll prices were suitable for the general public. The last reason why no PPP motorways were built is limited expertise of the road public administration in technical, financial and economic issues. The administration had little experience in executing such complex and innovative projects. This was evident through the National Highway Programme as it did not fare well in terms of the budgetary requirements and in terms of efficiency.

CRITICAL SUCCESS FACTORS FOR PPP IMPLEMENTATION

The main purpose of this paper is to identify Critical Success Factors (CSFs) in road projects that are procured through Public Private Partnerships. The main reason behind this is due to the lack of adaptation of PPPs in Slovenia, even though this is a standard or a main public procurement method in EU and other countries. Therefore, identification of critical success factors would help for the Slovenian context to identify whether or not these success factors exist, prior to adaptation or implementation of PPPs. This will be one of the first steps of implementation if they are to adopt it according to the policies relating to PPPs (PPP Act Slovenia). UK is a main example for a country that had made a huge progress in PPP/PFI projects. The reason for this is that PPP market in the UK is mature and there are no specific legal issues that arise in current projects. Government figures published in February 2010 (CMS 2010) identify over 580 operational projects completed since 1992 (i.e. where construction has been completed). The Private Finance Initiative (PFI) model has been particularly successful in the UK during this period. The UK has also pioneered a number of hybrid PPP models in relation to the procurement of local health facilities and portfolios of schools. Although the recession in the UK officially ended in January 2010, the global financial crisis has had a significant impact on the economy. This recession has been characterised by the "credit crunch" which has resulted in a lack of liquidity in the financial markets, and high prices and stringent financial conditions demanded by those banks that are continuing to lend. Inevitably the financial crisis has also had an effect on the PPP market in the UK. (Dufficy 2005) However, United Kingdom is still the largest and most diverse PPP market. Many successful PPP/PFI projects have been undertaken, so learning through experiences from UK PPP market, i.e. which CSFs have had a major influence on successful PPP projects, is essential for PPP implementation in Slovenia. Many researchers examined the relative importance of these factors. CSF is defined as: "those few key areas of activity in which favorable results are absolutely necessary for a manager to reach his/her goals (Rochard 1982). The CSF methodology is a procedure that attempts to make explicit those few key areas that dictate managerial success (Boynton 1984). Tiong (1996) explore CSFs for private contractors in competitive tendering and negotiation in BOT projects. How public clients successfully manage BOOT procurement is another CSF (Jefferies 2002) Eight independent CSFs were established by Qiao (2001) in Built Operate transfer projects in China: stable political and economic situation; appropriate project identification; attractive financial package; acceptable toll/tariff levels; reasonable risk allocation; selection of suitable subcontractors; management control; and technology transfer. Table 3 shows a summary of some CFS factors described in different sources of literature

Table 3: Critical Success Factors for PPP projects

CRITICAL SUCCESS FACTORS	SOURCE
Risk allocation and risk sharing	Qiao et al. 2001
Strong private consortium	Jefferies et al. 2002
Competitive procurement process	Jefferies et al. 2002
Thorough and realistic cost/benefit assessment	Qiao et al. 2001
Technical feasibility	Zantke and Mangels 1999
Transparency in the procurement process	Jefferies et al. 2002
Responsibility and commitment between public and private sector	NAO 2001
Good governance	Qiao et al. 2001
Legal framework	Bennett 1998
Available financial market	Mc Carthy and Tiong 1991
Political support	Qiao et al. 2001
Government guarantees	Stonehouse et al. 1996
Stable macro-economic environment	Qiao et al. 2001
Ex-communist country	
Social support – public opinion	Frilet 1997

According to Grimsey (2002) there are at least nine risks face any infrastructure project, thus risk allocation and risk sharing is an essential CSF for PPPs:

- Technical risk, due to engineering and design failures
- Construction risk, because of faulty construction techniques and cost escalation and delays in construction
- Operating risk, due to higher operating costs and maintenance costs
- Revenue risk, e.g. due to traffic shortfall or failure to extract resources, the volatility of prices and demand for products and services sold (e.g. minerals, office space etc.) leading to revenue deficiency
- Financial risks arising from inadequate hedging of revenue streams and financing costs
- Force majeure risk, involving war and other calamities and acts of God
- Regulatory/political risks, due to legal changes and unsupportive government policies
- Environmental risks, because of adverse environmental impacts and hazards
- Project default, due to failure of the project from a combination of any of the above

Risk allocation and risk sharing did not have any influence in our public procurement process. Contractors were not included in a process for any risks. All risks were on a state budget and increase of investments costs for almost 3 times confirm that. With PPP and risk sharing we would get more transparency and efficiency. The best value for money occasionally comes when private sector manages the risks of financing, design, build and delivery of the service facility.

Strong private consortium does not have a real power in Slovenia. Due to our history with a “social property” a private initiative is still in early stages. Thus, this factor is a critical failure factor rather than a CSF, at the moment, for Slovenian context. With the opening market in EU the power of private consortium would improve possibilities for successful PPP. On the other side also the interest of EU companies are now days different. A state, such as Slovenia is, in the main crossing of 5th and 10th European corridor is huge advantage for foreign investments.

Competitive procurement process as a CSF, in many cases in history, shows that legislation relating to PPPs is very important. Our legislation is establishment of necessary legislative and regulatory framework to support PPP program, so we could say that we have environment for competitive procurement process. Through our research we want to find the factors in successful projects, which should be implemented in our legislation as a guarantee for better end solution.

Thorough and realistic cost/benefit assessment is CSF which is not a well known in Slovenia. With many infrastructure projects we had done with public money we spend much more we planned. Realistic cost/benefit assessment is a very important CSF. A cost/benefit analyzes should be a first stage of any project, not only PP Projects. We think that we would propose a changes in PP process in the direction, that no PP Projects could start, before a realistic and confirmed analyzes are done.

Technical feasibility is now days generally not a problem. As we are a part of EU and knowledge could be sharing with others, the

experiences from others are well known. The technical solutions are very important for maintenance and costs in a use period. A CFS factors from that point of view should be found in a projects which are many years in work, and represented a successful story.

Transparency in procurement process is a CSF, which had a main influence in our public tenders. Unfortunately in a negative connotation. Many of our tenders were not made transparently, many of them were under police investigation and generally the public opinion is that all of our tenders are sources of corruption.

In a literature review we did not find any CS Factors relating on ex- communist country which has an influence on PP project. We have a thesis that also that correlation could exist and in our research we would focus on that facts too. Good governance, political support, government guarantees and stable macro-economic environment are group of factors very addicted from political situation. Generally we could say that Slovenia, with approximately 2 million inhabitants, is a small market with a "transition" political organize. In the last two decades only few foreign investment deals were successful in Slovenia. We could also say that there were limitations of public finance in infrastructure fields, but the government of Slovenia did not invite private entities or foreign investors to enter in long term contractual agreements for the financing, construction and operation of infrastructure projects. However, the global credit crunch and the lack of funds for public sector infrastructure investment, PPPs can be identified as a suitable procurement method for the public sector in Slovenia, general public and the Private investors. Experiences from countries which are for many years used PPP/PFI procurement and projects which were successful finished would help in developing a frame for decision making for future road infrastructure projects in Slovenia.

The above CSF are just some of those we will research and show the way we would like to process our work with a goal to find a best practices and models used in successful PPP.

Not only the CFS factors, but also the policy change in Slovenia should increase inclinations towards PPPs and barriers faced. In a future work we would not focus only on CSF but also on institutional level and on question whether or not a PPP is an appropriate approach for particular project.

CONCLUSION

PPP structures are typically more complex than traditional public procurement. There are often more parties involved in project, they have to share the risks and also the funding costs of PPP's are generally higher. There is evidence that the standard of the works in many cases was better on PPP projects that would have been found on a public procurement projects.

There were no PPP projects in Slovenia for last two decades. On the other hand, the national highway program that started as a major infrastructure projects in 1994 was completed, however, the success of the project was questionable. Public opinion in terms of public procurement changed dramatically as a result of this. The investment costs were doubled in comparison to the original requirement, and there were time overruns due to many project extensions. PPP procurement can provide a wide variety of benefits. Reduction in the cost and time of project implementation are now days very important. Given the most important CSFs and making a model for future political, financial and technical decisions would help our economy to find a better solutions.

In these days of financial crises, the state budget would be more and more reduced. To find a private investors and make a win-win solution for both sides (private and public) could be a goal. To achieve that goal we need a tools and models for a relevant decisions.

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A COMPARATIVE STUDY ON LEGISLATIONS RELATING TO PUBLIC PRIVATE PARTNERSHIPS IN THE UK AND SLOVENIA

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A comparative study of PPP legislations between Slovenia and UK has been carried out in this research. Researching significance, successful adoption and implementation of PPPs appear to be important within the contexts of public procurement and infrastructure development nowadays. And it is also important to compare different country adaptations of PPPs within Europe (and worldwide) to learn from each other's experiences. In this research, particularly, UK and Slovenian PPP are compared to identify any similarities or differences in their experiences. UK, as a successful case has adopted PPPs since 1993 is compared against the Slovenian situation. The comparisons will mainly be drawn on the regulatory frameworks and legislations of PPPs in the two countries. The comparative analysis will be based on similarities and differences between the PPP in UK and Slovenia. This will be done primarily through an extant literature review and the comparative study. The results will discuss any reasons for success in PPPs in the UK (in terms of level of adoption of PPPs, irrespective of the final overall outcome) and searching for the implementation steps for Slovenia. One of the main finding of research is that Slovenia is not evolving faster on PPP field because it has not established an effective and efficient central PPP unit (a similar system to the UK) to set policies and drive the process to aid in establishing a market for PPP and setting out detailed policy documents on how the process would work in the state.

Keywords: legal framework, legislations, PPP implementation, Slovenia, United Kingdom

INTRODUCTION

In this paper, an overview of the development of PPPs legislations (regulatory framework) will be carried out. Within this the UK context as a successful country that has adopted PPPs since 1992 will be compared against the situation in Slovenian. The paper will examine, in-depth, the legislative (regulative) framework for PPPs in the UK and in Slovenia. Specific investigation as to how UK government implement PPPs in practice will be presented. Slovenia has very few PPP projects which are more or less small scale water treatment projects and sports park/hall projects. Thus, in comparison, PPP implementation in Slovenia is lagging behind. Due to economic crisis and higher state debt there are increasing debates among politicians in terms of (re) building infrastructure through the use of PPPs.

LEGISLATIVE FRAMEWORK OF PPPs IN THE UNITED KINGDOM

During the late 70's and early 80's, compared to its European counterparts, the UK was underinvested in the upkeep of infrastructure, resulting in falling standards in schools, hospitals and other public service needs (Lawther and Martin 2005; Deloitte 2006). The Maastricht agreement (1992) also placed the government under extreme budgetary pressure as it restricted the ability to invest within infrastructure by placing limits on borrowing. Further pressure on the UK was placed by its participation in the European Union, where it had to fulfil the four principle criteria: inflation, long-term interest rates, fiscal debt and deficit and exchange rate. As a result, the UK started PPPs in the form of Private Finance Initiatives (PFI). According to HM Treasury website (<http://www.hm-treasury.gov.uk/>, 2011) "Public private partnerships (PPPs) are arrangements typified by joint working between the public and private sector. In the broadest sense, PPPs can cover all types of collaboration across the interface between the public and private sectors to deliver policies, services and infrastructure. Where delivery of public services involves private sector investment in infrastructure, the most common form of PPP is the Private finance initiative". According to Parker and Hartley (2003) PPPs including PFIs are part of a wider policy of "privatisation" based on the expectation that the private sector provides services more efficiently and more effectively than

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the public sector. In the UK the terms PFI and PPP are both used and often interchangeably. PFIs involve the provision of an asset and possibly a full-service package under a long term contract. PPPs integrate the private and public sectors, with assets not returning to government (Parker and Hartley 2003).

By PFI, the UK started widening its privatisation and contracting out policies to incorporate the provisions of infrastructure and public services by a hybrid approach of combined public and private sector funding. Procurement was subsequently redefined as the provision of services rather than the ownership of assets, with partnerships sought on a range of projects and PFI promoted as a preferred procurement method (Grimsey and Lewis 2002). Since 1997, the PPP approach has been heavily utilised in the UK. Specifically, private companies have so far been involved in facilities development, including designing, financing, construction, ownership, and/or operation of a public sector utility or service (Tang, Shen and Cheng 2010). Through PFI, not only the UK government makes use of partnership models to develop and deliver all manner of infrastructure, from schools to defence facilities but also pioneered the trend of PPPs. PFI projects represented between 10 and 13 % of all UK investment in public infrastructure and around 100 PPP projects have, thus far, being completed (Deloitte 2006).

According to Maslyukivska and Sohail (2007), the UK does not have special PPP regulations. It has selected a more centralised approach by creating one dedicated national PPP unit. In the indicated range of centralisation, these examples may be referred to as a mixed (centralised and decentralised) model. In the majority of cases, centralisation is reflected in the creation of a separate PPP unit in the country within a certain ministry with joint public and private participation. At the same time, there is a degree of decentralisation to this approach, because separate units do not implement the projects (implementation is still the responsibility of the relevant department, agency or local authority).

According to Maslyukivska and Sohail (2007), the PPP/PFI model developed in the UK has evolved enormously since 1994 up until recently. During the early 1990s, a central body, The Private Finance Panel Executive, was established to develop policy and best practice, but with limited project delivery or support functions. The Labour government replaced that body with the Treasury Taskforce, which was located within the Treasury to reinvigorate the Private Finance Initiative. Created within HM Treasury, it consisted of both a policy arm staffed by Treasury and seconded staff, and a project arm staffed by people from the private sector. The formation recognised the increasingly complex way that the public sector was engaging with the private sector, and the need to supplement and enhance the public sector skills base (Partnership UK, web site: <http://www.partnershipsuk.org.uk/index.aspx>). In the beginning, such PPP units have focused particularly on developing capability, the required legal and regulatory structures, market interests and pilot projects in order to test the value of PPPs. However, with time the focus has shifted towards assisting the selection of PPP opportunities, counselling and advice, ensuring value for money, attracting investors and above all maintaining political support and the trust of stakeholders. In 1999, the HM Treasury transformed the Taskforce, with responsibility for policy development being assigned to the new Office for Government Commerce and the project support role to the new Partnerships UK, a joint venture company established by the Treasury and a number of private companies holding a majority stake (Maslyukivska and Sohail 2007).

Partnerships UK was set up in 2000 to succeed the Treasury Taskforce and set up a permanent centre of excellence, moving away from the old model of 'revolving-door' secondments that offered no retention of expertise or knowledge (Partnership UK website: <http://www.partnershipsuk.org.uk/index.aspx>). The Operational TaskForce (OTF) was set up by the Treasury in 2006 to provide help, support and guidance to the public sector managers of operational PFI/PPP projects. The OTF can advise on contract strategies, benchmarking and refinancing of operational contracts. Staffed by experienced PFI practitioners, its primary role is to assist the public sector in improving the operational performance of PFI and PPP contracts. The OTF advises and provides guidance on a wide range of operational issues, including the development of contract management strategies, benchmarking, market testing, managing variations, refinancing and other issues that occur during the operational phase of a contract (HM Treasury web site: <http://www.hm-treasury.gov.uk/>).

In March 2010 HM Treasury established The Infrastructure Finance Unit (TIFU) whose objective was to lend to PFI projects that could not raise sufficient debt finance on acceptable terms. TIFU would lend alongside commercial banks and the European Investment Bank (EIB) (Farquharson and Encias 2010). From the June 2010, Infrastructure UK (IUK) has a remit to provide a stronger focus on the UK's long-term infrastructure priorities and meet the challenge of facilitating significant private sector investment over the longer term (HM Treasury web site: <http://www.hm-treasury.gov.uk/>).

CURRENT CONTEXT OF PPPs IN SLOVENIA

Most users of public services are unsatisfied with the quality level of public services and also with public sector as a whole. Citizens are demanding effective and efficient public sector which would support them with quality, adaptive and user friendly public services that would cost less (Koman et al. 2008). The solution to this demand could be found through PPPs. Even after the approval of Public Private Partnership Act (PPPA) in 2006, PPP development is still at its infancy stage. Slovenia is still in phase of designing the partnership policy, starting to using it legislative framework, getting the procurements and contracts right and building the marketplace by encouraging the private sector to bid on such PPP contracts. To avoid any risks, Slovenia, at this early stage of PPP development, could benefit from the opportunity to learn from other countries' experiences of PPP. The best way to learn the most is to learn from the best. One of the countries that pioneered the trend of PPP is the United Kingdom, thus learning from the UK experience could provide an insight to PPP development in Slovenia. Through its Private Finance Initiative (PFI), the UK government makes use of PPP models to develop and deliver all types of infrastructure, from schools to defence facilities. In the UK, approximately 10 and 13 % of all UK investment in public infrastructure represent PPPs (Deloitte 2006). Governments are even keener to reduce government spending and borrowing after the economic crisis, thus, many governments worldwide opt for PPP programmes in place of or to supplement direct state investments (Parker and Hartley 2003).

International reports specify a range of essential institutional conditions that should be met before PPPs can be fruitfully put in place (De Jong et al. 2008). Especially in cases of developing countries it is crucial that governments do not neglect the importance of regulatory framework for PPPs. Developing countries have the worst record in overrated benefits and project cost overruns, since some of the conditions (i.e. secure private property legislation, solid anti-collusion and antimonopoly laws and legislation enabling authorities to coherently utilise PPP rank high) seem to be lacking (Flyvbjerg et al. 2003). Regulatory framework has to tie government and private sector to proceed to action after economic, technical and environmental studies have been done. These studies are essential for quality of decision-making (De Jong et al. 2010). For successful regulatory framework aforementioned acts and laws have to be effectively enforced, verdicts reach by courts must be executed or followed by administrative bodies and private players have to have effective recourses. Accountability and transparency, which are crucial for successful PPP project, can be achieved also through legal framework with clear procedures regarding the phase of planning, tendering, design, construction, maintenance and operation of transport infrastructure project or any public service amenable to PPP (De Jong et al. 2010).

Slovenia has almost all the above preconditions, nonetheless, still almost none PPP project. From the legislative point of view as all EU member states also Slovenia has to comply with the *aquis communautaire*—basic directives, the EU Treaty and other legislation regulating the functioning of the EU. PPP procurement procedures, however, have no defined status in the regulatory framework of the EU; as a consequence, each member state has to develop its own PPP legal and institutional framework (Maslyukivska and Sohail 2007). As a European member, Slovenia has also all laws regarding protection of private property and safeguard industrial competition in accordance with EU regulations. It is also one of very few EU members that has special Public Private Partnership Act.

Regulatory framework is seen as a fundamental step towards successful PPP development. Brown, Stern, Tanenbaum and Gencer (2006) define regulation "...as the combination of institutions, laws and processes that, taken together, enable a government to exercise formal and informal control over the operating and investment decisions of enterprises that supply infrastructure services". Slovenia as a country at its first stages of PPP development should bear in mind that there is no one-size-fits-all model for PPP adoption, thus, each country takes its own path in developing PPPs. However, it is crucial to learn from countries that are at a more advanced stage of PPP. Many individual factors play a role in development of PPPs, including local geography, political climate, the sophistication of the capital market, the forces of driving formation of partnerships and the factors enabling their creation (Deloitte 2006).

PPP LEGISLATIVE FRAMEWORK IN SLOVENIA

Under the Article 2 of the Public Private Partnership Act, Public-private partnership is defined as a relationship involving private investment in public projects and/or public co-finance of private projects that are in the public interest, which relationship is formed between public and private partners in connection with the construction, maintenance and operation of public infrastructure or other projects that are in the public interest, and in connection with the associated provision of commercial and other public services or activities provided in a way and under the conditions applicable to commercial public services, or of other activities the provisions of which is in the public interest, or other investment of private or private and public funds in the construction of structures and

facilities that are in part or entirely in the public interest, or in activities the provision of which is in the public interest. The definition is rather broad and covers many models of PPPs. The EU definition of PPP from the Green paper (2004), in summary, denotes that 'PPP are partnerships based on following fundamental elements: public partner as a holder of a public interest; private partner as a holder of private interest and risk' (Ferk and Ferk 2008). Or in other words, a partnership of two or more entities (at least one public and one private), investing money and/or assets in a project in public interest and sharing risks.

Slovenian legislative framework on PPP development is based on the Public Private Partnership Act, Public Procurement Act (PPA) and Public Utilities Act (PUA). Beside, Act on the Auditing of Public Procurement (AAPP) is also relevant for the review of PPP procedures. Considering these PPP Acts, although the PPP development in Slovenia is at its very early stages, Slovenia is one of the counties in EU and globally, that that has an umbrella act for PPP (Ferk in Ferk 2008). In Slovenia, there is also a special organisational unit responsible for PPPs, which is under the Ministry of Finance. This particular unit's roles in PPPs are as follows:

- harmonization of Slovenian legislation in the field of utilities and concessions with the *aquis communautaire*,
- systematic monitoring of the Regulations of the European Communities and the World Trade Organization and other international institutions in the area of utilities and concessions and the preparation of materials for the working bodies of the European Commission and other European institutions,
- consulting the public sector in the design and evaluation of public-private partnerships,
- preparation of regulations governing public-private partnerships and cooperation with foreign institutions and experts working in the field of public-private partnerships,
- keeping records of public-private partnership based on good practice design guidelines for selecting,
- monitoring and evaluation of public-private partnerships,
- monitoring the implementation of public-private partnership arrangements,
- production and availability of scientific literature (Ministry of Finance 2011).

Slovenian PPPA is a basic act for PPP with many provisions. It is specified through bylaws and especially through case law and legal applications. For 'right' legal application of PPPs in Slovenia, fundamental principles are important. The fundamental principles in PPPA for PPPs are principle of equality, principle of transparency, principle of proportionality, principle of balance, principle of competition, principle of procedural autonomy, principle of subsidiary liability and principle of cooperation. They should be used in cases of lacunae, doubt or non-coherence of PPPA (Ferk and Ferk 2008).

Institutionalisation of PPPs is also regulated by PPPA. The ministry competent for finance (Ministry of Finance) had organised a special organizational unit, which should be responsible for development, monitoring, cooperation and implementation of PPPs in Slovenia. It is crucial for PPP development that public sector generates knowledge and leadership abilities for implementing and managing PPP projects. Public sector has to be equal partner for successful PPP (de Jong et al. 2010). Thus, the aforementioned Special organisational unit has to be permanent and trustworthy for the private partner/s involved in PPPs. PPP are a long term partnerships agreements, therefore, ad hoc organisational units are therefore not suitable (Pintar 2009).

There are two main forms of PPPs in Slovenian legislative framework. First one is relationship of a contractual partnership and the second one is relationship of institutional or equity partnership. Both forms give public entities considerable flexibility in the types of agreements they may enter into. It is important that PPP policies and practices are standard, but, they still have to be flexible as some standard templates simply do not work in some situations and sectors (Deloitte 2006). In PPPA, contractual partnerships are implemented in compliance the Public Procurement Act and the Public Utilities Act. Contractual partnerships are divided according to:

- a concession - i.e. a bilateral legal relationship between the state or self-governing local community or other person of public law as the awarding authority and a legal or natural person as a concessionaire, in which the awarding authority awards to the concessionaire the special or exclusive right to perform a commercial public service or other activity in the public interest, which may include the construction of structures and facilities that are in part or entirely in the public interest (hereinafter: concession partnership); or
- a public procurement relationship - a payment relationship between the client and supplier of goods, contractor of works or provider of services, of which the subject is the procurement of goods or the performance of works or services (hereinafter: public procurement partnership).

The difference between the above concession and public procurement partnership is in the level of commercial risks involved (for the public partner) in operating the PPPs. If the public partner bears the majority or entirety of the commercial risks involved in operating a PPP project and when in doubt, who bears the majority of commercial risk, such partnership shall be deemed to be a public procurement partnership. Otherwise the partnership is a concession. A public-private equity or institutional partnership

is a relationship established between public and private partners in a manner whereby the state, one or more self-governing local communities or other persons of public law or other public partner awards the exercising of rights and obligations proceeding from public-private partnership to the contractor of a public-private equity partnership:

- by establishing a legal person,
- through the sale of an interest by the public partner in a public company or other entity of public or private law,
- by purchasing an interest in an entity of public or private law, recapitalisation or
- in another manner in comparative terms legally and actually similar and comparable to the aforementioned forms, and through the transfer of the exercising of rights and obligations proceeding from the PPP to such person (for instance performing commercial public services).

PPPA also regulates procedure for establishing a PPP. The procedure for establishing a PPP is more or less the same for contractual and equity partnerships. The procedure consists of the following steps:

- preliminary procedure, having the purpose of determining whether the economic, legal, technical or other preconditions for PPP are fulfilled;
- the PPP Instrument, where the subject, rights and obligations of a PPP, the procedure for selecting the private partner and other elements of an individual PPP relationship are determined. PPP instrument is obligatory if the private partner obtains a special or exclusive right to perform a commercial public service or other activity in the public interest;
- public tender. A PPP contractor must be selected on the basis of a public tender if not otherwise provided by law. The PPPA promotes the use of the competitive dialogue procedure;
- selection of the PPP contractor (private partner) and the right to legal protection;
- creation of the PPP relationship and duration of relationship;
- operation of PPP.

Slovenian legislation on PPP procedure is mandatory (Ferk and Ferk 2008) and the private partner must follow the steps in the PPPA. PPPA also sets the value limit for adoption of PPPs. For example, PPP is mandatory in cases where the estimated value of a project exceeds 5,278,000 EUR. According to the PPPA, public partner also bears subsidiary liability for damages caused to the users of services or other persons by the contractor (private partner) in operating a PPP. Users of services or other persons may claim reimbursement for damages from the public partner after submitting a written demand for compensation from the private partner and giving the private partner a reasonable time to pay such compensation, where the private partner has not responded to the demand or has partly or entirely rejected the demand for reimbursement. The public partner also has the right to reimbursement of such damages and of all associated costs from the private partner.

All in all, Slovenia has an open legislative framework for development of PPPs. According to official report from the Ministry of Finance (2009), the current situation of no real activity on PPP projects is connected with a large number of municipalities that are financially too weak to participate in PPP projects and the fact that undersized projects do not stimulate enough investment interest from the private sector. Second possible reason is that role of structural EU funds is very minor and not seen at all; although EU regulations are already attempting to change this (COM, 2009, p.615). The third reason for underdevelopment of PPPs in Slovenia is, the Public sector lacking knowledge on implementing and managing PPP projects. This is common to all the countries that are at its earlier stages of PPP development. The fourth and final reason is that, the organisational Unit (of Ministry of Finance) responsible for PPPs acts too passive and; as a public partner, it does not give enough stimulation for the private partner to get involved in PPPs.

DISCUSSIONS AND CONCLUSIONS

According to Tang, Shen and Cheng (2010) there can be political obstacles in the way of using PPP. This is not surprising since PPP projects always need special legislation or at least political support. In most countries the discussions are long either on state or municipal level. But there has to be some regulation (legislation) or regulator that controls the use of PPP. It is important to have political support while some government agencies may not well receive the PPP method of project development. According to Deloitte (2006), key requirement for countries which are at the beginning of development of PPP is establishment of necessary legislative and regulatory framework to support PPP program. Jurisdiction must determine goals and objective, issue major guidelines for PPPs, develop the legal framework, design a standard framework to drive down cost, establish processes for receiving and qualifying candidate projects, outline the role PPPs will play in the larger infrastructure program, set the procurement process, analyse stakeholder interest and communicate both internally and externally.

Most governments in the world are competing to attract investment capital, but it needs support through a strong legislative and statutory environment. Governments need to evaluate existing legal system to ensure that the enabling legislation has the appropriate corporate and commercial laws in place to support private investment. It is suggested to examine the existing legislation and regulatory framework to ensure that there are no distortions in the overall incentive environment. Slovenian legislation has followed these steps and the legislative framework gives public entities considerable flexibility in the types of agreements they may enter into in the specific procurement process. It also allows contracts to be awarded according to best value and not just low price. One of the reasons why Slovenia is not evolving faster on PPP field is that it has not established an effective and efficient central PPP unit (a similar system to the UK) to set policies and drive the process to aid in establishing a market for PPP and setting out detailed policy documents on how the process would work in the state. This organisation should develop standard gateway review process that each PPP project must pass before the deal can move forward. That would bring consolidated knowledge, standardised process and best practice to bear on each transaction, as well as to bring more certainty to the market. Public officials must gain the knowledge as to how to control and coordinate work with private partners. They have to have the skills in negotiation, contract management knowledge and risk analysis knowledge.

In PPPs, it is important that they tackle problems unconventionally and that they focus on results rather than on defending bureaucracy. In the UK, the government has established special bodies/units to support PPP development. Also many local authorities in the UK have established partnership boards to maintain direct contact between private service providers and government agencies working in PPPs. The boards provide a forum where government officials and their partners craft mutual objectives, articulate local priorities and make joint decisions. The forums are also a good way to track results which in turn helps build public sector support for future PPP projects (Deloitte 2006).

PPPs are a tool in government's hands that require careful application. Slovenia should learn from the experiences (both failures and success stories) of countries that have already adopted PPPs to a greater extent (e.g. UK). Slovenia should be more proactive and innovate and give more support and make initiatives for the private sector involvement in public projects.

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PERFORMANCE INDICATORS FOR PUBLIC-PRIVATE PARTNERSHIP (PPP) IN INFRASTRUCTURE

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The concept of performance measurement is very relevant in virtually all spheres of life. The concept has received much attention in terms of construction generally, but very few works have addressed the concept from the perspective of public-private partnership in infrastructure delivery. This study therefore developed a set of Performance Indicators (PIs) for infrastructure public-private partnerships in Nigeria. The study employed survey research design approach, extensive literature review was conducted and possible indicators were extracted. Semi-structured interview was then conducted on 12 professionals that have engaged in PPP projects in order to gather their own opinion on the items to be considered while measuring the success or failure of a PPP project. The outcome of the interview was then synchronized with what was obtained from literatures and then presented in the questionnaire that was administered. A 5-point likert scale was used. 87 questionnaires were administered to professionals with PPP experience and 53 were collected. Mean score, the Kruskal-Wallis test and Spearman rank correlation was used for analysis. The result showed that, there was no significant difference between the sample means of the four groups of respondents i.e. Consultants, Contractors, Government, and Concessionaires. It was also revealed that a high magnitude of correlation exists between all but 3 of the 15 indicators presented in the questionnaire. Also, 14 out of the fifteen indicators had weighted mean scores above 3.00 that was initially set as the cut-off. The top three indicators were Cost; Innovation, Learning and Development; and Sustainability. The study therefore concludes that a number of qualitative and quantitative indicators apart from the popular 'iron triangle' are suitable for measuring the performance of PPP projects.

Keywords: performance indicators, performance measurement, public-private partnership, success measures

INTRODUCTION

Public-Private Partnership, or PPP, is simply a contractual agreement formed between a government agency and a private sector entity that allows for greater private sector participation in the delivery of public infrastructure projects (Deloitte 2005). In some countries, involvement of private financing is what makes a project a PPP project. According to HM Treasury (2000), a PPP is an arrangement that brings public and private sectors together in long-term partnership for mutual benefit– this definition in its simplicity leaves much for interpretation. The following definition was adopted and was used thereafter in Leiringer (2006), a public-private partnership is an arrangement between public sector and private sector investors and businesses (the Private Sector) whereby the private sector on a non-recourse or limited recourse financial basis provides a service under a concession for a defined period that would otherwise be provided by the public sector. However, the exact definition of PPPs is not as important as ensuring that both sides of dialogue understand what they are both talking about.

The importance of identifying performance is evident throughout the markets worldwide, it is important to consider how an organization, a project or a partnership performs. Research into the area of key performance indicators (KPIs) to assess the success of relationship-based projects in construction is vital because it can help set a benchmark for measuring the performance of these projects. It is difficult for stakeholders to objectively evaluate the performance level of their relationship-based projects. Yeung et al. (2009) developed a performance index which can be used to comprehensively, objectively, reliably, and practically measure the performance of relationship-based projects in Australia.

Despite extensive research, there is no general agreement on a set of KPIs for construction projects to-date (Chan and Chan 2004), so also for measuring the performance of partnerships in infrastructure delivery. However, it seems difficult as every project has certain unique features and limitations (Cox et al. 2003) even when executed under same procurement system. Therefore generalizing a set of performance measures for all kinds of partnerships looks fairly impractical. Regardless of this limitation, it is important to comprehend the perception of performance measures on public private partnerships. Cox et al. (2003) stated that there is the need for identifying a set of common indicators to be used by construction executives and project managers in measuring construction

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performance at the project level. Toor and Ogunlana (2010) only considered nine (9) indicators and no metrics for a study on large public sector development projects, the work's focus was not on PPP but large scale public sector development projects, therefore, the problem of unavailability of systematic indicators for Public Private Partnerships in infrastructure remain unsolved and needs to be addressed. It is ideal to talk about the existence of disputes, cost performance, time, and quality performance while considering the performance of construction works or infrastructure generally, but these parameters may not be sufficient to evaluate the success of the delivery approach as there are several other parameters that can be considered. It is therefore necessary to clearly set-out the most important varieties of possible parameters for evaluating the success of partnerships. Yeung et al. (2009) in a study on performance of relationship-based projects in Australia recommended eight performance indicators for relationship based construction projects and also provided an index to measure, monitor, and upgrade such projects. This research therefore presents performance measurement criteria for infrastructure partnerships based on the submissions of professionals who have engaged in public private partnership projects in Nigeria.

LITERATURE REVIEW

Public Private Partnership (PPP) project arrangements are complex and involve many parties with conflicting objectives and interests. Hence, PPP projects often require extensive expertise input, high costs and take lengthy time in deal negotiation. The high-transaction costs and lengthy time may not represent good value to all parties and as a result the deal may not materialize in the beginning or may falter in the end. PPP projects may incur higher transaction costs than those under the conventional public sector procurement. The legal and other advisory fees would be included as lawyers are involved in all stages of a PPP project, as well as the cost of private sector finance, and the price premium for single point responsibility arrangement. The potential high-transaction costs may have a negative impact on the objective of securing the best value (Li et al. 2006; Zhang 2005).

The application of PPP in Nigeria is becoming increasingly popular for both new projects and for the operation and management of old facilities. However, many infrastructure projects that had been developed through PPPs, even in countries with relatively long history of PPP applications have failed according to Abdul-Aziz (2001), cited in Ibrahim et al. (2006).

PPP is seeing to bring potential benefits to local economic development in the region(s) where the facility is built or the services are delivered. Local employment opportunities can be improved, not only for the direct construction and operational activities associated with the project, but also for ancillary services and businesses established by entrepreneurs eager to exploit the opportunities created by its location.

In Nigeria, Build Operate Transfer (BOT) and Joint Venture (JV) are the popular models of PPP being employed in the provision of infrastructure projects ranging from road, airport, to housing units. In a study conducted by Dada et al (2006) cited in Ibrahim et al. (2006), 18 out of 21 PPP projects surveyed in Lagos State used either JV or BOT model with two third of the projects in the housing sector. In another study conducted by Jagafa (2008), 9 out of 10 projects referenced in the work were on BOT.

BOT PPP model is the granting of concession by the government to a private promoter, known as concessionaire who is responsible for financing, construction, operation, and maintenance of a facility over a concession period before finally transmitting the functional facility to the government. While the Joint Venture approach is the system of partnership in which the private and the public sector partner pull their assets, finance, and expertise under joint management, so as to deliver long growth in value for both partners.

PPP was first introduced in the United Kingdom in 1992, in the form of Private Finance Initiative (PFI) as a way of procuring public infrastructure by getting the private sector to finance, build and operate it under contracts typically lasting 25 to 30 years. Up to 2006, 794 PPP/PFI deals had already been signed. The combined capital value was approximately £55 billion (National Audit Office, 2008) cited in Cheung, Kajewski and Chan (2009).

Public Private Partnerships have been used for many projects around the world. According to Leiringer (2006), examples are Bromley Hospitals redevelopment project, Farnborough – one of the largest hospital schemes to be carried out under the Private Finance Initiative (PFI) in the UK with a concession valued at £155 million; The HM Prison Parc in Bridgend, Wales – the first, major capital, non-lease-financing project to be put in place under the PFI, with construction work valued at £65 million and; King's College Hospital, Denmark Hill, south London – a £110 million DBFO project part of a long-term development plan at the hospital.

The reasons for initiating PPP projects might differ between the various parts of the public sectors. One of the main reasons that projects are procured by PPP is to enhance VFM by inviting the private sector to handle public works projects (Cheung, Chan and Kajewski 2007).

According to Leiringer (2006), some of the reasons why PPP may be initiated at the macro level are: Public policy and governance, effects on the public sector financial control framework and expenditure controls, and sustainable development in communities and regions.

This is evident from a report by HM Treasury (2000: 12), where the UK Government stated that the search for new opportunities to develop profitable business provides the private sector with an incentive to be innovative and try out new ideas. This in turn can lead to better higher services delivered more flexibly and to a higher standard. Risk transfer is one of the main reasons for adopting the PPP approach. The private sector is in general more efficient in asset procurement and service delivery and as a result it is to the government's advantage to share the associated risks with the private sector. Cost savings which refer to the reduction in price as a result of delivering a project by PPP instead of traditional methods is also one of the major reasons for adopting PPP. The private sector generally achieves higher operational efficiency in asset procurement and service delivery by applying their expertise, experience, innovative ideas/technology (e.g. using durable materials to reduce future maintenance costs) and continuous improvements. Overall cost savings to the project can be achieved by striving for the lowest possible total life cycle costs while maximizing profits (Cheung et al. 2009). Cheung et al. (2009) also opined that, the private sector is continuously searching for new products and services to increase its competitive edge and to save costs.

Key performance indicators are criterion or benchmark for the performance of a particular phenomenon (Dawood and Sikka 2009). The criteria of project success are seemingly constantly enriched, although, not usually infrastructure public private partnership oriented. Therefore, a systematic critique of the existing literature is needed to develop an outline for measuring construction public-private partnership success both quantitatively and qualitatively. According to Takim and Akintoye (2004), a key performance indicator (KPI) is the measure of the performance of the process that is critical to its success. The best performance achieved in practice is the benchmark.

Despite extensive research, there is no general agreement on a set of KPIs for construction projects to-date (Cox et al. 2003) even when executed under same procurement system. Therefore, generalizing a set of performance measures for all kinds of partnerships looks fairly impractical. Regardless of this limitation, it is important to comprehend the perception of performance measures on public private partnerships.

There are various performance indicators for industries. According to Latham (1994) they are: Client satisfaction, Public interest, Productivity, Project performance, Quality, Research and development, Training and recruitment, Financial. They can also be said to be Construction cost, Construction time, Defects, Client satisfaction (product), Client satisfaction (service), Profitability, Productivity, Safety, Cost predictability (construction), Time predictability (construction), Cost predictability (design), and Time predictability (design) (Egan, 1998).

The purpose of KPIs is to enable measurement of project and organizational performance throughout the construction industry (KPI working group 2000). Crane et al. (1999) introduced three types of measures for performance of partnering projects. Two of them, result measures and relationship measures, are crucial to measure the performance of partnering projects. They defined result measures as "hard" measures based on performance, such as cost, schedule, quality, and safety. They argued that since result measures tell the decision maker little or nothing about the condition of the environment in which the performance is attained, a partnering relationship must make use of relationship measures to achieve a greater degree of foresight and realize the benefits of increased time to react to problems in the relationship. Cheung et al. (2003) stated that hard measures alone do not provide a clear picture of partnering performance, as partnering is about cooperative working relationships between contracting parties. They also suggested that it is necessary to use relationship measures to assess the behavioural aspects of partnering. Crane et al. (1999) defined relationship measures as "soft" measures and they are used to track the activities and effectiveness of the partnering working team. The relationship measures identified in the study include: internal communication; external communication; meeting effectiveness; worker morale; internal trust; external trust; internal leadership; external leadership; accomplishment of objectives; utilization of resources; problem solving; creativity and synergy; timely evaluation and appropriate response; definition and adherence to roles and responsibilities; continuous improvement; and teamwork. Rosenfeld (2009) reaffirms that investing in quality is a worthy strategy and leads to several benefits.

Project success means different things to different people. Each industry, project team or individual has its own definition of success (Chan and Chan 2004). To some, it is an intangible perceptive feeling, which varies with different management expectations, among persons, and with the phases of project. Owners, managers, financiers, designers, consultants, contractors, as well as sub-contractors could have their own project objectives and criteria for measuring success. But the possible variant objectives are expected to be converted into a common focus. For example, architects often consider aesthetics rather than building cost as the main measure of success. Clients may value other dimensions more; managers of a PPP project may be more interested in the eventual cash flow of the project.

Chan et al. (2004) believes that same person's perception on success can also change from project to project. Definitions on project success are dependent on project type, size and sophistication, project participants and experience of owners among others. However, despite the possible variances in opinion, dictated by some or more of the aforementioned factors, it is evident from literature that conclusions from researchers are not always so far from each other. In a review conducted by Chan (1996), cited in Chan et al. (2004), in the early 1990s, success of construction activities, without reference to procurement approach, is based on duration, cost and quality. At a later period, other measures were introduced, among these are; participants satisfaction level, absence of legal claims, user's satisfaction, client and project manager's satisfaction, transfer of technology, friendliness of environment, health and safety among others. Toor and Ogunlana (2010) suggested three-layer measurement criteria for mega projects as follows:

- Level 1 - On time, On budget, According to specification
- Level 2 - Safety, Efficiently, Doing the right things (Effectiveness)
- Level 3 - Free from defects (high quality of workmanship), Conforms to stakeholders expectation, Minimized construction aggravation, disputes and conflicts. It was stated that key performance indicators (KPIs) are closely connected to each other. In order to achieve the KPIs at level 1 (on-time, on-budget, and according to specifications), sufficient effort must be put to achieve safety, efficiency, and effectiveness/precision. According to the study, the KPIs at level 1 cannot be achieved if the KPIs at level 3 are not constantly monitored.

RESEARCH METHOD

Data for this study were collected via questionnaire survey and interview conducted on professionals with public private partnership experience. The population for this research was the total number of professionals that have been involved in an infrastructure public private partnership project in Lagos state, the list of organizations that have engaged in PPP was collected from three major infrastructure projects website and PPP office Lagos state. The organizations identified fell under four groups i.e. Government, Developer/Concessionaire, Consultants, and Contractors. Professionals that participated on PPP projects were identified by respective organizations and were demanded to be served questionnaire. During the interviews conducted prior to the construction of the questionnaire it was discovered that a number of consultants are usually engaged by the government but they hardly know about public private partnership. These consultants strictly understand their technical areas, they were therefore not considered for this work. Presented in Table 1 below is the number of questionnaire administered.

Table 1: Number of questionnaires administered

GROUPS/TYPE OF ESTABLISHMENT	NUMBER ADMINISTERED
Government	5
Concessionaire	12
Consultants	55
Contractor	15
TOTAL	87

A total of 12 professionals were interviewed within the identified group of target respondents in order to gather their own opinion on the items to be considered while measuring the success or failure of a PPP project. Four (4) professionals responded to the interview in 2 concession companies and four (4) from the public-private partnership office. Others were two corporate members of the Nigerian Institute of Quantity Surveyors, who are members of staff of the consultant Quantity Surveyor on Murtala Mohammed airport, Lagos (a PPP project), an Architect and an Engineer on a PPP market project being developed at Yaba, Lagos State Nigeria were the remaining four. Presented in Table 3 is the distribution of interviewees from the government and concessionaire group.

Table 2: Distribution of interviewees

GROUPS	INTERVIEWEES	NUMBER OF INTERVIEWEES
Government	Legal and Risk Unit	1
	Director General's office	1
	Procurement unit	1
	Engineering and Construction	1
Concessionaire	Line Manager	2
	Project Engineer	2

The outcome of the interviews conducted was absorbed in the questionnaire administered for the development of performance indicators for partnerships in infrastructure. This was done in order to prevent total dependence on literature, neutralize the researcher's pre-conceived ideas, and most importantly allow experienced parties to set the indicators. Their responses were then compiled and joined with performance indicators obtained via literature review into the questionnaire that was administered.

The designed multiple choice type questionnaires consist of different tables and check boxes. The first section of the questionnaires contains questions meant to collect data about the general characteristics of respondents, this is necessary so as to check the quality or worthiness of the person giving the information. This section served as a source of information regarding the profession, membership of professional bodies and years of experience of respondents. The other section of the questionnaire was structured with a question relating to objective of the study on a 5-point Likert scale for importance with 5 and 1 being the highest of the rating and the least respectively. Respondents were asked to indicate the importance/suitability of each indicator for measuring the performance of partnerships in infrastructure.

Mean score was used to rank performance indicators and metrics. The premise of decision for the ranking is that the factor with the highest mean score is ranked 1st and others in such subsequent descending order. The basis of determination of level of importance of factors using mean item score was on this premise: $1.00 < MIS \leq 1.99$ - No importance, $2.00 < MIS \leq 2.99$: Low importance, $3.00 < MIS \leq 3.99$ - Moderate importance, $4.00 < MIS \leq 4.89$ - High importance, and $4.90 < MIS \leq 5.00$ - Extremely high importance. Factors with a mean score of greater or equal to 3.00 will only be recommended as indicators to be considered for performance measurement.

Kruskal-Wallis Test, the nonparametric tests for multiple independent samples, are useful for determining whether or not the values of a particular variable differ between two or more groups. This is especially true when the assumptions of ANOVA are not met. This test was used to measure the level of difference between the sample means of performance indicators as scored by respective group of respondents. Although one-way analysis of variance (ANOVA) is the method of choice when testing for differences between multiple groups, it assumes that the mean is a valid estimate of center and that the distribution of the test variable is reasonably normal and similar in all groups. However, because the test variable is ordinal, the mean is not a valid estimate because the distances between the values are arbitrary. Even if the mean is valid, the distribution of the test variable may be so non-normal and this makes one suspicious of any test that assumes normality. These are referred to as nonparametric because they make no assumptions about the parameters (such as the mean and variance) of a distribution, nor do they assume that any particular distribution is being used.

Spearman's rank correlation coefficient is used in assessing the level of association or the strength of relationship between two variables (Naoum 1999) and its value ranges from -1.0 to +1.0. This method was employed in this research work to examine the level of association between the respective indicators.

DATA ANALYSIS AND RESULT

Out of the total number of 5 questionnaires administered at the public private partnership office, only four were retrieved, a total number of twelve were also administered to concessionaires but only four were returned, also, thirty six out of the fifty five administered among consultant as earlier identified were returned, a total number of nine were also retrieved from contractors. On the overall, a response rate of 60.92% was recorded. 7.50% of the respondents had HND as their academic qualification, while those with B.Tech/BSc were 49.06%, the B.Tech./BSc holders were from different professions ranging from Quantity Surveying - 26.42%, to Architecture - 39.62%, Engineering - 28.30% and others. 41.51% of the respondents had M.Tech/MSc, while 1.89% of them had

LL.B. Those with over 11 years in service were 30.19%, with the majority of others having between 6 and 10 years of experience. About 52.71% of the respondents were corporate members of their respective professional bodies, majority of others were graduate members. The wide distribution of the respondents over several professions, their relatively high academic status (M. Tech./M. Sc.), their affiliation with relevant professional bodies and their experience on and their knowledge of public private partnership in infrastructure makes them suitable to provide needed information for this study.

In order to ascertain the internal consistency of the survey variables, reliability test was conducted and a Cronbach's alpha value of 0.836 was obtained. This is higher than what was obtained in a similar study by Yuan, Zeng, Skibniewski and Li (2009), signifying that the instrument used for the study was reliable. Presented in table 3 below is the mean score and rank of performance indicators by the various groups of respondents.

Table 3: Ranking of performance indicators by the respondent groups

	CONSULTANT		CONCESSIONAIRE		GOVERNMENT		CONTRACTOR		OVERALL	
	MEAN	RANK	MEAN	RANK	MEAN	RANK	MEAN	RANK	MEAN	RANK
Cost	4.75	1	4.25	2	4.50	1	4.67	1	4.68	1
Innovation, Learning and Development	4.75	1	3.50	9	3.50	8	3.89	7	4.42	2
Sustainability	4.50	3	4.00	3	4.00	2	4.00	4	4.34	3
Time	4.36	4	4.00	3	3.75	5	3.89	7	4.21	4
Quality	4.11	6	4.50	1	4.00	2	4.22	2	4.15	5
Socio economic issues	4.00	7	3.75	6	4.00	2	4.00	4	3.98	6
Environmental	4.28	5	3.50	9	3.00	14	3.11	13	3.92	7
Relationship and Communication	3.94	8	3.50	9	3.75	5	3.78	10	3.87	8
Scope of rework	3.89	9	3.50	9	3.50	8	3.78	10	3.81	9
Financials and Marketing	3.75	10	3.25	13	3.75	5	4.00	4	3.75	10
Users' satisfaction	3.50	11	4.00	3	3.25	11	4.22	2	3.64	11
Safety	3.50	11	3.75	6	3.25	11	3.78	10	3.55	12
Government's satisfaction	3.22	14	3.75	6	3.50	8	3.89	7	3.40	13
Host Community's Satisfaction	3.25	13	3.25	13	3.25	11	2.89	14	3.19	14
Developer/Client's satisfaction	3.00	15	3.25	13	3.00	14	2.56	15	2.94	15

Table 3 shows the level of importance attached to the respective infrastructure partnership performance indicators by the respective groups of respondent. The Kruskal-Wallis test was carried out to examine the significance of the difference between the ratings of indicators by the four groups of respondents.

Degree of freedom (DF) = 3: H-calculated (Hcal) = 3.81; $\chi^2 = 6.251$ at 10% level of significance; p-value of 0.283.

Decision: $H_{cal} < \chi^2$, there is no significant difference in the sample means of the four respondent groups. This means that, all the groups of respondents are in agreement, and the overall mean calculated can be accepted as representing individual opinion. To understand the pattern of rating a little bit more, the mean ranking by respondent groups were examined. All the factors identified for measuring the success of partnerships scored above 3.00 across all the groups of respondents except the factor 'developer's satisfaction' under government's rating and contractors' rating and 'host community's satisfaction' under contractors' rating. The mean score of 3 and above as obtained in this study indicates that the identified factors were important, highly important or extremely important.

The three traditional measures of performance in the construction industry still maintained a high importance among the total of 15 indicators identified for the study, innovation, learning and development; sustainability, and socio-economic issues were also rated among most important indicators for determining the success of partnership agreements in infrastructure. This might be connected with the recent desire for change across different quarters in the country, also, sustainability of principles and ideas is another important culture being demanded by so many people in the country, considering the nature of PPPs especially the Build Operate Transfer family, the issue of sustainability can be considered to be important. It is important to note, that some of these indicators

are qualitative.

Correlation test was done to examine the association between indicators, Table 4 above shows that there is an appreciable magnitude of correlation between indicators except for government satisfaction, host community's satisfaction and developer's satisfaction. Apart from these three indicators, all others strongly correlate with each other, this implies that there is a relationship or overlap and can therefore be reduced to groups. But, this might not be necessary because (i) some of the indicators are qualitative, combining them with quantitative ones may not serve any purpose, (ii) most of the indicators are not only numerically related but logically connected, therefore, they are not to be seen as separate entities but various units/aspects of a single group.

DISCUSSION OF RESULTS

The study built on professionals' submissions and extensive literature review to extract a list of relevant indicators cutting across works done in different nations and eventually presented a final list of performance measures spanning through the pre-execution, execution, and operation of infrastructural facilities.

In order to clarify some ambiguities related to scale of project success, Lim and Mohammed (1999) opined that there are two view points, they are, macro level success and micro level success. The micro view points are said to concern construction parties-consultants and contractors while the macro level concerns end users and project beneficiaries. Toor and Ogunlana (2010) identified and ranked 9 performance indicators in their study on large scale public sector development projects, delivery on time, under budget, efficient use of resources and safety were the first four top indicators.

Sohail and Baldwin (2003) identified six indicators and an overall of 67 measures for micro projects in developing countries but the strength of each was not identified. This study identified 15 indicators, at the end of evaluation, cost; innovation, development, and learning; sustainability and time were rated as the first four most important indicators. Comparing this with the findings of Toor and Ogunlana (2010), cost and time fell among the first four in both studies.

INDICATORS	TIME	COST	RELAND COMM.	SUSTA'TY	SAFETY	ENVIRONMENTAL	GOVT'S SATISFACTION	DEV/CLIENT'S SATISFACTION	HOST COMMUNITY'S SATISFACTION	USERS' SATISFACTION	QUAL.	SCOPE OF REWORK	SOC ECONOMIC ISSUES	INNOV, LEARNING & DEV.	FIN. AND MKTG
Time	1.000														
Cost	0.567**	1.000													
Relationship and Communication	0.231	0.571**	1.000												
Sustainability	0.014	0.440**	0.523**	1.000											
Safety	-0.316*	0.141	0.475**	0.583**	1.000										
Environmental	0.251	0.298*	0.440**	0.576**	0.435**	1.000									
Government's satisfaction	-0.089	-0.118	0.131	0.250	0.334*	0.167	1.000								
Developer/Client's satisfaction	0.235	-0.108	0.209	0.114	0.250	0.433**	0.246	1.000							
Host Community's Satisfaction	-0.202	0.025	0.511**	0.407**	0.610**	0.425**	0.172	0.635**	1.000						
Users' satisfaction	-0.180	0.368**	0.468**	0.387**	0.741**	0.230	0.356**	-0.179	0.173	1.000					
Quality	-0.364**	-0.195	0.076	0.199	0.596**	0.047	-0.033	0.181	0.398**	0.296*	1.000				
Scope of rework	0.240	0.340*	0.496**	0.304*	0.368**	0.397**	0.379**	0.226	0.188	0.363**	-0.143	1.000			
Socio economic issues	0.241	0.657**	0.479**	0.567**	0.327*	0.415**	0.451**	-0.006	0.015	0.562**	-0.292*	0.532**	1.000		
Innovation, Learning and Dev.	0.619**	0.765**	0.583**	0.490**	0.217	0.610**	-0.153	0.181	0.119	0.182	-0.101	0.462**	0.530**	1.000	
Financials and Marketing	0.482**	0.799**	0.594**	0.403**	0.254	0.237	0.086	-0.081	0.043	0.369**	-0.148	0.377**	0.632**	0.651**	1.000

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 4: Correlation Matrix for performance indicators

The whole of 15 indicators identified and subjected to professionals' verification scored above 3.00, this indicates a high level of support. Sohail and Baldwin (2003) came up with 69 indicators for micro-projects; the indicators were subdivided under the following headings: general indicators, time indicators, cost indicators, quality, inter-organisational co-operation and partnership, socio-economic issues. This study outlined 15 indicators with each having a list of measures or metrics though not presented in this particular study. In a similar work by Yuan, Zeng, Skibniewski and Li (2009), 48 indicators were identified under 5 headings. The headings are perspective of physical characteristics of projects, financing and marketing, innovation and learning, stakeholders' indicators, and process indicators.

A review of the indicators developed in this study shows that they reflect the atmosphere of public private partnership and were also set based on the examined capabilities of the partners on ground. The eventual lists of indicators represent a set of metrics from which stakeholders in PPP can select the appropriate basis for the overall programme of PPP projects.

CONCLUSION

Thirteen (13) out of the 15 indicators identified for this study had mean scores of above 3.50. This implies that all the groups of respondents engaged in the research believed that majority of the indicators are at least moderately important. Innovation, learning and development; and sustainability notably made the list of first five indicators for infrastructure partnerships alongside time, cost and quality of project. The measures of assessing the success of infrastructure related projects are shifting away from time, cost and quality; all stakeholders should work assiduously to ensure the satisfaction of all the indicators identified in this work especially sustainability, innovation, learning and development in all partnerships.

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EXTERNAL AGENCIES FOR SUPPLEMENTING COMPETENCIES IN INDIAN URBAN PPP PROJECTS: A PERCEPTION ANALYSIS

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Rapid growth in India's urban population has been creating severe stress on urban infrastructure. The poor state of urban infrastructure has the potential to hamstring long-term economic prospects of not only the urban areas but also the country as a whole. Public private partnership (PPP) model has been gaining a prominent place in policy initiatives for improving provision of urban services. As per the Indian Constitution, urban local bodies (ULBs) are responsible for delivery of urban services. The weak competencies in ULBs for implementing urban PPP projects is recognized as a major hurdle in uptake of PPP model. In India, there is growing popularity of involving external agencies for supplementing competencies at ULB level. These external agencies include: transaction advisors, PPP nodal agencies, PPP cells and private advisors. There are two key aspects which need investigation before making a decision to involve external agencies in urban PPP projects: reasons for involvement of external agencies and competencies to be supplemented by these agencies. A questionnaire survey was conducted among urban PPP experts and ULB representatives for analyzing these two aspects, which represents demand and supply side of competency development system respectively. The reasons for involvement of external agencies to supplement competencies rated high in importance are improvement in quality of deliverables, making available unique competencies for implementing urban PPP projects and transparency in implementation of urban PPP projects. The five most important competencies to be supplemented by external agencies are transaction design, evaluation, project marketing, project development process management and PPP process management.

Keywords: competencies, external agencies, public private partnerships, urban infrastructure, urban local bodies

INTRODUCTION

In India, there is an unprecedented wave of urbanization across many states. According to the census of 2001, the urban population accounted for 28 percent of country's population. This is expected to rise to about 40 percent by 2021 (Ministry of Urban Development 2005). The existing urban infrastructure is grossly inadequate to meet the needs of rapid urbanization. This has led to deterioration in quality of urban services. Urban local bodies (ULBs) are constitutionally responsible for providing urban services. These ULBs are facing challenges in mobilizing financial resources and skilled manpower to meet demand of urban services. Policy makers have recommended a series of reforms to address the urban infrastructure deficit issue. Delivery of urban services through public private partnership (PPP) model is one of the recommendations. This model was expected to usher in a new wave of urban infrastructure development in the country. However, the reality is altogether different. The uptake of the PPP model has been facing a major hurdle in terms of weak competencies in urban local bodies to implement PPP projects. As a result the competency development in ULBs has become one of the key themes of policy frameworks for urban infrastructure development.

In India, there is growing trend of involving external agencies for addressing weak competencies at ULB level. These external agencies include: transaction advisors, PPP nodal agencies, PPP cells and private advisors (World Bank 2007; Dutz et al. 2006; Government of India 2007). In India, the earliest method of incorporating external agencies was the appointment of external advisors from open market and the service delivery department defined their role according to the needs of the urban PPP project. However, the government felt the need for institutionalizing the role of these private external advisors based on interaction with the service delivery departments and urban PPP experts (ADB 2006). The formation of a panel of transaction advisors by the Central Government is one of institutional mechanisms for engaging external advisors, followed by establishment of PPP nodal agencies by state governments and PPP cells at state level in collaboration with Asian Development Bank and Central Government (Dutz et al. 2006; ADB2006).

Dutz et al. (2006) have analyzed the external agencies existing in various states in India for supplementing competencies in ULBs and service delivery departments. Similarly, a report by World Bank on PPP units has investigated contributions made by PPP units to success of PPP programs in different countries (World Bank 2007). These studies highlight the following issues: 1) the growing

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popularity of external agencies in the form of PPP units and PPP cells, and 2) the variation in competencies supplemented and roles played by external agencies across different countries. Also, these reports mention that roles and responsibilities of external agencies have to be designed according to the problems faced by governments in implementing a PPP program. In this context there are two key aspects that need investigation: reasons for involvement of these agencies and competencies to be supplemented by external agencies.

The competency development system comprises of two components: a demand side and a supply side (Peltenburg 1996). The demand side consists of ULBs whose competencies need to be developed. The supply side includes the developmental organizations, private advisory firms, and research institutions involved in formulation and implementation of policies pertaining to competency development for implementing urban PPP projects. Various research studies have highlighted the need for creating an interface between the demand and supply side for developing competencies and have also underscored the importance of the shift from the supply side to demand-led initiatives for competency development (Peltenburg 1996). This interface would provide key inputs to policy-making process and help in tapping the potential of external agencies to the fullest extent. In this context, a research study was carried out with an objective to evaluate the perception of demand and supply side of competency development on aspects related to involvement of external agencies. This paper describes the outcome of this research study.

RESEARCH METHODOLOGY

As part of a systematic study on 'Identification and assessment of competencies in ULBs for implementing PPP projects in India', the competencies required for implementing urban PPP projects were identified by a two step process - review of literature and semi structured interviews with various stakeholders associated with urban PPP projects. This process resulted in the development of a competency framework for implementing urban PPP projects consisting of twelve competencies grouped under four categories based on the phases of urban PPP projects - project appraisal, procurement, service management and project lifecycle. The applicability of PPP competency framework in the practical realm was investigated with case study approach involving five urban PPP projects (Devkar 2011). The competencies identified are described in the Table 1.

There are various reasons behind engagement of external agencies. This research study conducted literature review for identifying these reasons. The preliminary list of reasons for engagement of external agencies was discussed with urban PPP experts and officials of ULBs. The final list consists of eight reasons: 1) lack of manpower in ULBs to handle additional responsibilities of PPP project, 2) lack of understanding among the ULB officials about PPP in delivery of urban services, 3) enables the ULBs to make available unique competencies for implementation of PPP project, 4) third party view on the potential PPP project, 5) transparency in implementation of PPP project, 6) allows the ULBs to focus on its core functions in implementation of PPP projects, 7) cost savings, and 8) improvement in quality of deliverables.

The questionnaire survey approach was adopted in this research study. The respondents to the questionnaire were urban PPP experts and ULB representatives. These two categories of respondents represent the supply and demand side of competency development system respectively. The questionnaire survey has been designed carefully with focus on aspects like scope, content and purpose of the question, choosing the format for obtaining response from the respondent and wording of the questions to completely tap the issue of interest. The preliminary questionnaire was circulated among urban PPP experts and officials of ULBs in the field, and their suggestions with respect to content, structure, format and sequencing of the questions were incorporated in the final questionnaire.

A literature review was performed to identify organizations where urban PPP experts have been involved. In 2005, the Central Government of India launched an ambitious programme in the urban sector, named Jawaharlal Nehru National Urban Renewal Mission (JNNURM). This program has identified 63 cities across India for showcasing improvement in the provision of urban services. The ULBs that come under JNNURM program (JNNURM ULBs) are the focal points of efforts in the direction of competency development, urban infrastructure financing, urban PPP projects, citizen participation, and administrative reforms. Owing to these developments, responses from representatives of JNNURM ULBs were collected in this research study. The municipal commissioners of these JNNURM ULBs are at the helm of affairs relating to the delivery of urban services. Hence, municipal commissioners of JNNURM ULBs were requested to provide responses to the questionnaire. In case of unavailability of municipal commissioners owing to administrative reasons, responses were sought from ULB officials who can provide a holistic view on competency development for implementation of urban PPP projects.

The survey was administered during the period of January to December 2009. 113 questionnaires were mailed to urban PPP experts and ULB representatives, which included 63 questionnaires to JNNURM ULBs and 50 questionnaires to urban PPP experts. At the end of this exercise, 51 responses were received. Of these, 26 responses were from ULB representatives and 25 were from urban PPP experts. The response rate of 45% percent is considered very good for this kind of mail survey.

Table 1 Description of Competencies

COMPETENCY	BRIEF DESCRIPTION
I. PROJECT APPRAISAL COMPETENCY CATEGORY	
1. Project identification	Ability for identification of service requirement in the municipal area which can be delivered on PPP mode
2. Project conceptualization	Ability to sufficiently define the proposed project for deciding whether to commit resources for project development and maximize the chances of implementing the project on PPP mode.
3. Project development process management	Ability to undertake project preparation studies for informed decision making about implementation of project.
II. PROCUREMENT COMPETENCY CATEGORY	
4. Transaction design	Ability for designing the PPP bidding process as well as associated documents to be used in a procurement plan
5. Project marketing	Ability to promote the PPP project among private participants and ensure development of marketplace of urban PPP projects in long run
6. Evaluation	Ability to assess the responses received from private parties at various stages of procurement process for selection of sound strategic private partner.
III. SERVICE MANAGEMENT COMPETENCY CATEGORY	
7. Contract management	Ability to ensure that the respective roles and responsibilities of parties to the contract are fully understood and fulfilled to the contracted standard during the operation phase of the project
8. Relationship management	Ability to develop and manage the relationships between ULB and private operator involved in the project
9. Service handover management	Ability to facilitate transfer of service to the ULB or other parties for continued delivery of services satisfactorily.
IV. PROJECT LIFECYCLE COMPETENCY CATEGORY	
10. Stakeholder management	Ability to plan and facilitate a process of stakeholder consultation that leads to transparent and inclusive decision making at various phases of PPP project
11. PPP process management	Ability of planning and monitoring the various processes in PPP project to achieve project objectives
12. Project governance	Ability to provide strategic direction to the project by ensuring adoption of principles of participation, decency, transparency, accountability, fairness and efficiency in implementation of PPP project.

COMPETENCIES TO BE SUPPLEMENTED BY EXTERNAL AGENCIES

The survey respondents were asked to rate the importance of supplementing the competencies by external agencies based on their perception and experience with urban PPP projects. A five-point scale from “Not Important” to “Most Important” was used for rating importance of these competencies. The relative importance index (RII) was used for summarizing the importance of each competency. The RII is calculated as follows (Kumaraswamy 1998):

$$RII = \frac{\sum w}{A \times N}$$

where w = weight as assigned by each respondent in a range from 1 to 5, where 1 implies ‘not important’ and 5 implies ‘most important’; A = the highest weight (5); N = the total number in the sample.

These competencies within each category of respondent were ranked on the basis of RII. The combined perception of all respondents, as well as differences in perception between urban PPP experts and ULB representatives are shown in the Table 2. It can be seen that

there is, in general, a high degree of agreement in importance rating of competencies supplemented by external agencies except for stakeholder management. Therefore, the results are discussed based on the combined perception of all respondents on competencies supplemented by external agencies at ULB level.

Table 2 Importance Ratings of Competencies to be Supplemented by External Agencies

COMPETENCY	URBAN PPP EXPERTS		ULB REPRESENTATIVES		COMBINED		T TEST	
	RII	RANK	RII	RANK	RII	RANK	T VALUE @	SIG.
Project identification	0.58	9	0.59	12	0.58	12	- 0.220	0.827
Project conceptualization	0.61	7	0.67	10	0.64	8	- 0.909	0.368
Project development process management	0.74	4	0.72	6	0.73	4	0.202	0.840
Transaction design	0.82	1	0.76	2	0.79	1	1.142	0.259
Evaluation competency	0.78	2	0.73	4	0.76	2	0.847	0.401
Project marketing	0.73	5	0.76	1	0.75	3	- 0.469	0.641
Contract management	0.74	3	0.69	7	0.71	6	0.611	0.544
Relationship management	0.56	12	0.65	11	0.6	11	- 1.246	0.219
Service handover management	0.58	8	0.69	9	0.64	9	- 1.480	0.145
Project governance	0.57	10	0.69	8	0.63	10	- 1.761	0.085
PPP process management	0.71	6	0.74	3	0.73	5	- 0.435	0.665
Stakeholder management	0.56	11	0.73	5	0.65	7	- 2.805	0.007*

@ H₀: There is no significant difference in importance rating by different category of respondents

* H₀ Rejected at 5% significance level H₁: Significant difference in importance rating among different category of respondents

RII: Relative Importance Index

ULBS NEED MAXIMUM INVOLVEMENT OF EXTERNAL AGENCIES FOR SUPPLEMENTING PROCUREMENT CATEGORY COMPETENCIES

The procurement competency category deals with the selection of private partner for delivery of urban services. The competencies associated with this category have been rated highest in importance by survey respondents among competencies to be supplemented by external agencies. This competency category marks the important transition of the PPP project from internal assessment of possibility of delivering urban service with PPP model to approaching PPP marketplace for selection of private partner. The external agencies contribute in two areas: extensive knowledge of the PPP marketplace and best practices for procurement of PPP projects. The urban PPP projects can garner benefits by involving external agencies for supplementing competencies related to selection of private partner. The survey findings are in line with the ongoing policy initiatives in India such as creation of state level PPP nodal agencies and transaction advisors, which assist the ULBs in procurement process of urban PPP projects (Dutz et al. 2006).

PROJECT DEVELOPMENT PROCESS MANAGEMENT

In the project appraisal competency category, the project identification and project conceptualization competencies have been rated considerably low (ranks 12 and 8 respectively) whereas project development process management has been rated higher (rank 4), in importance by survey respondents among competencies to be supplemented by external agencies. The potential projects to be implemented by the PPP mode are identified by the ULB representatives and then the external agencies are brought in to develop and structure the PPP model for the project.

The preference of survey respondents towards involvement of external agencies for supplementing project development process management is relevant to the prevailing scenario in India. The absence of robust pipeline of bankable urban PPP projects is a major concern among the private sector and policy makers in India. The root cause of this scenario is weak competencies in ULBs to identify potential opportunities for private sector participation, development of initial project concept and carry out full fledged feasibility studies (ADB 2006). Currently, the Central Government and some of the state governments have initiated measures to improve the quality of project development process by creation of project development funds, panel of transaction advisers and establishment of state level PPP nodal agencies.

PPP PROCESS MANAGEMENT

There is a marked difference between the traditional procurement model and PPP model in provision of urban services in terms of management of processes involved in various phases of the urban PPP project (Edelenbos and Teisman 2008). The external agencies can work as a support mechanism to ULBs for confidently coordinating and overseeing the whole process from development of initial project design till the delivery of services in the operation phase. The survey respondents have rated the PPP process management competency moderately high in importance. Some countries have created an institutional architecture for streamlining processes which are fragmented across many governmental agencies and achievement of long term benefits by improving management of processes (World Bank 2007). In India, states such as Gujarat and Andhra Pradesh have crafted systematic procedures to be followed for implementing PPP projects and entrusted the responsibilities for ensuring compliance with these processes to the PPP nodal agencies (Dutz et al. 2006).

STAKEHOLDER MANAGEMENT

The stakeholder management is rated considerable higher in importance by ULB representatives than by urban PPP experts and there is significant difference (at 5 % percent significance level) in importance rating by these respondents. The usage of PPP model for provision of urban services complicates the stakeholder landscape and ULBs may face serious bottlenecks in identification, consultation and involvement of stakeholders over project lifecycle (El-Gohary et al. 2006). Therefore, ULB representatives prefer assistance from external agencies to the ULBs for coordinating and managing diverse range of stakeholders.

CONTRACT MANAGEMENT

The role of ULB transforms from provider to manager of urban services with adoption of the PPP model (Bloomfield 2006). The contract management competency focuses on a critical dimension of urban PPP projects, which is management of roles and responsibilities of parties to the contract during construction and operation phase. The survey respondents have rated contract management competency moderately high in importance. These findings are relevant for design of policy initiatives for supplementing competencies at ULB level. The ongoing initiatives primarily focus on supplementing competencies until selection of private partner (Dutz et al. 2006). However, it is important for policy makers to realize that the efforts expended in the appraisal of PPP projects and selection of suitable partners could bear fruit with contract management competency (Richter 1993).

REASONS FOR ENGAGEMENT OF EXTERNAL AGENCIES FOR SUPPLEMENTING COMPETENCIES

In the survey, the respondents were asked to rate the importance of the reasons for engaging external agencies by using a five-point scale from “Not important” to “Most Important”. The Relative Importance Index (RII) discussed in the earlier section, was used for summarizing the importance of each reason. The results presented in Table 3 show ranking, based on RII, for reasons associated with engagement of external agencies for supplementing competencies in urban PPP projects.

Except in the case of two reasons (lack of manpower and lack of understanding), it can be seen from the importance ratings values that the ULB representatives have given much higher ratings compared to the urban PPP experts. In the case of ULB representatives the RII values ranged from 0.62 to 0.85, while in the case of urban PPP experts they have ranged from 0.42 to 0.71. To compare the relative rankings of the reasons by the two groups, Spearman’s rank correlation test was performed. The Spearman’s rank correlation coefficient of 0.119 at a significance level of 0.089 shows a very low level of agreement between the two categories of respondents.

EXTERNAL AGENCIES PROVIDE REQUISITE COMPETENCIES AND PLAY A ROLE IN IMPROVEMENT OF QUALITY OF SERVICES

Over the years the ULBs have nurtured competencies in tune to traditional design-bid-build model for delivery of urban services. Therefore, the existing competency base in ULBs is substantially different from the competencies required for implementation of urban PPP projects. Under these circumstances, the external agencies can play a critical role in making available these unique competencies in line with needs of a particular project.

Apart from furnishing required competencies for urban PPP project, the external advisors bring to the table practical experience gained from working on various PPP projects and interaction with the PPP marketplace. As a result the external agencies can considerably improve the quality of the processes associated with the urban PPP project and attractiveness of project in the PPP marketplace. Both the reasons –external agencies make available unique competencies for implementing urban PPP projects (Rank = 2) and improvement

in quality of deliverables (rank = 1) are rated highest in importance by respondents. This indicates the growing recognition among ULBs and policy makers of the strength of external agencies to overcome competency bottlenecks in implementation of urban PPP projects and value addition brought in by external agencies in urban PPP projects. The involvement of external agencies in response to lack of specialist competencies in the government machinery for implementation of PPP projects and need for quality improvement in project processes has also been discussed in literature (World Bank 2007).

Table 3 Importance of Reasons for Engagement of External Agencies for Supplementing Competencies

COMPETENCY	URBAN PPP EXPERTS		ULB REPRESENTATIVES		COMBINED		T TEST	
	RII	RANK	RII	RANK	RII	RANK	T VALUE @	SIG.
Lack of manpower in ULBs to handle additional responsibilities of PPP project	0.69	3	0.62	8	0.66	5	0.926	0.359
Lack of understanding among ULB officials about PPP in delivery of urban services	0.71	1	0.62	6	0.66	4	1.333	0.189
Enables the ULBs to make available unique competencies for implementation of PPP project	0.61	4	0.76	3	0.69	2	- 2.798	0.007*
Third party view on the potential PPP project	0.49	7	0.62	7	0.55	8	- 2.297	0.026*
Transparency in implementation of PPP project	0.58	5	0.78	2	0.68	3	- 2.956	0.005*
Allows the ULBs to focus on its core functions in implementation of PPP projects	0.54	6	0.73	4	0.64	6	- 3.272	0.002*
Cost savings	0.42	8	0.71	5	0.57	7	- 3.394	0.001*
Improvement in quality of deliverables	0.7	2	0.85	1	0.77	1	- 2.866	0.006*

@ H₀: There is no significant difference in importance rating by different category of respondents

* H₀ Rejected at 5% significance level H₁: Significant difference in importance rating among different category of respondents

RII: Relative Importance Index

EXTERNAL AGENCIES HAVE POTENTIAL TO IMPROVE TRANSPARENCY IN IMPLEMENTATION OF URBAN PPP PROJECTS

The ULB representatives have rated the transparency in implementation of urban PPP project considerably high in importance (rank 2, RII 0.78) among the reasons for engagement of external agencies. The adoption of PPP model for provision of urban services has many public policy concerns due to the long-term nature of contractual agreement, web of relationships between stakeholders, complex financial structuring and risk allocation (Siemiatycki 2007). In this context, it is essential to garner public confidence in the decision making process by disclosing relevant financial, technical and contractual information in the public domain. Additionally, the private players and public do have concerns over transparency and fairness of bidding process (Iossa 2007). The literature has reported that the external agencies can play a central role in addressing both - public and private sector's concern by ensuring *transparency* in implementation of the urban PPP projects (World Bank 2007).

EXTERNAL AGENCIES ARE INVOLVED TO ADDRESS LACK OF MANPOWER IN ULBS AND LACK OF UNDERSTANDING AMONG ULB OFFICIALS ABOUT PPP MODELS

The reasons - lack of understanding among ULB officials about PPP model and lack of manpower in ULBs are ranked substantially different (rank difference = 5) by the two groups of respondents. The higher importance rating to these reasons by urban PPP experts directs attention towards the human resource development practices in ULBs. The prevailing scenario on human resources in ULBs indicates that the performance of ULBs has been affected due to long-term vacancy of several positions and very thin top management (Ministry of Urban Development 2006). The shortage of skilled manpower has been affecting implementation of urban infrastructure developmental projects. This often results in ULBs engaging external agencies to overcome the bottleneck caused by shortage of ULB officials and very weak competencies in ULBs during implementation of urban PPP projects.

However, the quality of deliverables and outcomes of urban PPP projects are adversely affected by these inherent deficiencies in the institutional structures of ULBs. Akintoye et al. (2003) have pointed that lack of understanding among client team members

on project risks and scope has eroding effect on the Value for Money (VfM), and poses difficulties in communication and mutual understanding. Therefore, the policy makers will have to design interventions at different levels - organizational, human resource and institutional framework to address the root cause of weak human resource capacity in ULBs.

CONCLUSIONS

This paper focused on two key aspects related to involvement of external agencies in urban PPP projects, which are competencies to be supplemented by external agencies and reasons for involvement of external agencies in implementation of urban PPP projects. Along these lines, a questionnaire survey was carried out to analyze perception of urban PPP experts and ULB representatives on these two aspects. The survey respondents preferred involvement of external agencies for supplementing competencies related to implementing procurement process, project development process, and management of stakeholders and diverse processes in urban PPP project.

The survey respondents felt that external agencies can add value to the urban PPP projects by making available unique competencies for implementation of urban PPP projects and improving quality of deliverables. It was felt that the involvement of external agencies could lead to improved transparency in implementation of urban PPP projects. The urban PPP experts opined that lack of manpower and lack of understanding among ULB officials about PPP model to be the major reasons for engagement of external agencies.

The findings of this research study contribute to the growing body of knowledge on involvement of external agencies for supplementing competencies in urban PPP projects and would be of interest to the policy makers associated with urban infrastructure development. Researchers can build on insights gained in this research study by analyzing involvement of external agencies with case studies of urban PPP projects.

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VALUE GENERATION AND DELIVERY IN LONG-TERM SERVICE CONCESSION PROJECTS: THE ROLE OF FACILITY MANAGEMENT IN VALUE OPTIMISATION

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Long-Term Service Concession (LTSC) projects, including Public-Private Partnerships and Alliance Projects have been used since the mid-1990s to procure facilities and services associated with social and economic infrastructure, at state and national levels. A key feature of LTSC projects is that they generally require a group of organisations associated with the construction and ongoing delivery of services to form a Special Purpose Vehicle (SPV) whose role is to provide sufficiently compelling evidence of technical and financial competence as to win the right to run the concession for the client over an extended period. The primary considerations driving such procurement are to achieve value for money, significant innovation, appropriate risk transfer and superior whole of life outcomes - frequently questions of value for money and whole-life outcomes are raised during the operational phase of a facility. It is apparent that such concessions assume a fundamentally different nature pre-and post-asset delivery once the service delivery phase commences, and that the composition of project players/responsibility for value delivery is at the heart of this change. This paper reports the preliminary findings of a multiple perspective study of key LTSC stakeholders to surface dimensions associated with the role of facility management that enable value maximisation. It concludes that, contrary to expectations based upon theory, the facility management function is often underutilised during asset feasibility and design stages and that this inevitably has a negative effect upon value maximisation during the operational phase of a LTSC. Further, a level of uncertainty can exist as to who will ultimately deliver concession services during the operational phase, and what their eventual scope will encompass.

Keywords: long-term service concession, PPP, alliance, facility management, service delivery

INTRODUCTION

Over nearly two decades a variety of relational-based procurement mechanisms have been developed in order to deliver assets and services in the constructed environment. Typically such assets have been associated with social or economic infrastructure and the services have been associated with the operational phase of them, ranging from basic maintenance through to the delivery of core services throughout the life of an asset. In broad terms this range of operational support activities has come to be delivered by the facility management profession, and the financial/commercial/legal mechanisms developed to facilitate such activities can be thought of as LTSCs. Typically these take the form of alliance agreements or public-private partnerships (Buxbaum and Ortiz, 2007), though full range of adjacent procurement instruments also exist, such as build-operate-transfer, or build-own-operate-transfer (Cheung et al., 2005).

Whatever form the project takes, its initiation requires a public sector body to identify a pressing service need, followed by an invitation to negotiate for the provision of service. This is made to an embryonic body that typically includes financial, construction, and operational service provision functions, which eventually morphs into a SPV. This provides a single point of legal accountability for the client body. Over time a range of competing SPVs present their cases for technical and financial competence and innovation to the client, and eventually one will prevail (Clifton and Duffield, 2006).

From the client's perspective issues such as appropriate risk transfer, innovation, superior whole-of-life outcomes (as compared to public sector-only service provision) are considered when evaluating competing LTSC propositions, with the ultimate objective of achieving a demonstrable value-for-money proposition. It is apparent that such projects often fall into two distinct phases, the first being concerned with the delivery of the constructed asset whilst the second is solely concerned with the effective delivery of services

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during its operational life (Clifton and Duffield, 2006). As with so many constructed or manufactured assets it is this latter phase that has the most significant impact upon the whole-of-life costs of owning and running it, and it would seem logical that the elements within the SPV associated with the operational phase of such projects would have the potential to influence, both positively and negatively, the overall success of the project, from all stakeholders' perspectives (Kadefors, 2008).

This paper presents the preliminary findings of a study of the multiple perspectives associated with LTSC procurement of social infrastructure by an Australian State Government, when viewed from the SPV. In particular it seeks to identify perceptions of the FM function as a generator of innovation and value at the design and operational phases of the project.

LITERATURE REVIEW

In the mid-90s Barrett (1995) identified that proactive FM involvement could improve service provision during the operational phase if FM input was sought during the design phase of the project. This could improve and speed up the procurement process since it would ensure "that the commissioning, testing, training, and facility operations will not be treated as an afterthought, resulting in unanticipated changes that cost time and money" (Trinh et al., 2002: 115). From the client's perspective such proactivity in the context of LTSCs was identified as having the potential to improve occupant health, satisfaction, and productivity (e.g. Oja, 2001; Raiford, 2002). Ideally these would be reflected in consideration of a full life-cycle framework during design and management decision-making (Nutt, 2000). On the other hand, failure to seek or accommodate FM input during the design phase of projects would likely result in an asset's sub-optimal contribution to a client's business needs and core business functions (Brown et al., 2001: 119).

The LTSC procurement route – or the 'finance resource trail' – was identified as a possible future direction for the FM profession, as "it places the operational value of facilities and infrastructure at the centre of concern, targeting the output needs of organisations, their staff and customers over a 25 to 30-year life-cycle" (Nutt, 2000). Identification of the strategic significance of FM to the long-term focus of LTSC projects – particularly in the areas of facility operations and service provision – highlighted the significant influence of FM in the overall success of such a venture (Kadefors, 2008).

In general FM-mediated project success could be realised through increased cost efficiency and other non-cost performance measures experienced by public sector clients, and competitive advantage for bidding consortia utilising FM integration during project development, design and delivery. UK Private Finance Initiative experience indicated a 25/75 split between construction and service delivery costs, emphasising the impact that service delivery would have upon project outcomes over the long-term (Campbell and Ridley, 2001: 9).

Consideration of the impact of design decisions over the long-term could ultimately be considered an issue of risk identification, mitigation, and transfer (Akintoye, Taylor and Fitzgerald, 1998). Issues of performance specifications and levels of service delivery could best be borne by those parties with the experience to make informed decisions as to how to meet them, and whilst the former lay in the province of the construction contractor the latter could best be considered the domain of FM (Kadefors, 2008). Moreover both could be improved by the incorporation of FM expertise during the design and construction phases of the project.

Implicit in all of the foregoing is the notion that a LTSC changes character at certain critical points in its life, most notably at the time when the SPV finalises its financial arrangements, when design of the asset is finalised, and when the asset itself is delivered prior to commencement of service delivery. Clifton and Duffield (2006) examined the hypothetical integration of PPP and Alliance principles in order to improve the risk allocation within a LTSC, indicating that such a hybrid arrangement might be suitable for certain types of PPP project. Their contention was that under certain circumstances a renegotiation of project scope might be necessary at practical completion (delivery of the constructed asset) prior to the commencement of service delivery. It would be at this juncture that the most visible FM involvement would commence, and potentially also the juncture at which refinancing or on selling of the concession could occur. From the client organisation's point of view this could also be the point at which uncertainty (and therefore their risk) associated with service provision would increase – an occurrence that the hybrid PPP/Alliance structure was designed to alleviate.

RESEARCH METHOD

This study was exploratory in nature, designed to surface the experiences of the key participants in a LTSC, in relation to the role, scope, and influence of the FM function in concession delivery over a protracted period. It was predicated on the notion that these aspects of FM function would initially be defined at the time of SPV formation, and would be geared towards value maximisation for the client and profit maximisation for the concession stakeholders. A comprehensive literature review was therefore conducted, thematic analysis of the literature then performed in order to develop a coherent set of topics and questions for use in semi-structured interviews.

Key participants were identified from publicly available project documentation, invited to participate, and subsequently interviewed in accordance with the precepts approved by the University of Newcastle Human Research Ethics Committee (FEBE15-03). The interviews were recorded, transcribed, cleared by the interviewees as true representations of their words, and subjected to detailed thematic analysis.

First level coding was automatically derived from the transcripts according to question. Open coding of the transcripts was thereafter independently conducted by multiple coders to derive a set of themes spanning multiple questions and multiple interviews. Each of these was thereafter given detail through a process of axial coding during a second round of data analysis (Morse and Richards, 2002).

All codes were supported by quotations from the transcripts accompanied by explanatory memos written by the coders. Codes were consolidated at a roundtable coding meeting where similarities and differences between coding outcomes were discussed and resolved. Overarching themes and their details were then developed and described, enabling them to be discussed in relation to existing literature where possible, and for new theory to be surfaced where current literature proved inadequate (Morse and Richards, 2002). The following section provides an overview of these findings.

RESULTS

The process of analysis revealed 13 themes within the data. These appeared across three temporal domains: client's pre-existing expectations of the project; contribution of facility management to LTSC performance, and; potential contribution of facility management to future LTSC performance. These themes are now presented in more detail.

VALUE FOR MONEY

This was one of the primary objectives driving client decision-making in relation to LTSC procurement. It was triggered partially by the need to demonstrate benefits through the use of the public sector comparator and by the political benefit of securing new services without significant capital expenditure, which the financier recognised as being a political expedient in the jurisdiction under consideration.

RISK TRANSFER

This was identified as another objective of government, frequently being co-located with value for money when discussing LTSCs. This was reflected in concession participants' perceptions of risk transfer and where it lay, which was largely acknowledged to fall upon the service provider (facility manager).

CERTAINTY

From the client's perspective the outcome of achieving the previous two objectives would be the assurance of a minimum standard of service being met, at a known cost, over the longer term. The pressure to achieve certainty was reflected in the client's onerous concession deed, the consequences of which would mostly fall upon the facility management function.

REPUTATION

From the client's perspective the achievement of certainty was reliant upon the track record of the concession team. Factors such as credit rating, financial base, appropriate skills, and proven ability to be around for the duration of the concession period would be central to their decision-making, and prior experience would be seen as an advantage. Significantly the financier's concerns and choice of concession partners was driven by similar considerations.

INCENTIVES

These related to high performance and were found to take one of two forms: the opportunity to be demonstrably successful in a lucrative market, with the potential to win other projects and conversely the desire to avoid client imposed penalties for underperformance on the current project. The facility manager appeared to have recently recognised the strategic benefits of LTSC projects for his organisation.

RISK

This was recognised as a key element across the entire LTSC organisation, individually and collectively being the recipient of large amounts of risk transfer from the government client. However opinions as to the fairness of the risk distribution within the LTSC organisation differed widely, with the financier acknowledging their comparatively low risk exposure. This contrasted with the contractor who felt that the need to lock in a firm tender price and program before the tender was submitted sharply increased their risks given the long project lead time. However there was a general consensus that the majority of the project risk was born by the facility manager, given their exposure to the long-term consequences of early design decisions, the ease with which they could be replaced during the operational phase of the project, and their position as the target of non-performance penalties imposed by the client.

BALANCE

An often mentioned issue, triggered by the high bidding costs for competing concession consortia, was the need for a balance to be struck between the needs of government and private industry. Specifically, mention was made of the high level of detail expected in tender documentation, together with an expectation that the private sector would accept very high levels of risk transfer, all of which required the development of a new skill set by the private sector. This was not matched by a corresponding high level of demand from the public sector in terms of the volume of projects to which such skills could be applied in the future. The general feeling across LTSC members was that this situation would quickly exclude all but a few concessionaires who had acquired these skills through their early engagement in the marketplace. It was interesting to note that the facility management function was generally recognised as being excluded, or at least its influence severely curtailed, during the early stages of the bidding process in an attempt to limit the cost of bidding. This imbalance was recognised by the facility manager as regrettable but to some extent understandable, but he bemoaned the negative impact this inability to influence design decisions would have over the longer term, during the operational phase of the concession.

PERSONNEL

The failure to engage fully with the early stages of the design process was noted in the previous theme as being driven by cost cutting. However it was also apparent that the construction contractor had expected more input from the facility management contractor, and when it was not forthcoming both parties were prepared to partially attribute this to a combination of the immaturity of the Australian PPP sector, together with a lack of personnel within the facility management function who were experienced in the conduct of LTSCs.

FACILITY MANAGEMENT VALUE

The value placed upon facility management expertise within LTSCs has been implicit in all the foregoing themes, and indeed was made explicit at numerous points throughout the data. There was a recognition that the capacity of a facility management contractor to deliver quality over the long-term was an essential prerequisite for any successful service concession, as the client had to be convinced that not only would the physical asset be delivered but that its continued fitness for purpose would be ensured throughout the term of the concession. This was equally valued by the financier, who would come to rely upon the facility manager as the facilitator of predictable cash flow. From a government perspective the facility management function would serve two further purposes: firstly, to field public complaints about service provision directly, and; secondly, to ensure that the constructed asset was still largely fit for purpose at the end of the concession period, when it would be handed back to government ownership.

LTSC LEADERSHIP

LTSC members contrasted the predominant Australian experiences with those found in the UK, noting that most Australian concessions were led by the finance function in contrast to the UK where contractor-led consortia were the norm. Interestingly the financier dismissed the idea of contractor-led concessions on the basis that construction contractors were only interested in the short-medium term, whereas facility management contractors were potentially well-positioned to lead. Ultimately though, the financier regarded the facility management sector in Australia as currently lacking sufficient maturity to successfully fulfil this role.

INNOVATION

From a government client perspective the attractiveness of LTSCs are to reduce costs and increase the effectiveness of service provision by harnessing private sector innovation. It was evident that all of the LTSC members felt to a greater or lesser extent that their efforts

in these regards were hampered. On the one hand the financier believed that the inexperience of the facility management contractor limited the design innovation that was possible during the early stages of the project. On the other hand both the construction and facility management contractors believed that heavy-handed client input at the briefing stage severely limited their ability to demonstrate true innovation. They cited as examples highly prescriptive materials and finishes specifications, and the client's reticence to engage in the use of new, energy-efficient technologies. A view was also expressed that the client might have political motivations for restricting the extent of private sector innovation as this could expose a gulf between existing, wholly government-supplied services and those supplied through PPP concessions.

EXTERNAL AND INTERNAL PERSPECTIVES OF THE FM FUNCTION

Stark contrasts were evident between the perceptions of the facility management contractor and the other concession partners regarding the role and scope of the facility manager. On the one hand the facility manager placed high emphasis on its "all-encompassing), service management and delivery. On the other hand, this contrasted sharply with the others who placed more emphasis on the, as yet unfulfilled role the facility management function could play in adding value during the early stages of the project, specifically in relation to life cycle costing, design decisions and specifications writing.

All parties tended to explain this gap between potential and reality in terms of the infancy of the facility management profession in Australia, the nature of the prior experience of this specific facility management contractor, and uncertainty regarding the nature of the risks that would be inherent when accepting a wider role within the concession.

From the financier's point of view the facility management function was more important to the overall viability of the project when compared to the construction contractor. Moreover he acknowledged that the facility management contractor had approval rights for all aspects of the detailed design, noting that this reduced his own organisation's risk by double-checking the construction contractor's designs: he acknowledged that this increased levels of tension within the concession team but felt this was beneficial.

To a greater or lesser extent all parties acknowledged that the specific development of the facility management profession in Australia had led it to focus on maintenance and operations, leading it to ignore the potential opportunities on offer were it to embrace more strategic roles within LTSCs. This was explained variously in terms of a lack of design experience, poor market awareness, the complexity of life cycle costing, and the questionable benefit of developing such skills given the as-yet limited opportunity to use them in an Australian context. It was therefore significant that when all parties were encouraged to speculate as to future developments they all contrasted the domestic facility management market with that found in the UK, where the sector was more mature, and contractors had embraced their central position within PPPs to the extent that some were responsible for providing core services as well as non-core services. This led the financier to concede that facility managers were potentially more suited to front-running such concessions than the construction contractors.

In summary, all parties recognised potential of the facility management function to be a process driver in future projects, from the earliest stages of the project through to final disposal. Opinions only differed where issues of capability, timeframe, and cost-benefit of skills development were concerned.

POTENTIAL OPPORTUNITIES

All the parties interviewed recognised significant limitations in the current PPP/LTSC environment, and indicated that addressing them would create significant opportunities for suitably qualified concession teams. At their heart lay Australia's ageing infrastructure, which was overdue for renewal. Given the prevailing political climate it was felt that the service charges associated with LTSCs would be considered preferable to massive public sector borrowing to support capital works, particularly in terms of social infrastructure.

There was an expectation that acceptance of the suitability of PPP style procurement would trickle down to all levels of government. This was expected to lead to a desirable increase in the number of concession opportunities, the current shortage of which was highlighted as a significant barrier to engagement with such projects, in terms of gaining tender and operational expertise.

There was speculation that concession style models of procurement might be extended into the private sector, leading to privately financed LTSCs. It was felt that this would create optimal conditions within which a concession team could maximise innovation.

CONCLUSIONS

This exploratory study investigated the extent to which SPV participants LTSC projects experience the influence of the FM function in its operations, the consequences of their involvement, and speculations as to the potential that FM involvement in future LTSC projects presented SPVs in terms of value generation and risk minimisation. It came to the following conclusions.

Two primary objectives exist for government sector clients when procuring infrastructure using LTSC strategies: firstly, achieving value for money whilst concurrently securing infrastructure without capital outlay, at a lower cost than the Public Sector Comparator, and; secondly, appropriately apportioning project risks, especially those relating to the construction and subsequent operation of facilities to private sector concessionaires.

This study found that a major benefit for government sector clients has been the guarantee of cost and performance certainty, locked in through the application of a 25-30 year contract. However, whilst the expectation of innovative infrastructure delivery was a further theoretical benefit, little evidence was found for this during the study. On the other hand it was found that LTSC participants received adequate incentives to uphold the contract deed through associated rewards such as competitive advantage in other LTSC bids, and predictable cash flow over the longer term. It was also recognised that client-imposed penalties were also a keen incentive to avoid charges of non-performance.

The role of FM in achieving LTSC performance was both complex and largely underutilised. Despite the theoretical ability of FM to positively influence strategic issues such as project management, design and specification, and whole life costing (WLC) throughout the life cycle of the concession the FM function was reported to be primarily focused on facility operations and maintenance. However all stakeholders in LTSCs recognised the importance and value of this function, highlighting the risks that FM carried during the life of the concession, its ability to underwrite such risks for the concession bid, and ultimately its ability to provide integrated service management.

Yet in spite of widespread recognition of the potential for FM to add considerable value to a LTSC it was perhaps perverse that the FM sector was widely reported as being in its infancy and relatively unsophisticated. Specific issues identified included low levels of expertise in design processes such as life cycle costing, design management, value engineering, and specifications.

This contrasted starkly with the expectation that in the future the FM function could in many ways drive LTSC procurement processes, resulting in additional cost savings, accompanied by increased quality and efficiency savings. Significantly, opinions differed as to how the benefits would be achieved, with FM contractors indicating that their increased involvement during design would result in more efficient design options being specified for inclusion during construction, whereas other stakeholders believed that the Australian FM sector would come to mimic the FM function as displayed overseas (particularly in the UK) where it had become a driver of the design and specification processes through the integration of life cycle costing techniques.

Ultimately this study found that the FM industry in Australia is still immature relative to its overseas counterparts, and lacks the sophistication required to accurately assess the life cycle cost implications of design decisions early in the project design/procurement process. An opportunity exists for the facility management function to become a leader in the quest for value for money through the application of value engineering techniques to both the design of the base building and the provision of services throughout the life of the project.

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TRANSFORMATION IN THE TRADITIONAL PROCUREMENT ROUTE IN THE UK

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This paper is part of an ongoing investigation into project performance measurement through the lens of procurement systems. Construction procurement systems are continuously evolving leading to transformation in procurement routes. A good example is the transformation in design and build procurement routes through different forms of 'novation'. This paper will focus on transformation in the traditional procurement route in the UK. The paper will be based on a literature review and a case study of Local Authority projects in the North West of England. The findings indicate (i) a shift in the traditional contractor's contractual role from active participation in construction activities to a mere management role; (ii) organisational similarities between traditional and management systems and (iii) the structure of the industry supports these forms of transformation and the present low demand economic climate will exacerbate the trend. The study can serve as a learning opportunity in promoting innovative systems of contracting.

Keywords: procurement system, traditional contract, United Kingdom, performance measurement

INTRODUCTION

Construction procurement has gone through various transformations since the inception of professional system over 165 years ago. Winch (2000) postulates that the British construction industry is presently going through a period of rapid change due to a combination of government-led reform initiatives, changes in government procurement strategies, and increasing exposure to international competition. The transformation has been fuelled by the need to move from adversarial relationships to collaborative system of working. Along the continuum of procurement transformation, different procurement routes have developed from traditional system to management system and most recently a collaborate system of working. The conditions of contracts have also developed in line with procurement transformation along emergent system and modern system. The underlying principles guiding the modern contracts are collaboration, partnering and relationship management.

According to the RICS 2007 Survey of Contracts in Use in the UK by number of contracts shows that drawing and specifications account for 47.2% of number of contracts. This was followed by the design and build route with 21.9%, firm bills of quantities accounting for 20.0% and partnering accounting for 2.4% of numbers of contract. In terms of distribution of methods of procurement by value of contracts design and build account for 32.6%, followed by specification and drawing with 18.2%, partnering 15.6% and firm bill of quantities 13.2% (RICS 2007). The RICS survey 2007 also shows the dominance of the JCT suite of contracts. However, this has dropped in relation to previous years as the NEC contracts are seeing an increase in usage (RICS 2007).

Although the rationale behind the RICS procurement categorisation is debatable one thing that is clear is that the traditional system still has significant proportion of contracts in terms of number and value of contracts. In addition, anecdotal evidence also supports transformation in traditional system. Hence, the reason why we have focused on studying the transformation to the traditional system of contract. This study is ongoing and will be divided into two parts. The first part is to examine a small number of case studies on the transformation in traditional system in order to establish that transformation is happening. One case study is reported in this paper. The second phase of the research will be to carry out a benchmarking study to compare the performance of transformed traditional contracting. This will enable us to investigate through comparative studies the performance of the case studies through key performance measurement.

The group of factors that comprise the success criteria in the construction industry are currently called key performance indicators (KPIs). Key performance indicators provide a useful framework for measuring and comparing the performance of projects and furnish project managers, clients and other stakeholders with useful information needed to implement a project to a successful

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completion (Chan and Chan 2004). In this study we intend to establish that transformation is happening in traditional system and compare the performance of the new (transformed) system with the 'old' system.

TRANSFORMATION THROUGH EVOLUTION OF PROJECT DELIVERY

According to Winch (2000) the emergence of the professional system was the beginning of a formal procurement route in UK construction. At its commencement, the professional system relied upon the trade system but a shift was necessary because of the urgency of the building programme. A single contractor was needed to undertake financial responsibility for the entire work in a single contract. Due to the problems of the professional system which included slow and expensive delivery emergence of other system was imminent. Therefore in early 1900s, most projects were completed under lump sum contracts (the traditional system) and this trend continued for most of the first half of 20th Century with only some limited exceptions developed in the private sector to improve costs, schedules and adversarial relationships through contractor centred approaches (design and build) (Dorsey 1997; Oyegoke 2001).

According to Masterman (2002) design and build only began to emerge from its period of dominance after the Second World War to answer the needs of the ambitious targets set by government for the public housing sector in the UK. Increase in borrowing and inflation rates during the oil crisis of 1970s combined with the state of national and international economies produced an opportunity for a newer procurement route. Other reasons for the emergence of new procurement route include: the need to ensure that projects were both speedily commenced and completed in order to minimise the associated financial risk and the client dissatisfaction with the performance of conventional methods (Masterman 2002).

Construction management emerged in the 1960s but fully developed in the 70s in the UK due to the economic recession at that time (Dowd 1996), consultative design and build also developed in the 70s, and program management emerged in the 1980s (Dorsey 1997) as clients sought more efficient ways to complete complex projects. Other management-oriented approaches like partnering and framework agreements based upon the concepts of early contractor involvement, integrated teams, collaborative working arrangements and relational contracting became more prominent during the late 1990s and early 2000s. Krubasik and Lautenschlager (1993) categorised different forms of co-operation from mergers and acquisitions to core business joint ventures, sales joint ventures, production joint ventures, product swaps, production licenses, technological alliances and development licenses.

THE LINKS BETWEEN PROCUREMENT AND KPIS

The compilation and presentation of the first set of KPIS grew out of Sir John Egan's 1998 report 'Rethinking Construction' which was done in response to the challenging state of the UK construction industry where projects were observed to be consistently running over time, over budget, and short of client expectations. Though, initially focused on cost and on-time performance, the KPIS have been expanded to include benchmarks for environmental performance, employee satisfaction, and project safety, to name just a few (Glenigan 2011).

Winch (2010) argue that the key criterion for project success is not that the project mission is fully achieved, but that the realised asset fully matches the client's needs at the time of realisation in a way that it satisfies other requirements. He argued further that it is necessary to fully define the project mission notwithstanding the fact that it may change. Therefore the ultimate goal of procuring any construction project is to achieve strategic fit between the client's primary business objectives and secondary procurement strategy. The strategic fit between client business need and procurement strategy will result into project success. However, success in this regard has meant different things to different stakeholders involved on the project (Bryde and Brown 2005; Toor and Ogunlana 2008). The traditional perception of project success being judged based on cost quality and time has changed over time to include; micro and macro viewpoints, stakeholder satisfaction, reduced conflicts and disputes and environmental friendliness (Lim and Mohamed 1999; Cookie-Davies 2002; Bryde and Brown 2005; Low and Chuan 2006; Toor and Ogunlana 2010). The group of factors that make up the success criteria in the construction industry are called key performance indicators (KPIS).

The KPIS are used by construction firms as a benchmark to monitor and improve overall project performance, continuously improve client satisfaction, and in the case of government to measure the effectiveness of contractors in the construction industry. Glenigan (2011) reports among others a slight decline in the level of client satisfaction with services received from contractors.

Chan and Chan (2004), in a study of key performance indicators for measuring construction success, found that the completion time as it relates to speed of a project depended on the procurement method adopted for the project. They attributed the slow speed (delay) observed in one of the projects studied to be due to the use of the traditional procurement method. They however, acknowledge the possibility of other factors playing a part as it was observed that the project which suffered delay, performed better in terms of cost compared to those procured through the design and build method.

An important factor on which the success of a project depends, is the type of procurement method used (Love et al. 1998). According to Anumba and Evbuomwan (1997) the choice of the procurement route for construction work is one of the many decisions that are important for the clients to make. Some of the KPIs are concerned with the predictability of design cost and time as well as construction cost and time which can be regarded as procurement oriented (Takim and Akintoye 2002). This therefore means that the effectiveness of the procurement method adopted for any construction project plays a vital role in the success or otherwise of the project. Other factors of the KPIs are concerned with; environmental compliance, health and safety, profitability and productivity related measures, all of which can be regarded as process oriented. In this study we intend to extend the use of KPIs to measure the performance of 'old' and transformed traditional contracting by using key performance indicators.

THE UK PREVALENT PROCUREMENT SYSTEMS

From delivery system points of view, traditional contracting is a one off project, where there is a simple relationship between the client and consultants and a contractor. Traditionally a consultant is used to design works on behalf of a client who then appoints a contractor to construct the works. The contractor is solely responsible for the project with the exception on nominated contracts. Most of the work is carried out by main contractor's work force and within its direct supply chain. In this approach, the general building contractor is employed and responsible to construct the project. According to Eccles (1981) the contractor will not carry out all the works but sublet specialist works, such as building services works, to subcontractors specialized in the respective work disciplines. Hughes et al. (1997) and Yik et al. (2006) describe specialist work as those that involve the use of special methods, delivery of proprietary products, or works that can only be performed by registered or licensed companies or persons. In addition to supply and installation of equipment and materials, specialist subcontractors provide a certain amount of design input. Therefore, the unique feature of the traditional contract is that the general contractor possesses in-house general building capability and a portion of specialist work is undertaken by a nominated or contractor's subcontractors.

In a design and build contract a single contractor has sole responsibility to a client for the design, management and delivery of a development. The contractor will therefore, manage its subcontractors and supply chain. As a result it is the sole responsibility of the contractor to deliver the project on time, on budget and in accordance with the performance specification. Management system comprises of construction management contract and management contract (Haltenhoff 1999; Dorsey 2004 and Oyegoke 2001). Management contract is predominately used in the UK. In management contracting (MC), an owner appoints first a professional team that prepares project drawings, specifications and bills of quantities which broadly describe the scope of a project. The owner also appoints a management contractor at the early date who is a project planner, manager and organiser. A management contractor provides site supervisory, technical and administrative staff as well as puts in place special facilities to be shared by subcontractors. He plans, co-ordinates, organises, supervises and generally manages and secures construction works (JCT 1987). Ashworth (1991) emphasises that when trade contractors tender the works separately, this leads to the least expensive cost for each trade and, thus, for the construction works as a whole. However, this is an open-ended method since the price can only be firmed up after the final works package quotations have been received. Trade contractors must not sub-let any portion of the works without the written consent of the management contractor (JCT 1998).

In comparison of the definitions of the procurement routes, general and D-B contracting routes make use of a single prime contractor that is hired as an independent contractor. CM and MC contracting exploit multiple prime contractors hired as independent contractors. General contractors (GC) have financial stakes in construction phases under design-bid-build contracts. D-B contractors have financial stakes in both design and construction phases under D-B contracts.

A CASE STUDY

GENERAL INFORMATION

The project was procured under traditional contracting procedures of design-bid-build. The contract sum was £4.5 million with £500,000 contingency sum. The education department of a Local Authority in the North West of England is the owner of the project and the department of services for children and young people is the end user. The project was wholly financed by the local authority. The design process takes about 2 years because of the demolition of the existing school, allocation/distribution of students to other schools, additional land for sporting activities, settlement of sustainability issues and settlement of boundary line with the existing cricket pitch. The contracting firm was not involved in design process. The design was carried out by the Council's architectural department and the Council outsourced other consulting services in engineering services, quantity surveying, and structural engineering. The Council maintained a supervisory role on the project.

BIDDING

Six main contractors tendered for the project. Although these firms could be described as traditional contractors the contemporary practice that they implement involves always carrying out bid shopping at the tendering/pricing stage amongst the pool of their subcontractors. Although the main contractor inculcate the principle of 2nd-tier partnering arrangement based on trust with their subcontractors. There is no legal bidding agreement that prevent the subcontractors to bid for other competing main contractor. In one instance a subcontractor assisted four main contractors in pricing the same project. In another instance, where the trade is specialist in nature the six main contractors submitted a quote from the same specialist firm. This practice also allows the main contractor to ask for subcontractor's prices from more than one subcontractor for the same work package.

The pricing directive from the main contractor allows the subcontractors to inclusively price disposable waste in order to transfer the risks to the subcontractor. Environmental regulation stipulates that waste should be disposed where it will not cause contamination to surface water or close to drainage. In addition, this is a means of reducing waste by the subcontractors' most especially excessive packaging. The irony is that most often the subcontractor will not price disposal of waste and priced under special conditions (exclusive of waste disposal).

The subcontractors' prices are then scrutinised, complied and adjusted (profit and overhead, price adjustment for inflationary trends) by the contractor. The pricing mechanism for project within 12 months is always on fixed price. Projecting inflationary trend is an important part for the main contractor for arriving at a reliable fixed contract sum. This project was tendered for in October 2007 and within 8 months the price of steel has jumped by 20% and the effect of increase in oil prices have affected almost all other materials. For instance, the main contractor lost £6000 on a subcontract fencing package with initial quotation of £30,000. The prices (quotation) submitted by the subcontractor at the tendering stage is an indicative of price with a week or two guarantee up to maximum of three months. Therefore, the main contractor is bearing the risks on prices but the subcontractors risk begins when an order is placed. However, the main contractor will have allowance for price risk but the risk is not back-to-back with the subcontractors. In that case, the main contractor places an order for the bigger and longer lead trade in order to transfer risk to the subcontractors, e.g. M&E, brickwork, steel.

PAYMENT ARRANGEMENTS

Payment arrangement is carried out through a combination of many methods depending on the agreement and the nature of the work, e.g. monthly payment for block work (measured item) and stage payment for M&E. For instance, at the time of placing order for the lift 40% of the price is required, when the lift is completed another 40% is required and when the lift is incorporated with the work and ready for use the remaining 20% is required. Payment through normal evaluation process and the client reimburse the contractor while the contractor pays the subcontractors. There is no incentivisation in the project but value engineering was carried out at the onset. Preliminaries are calculated through normal procedures.

PROJECT ORGANISATION

Although the project organisation was described as traditional process but the arrangement on site seems to resemble management contracting process. On this site, there are 4 main contractor's workers (a site manager, an assistant site manager, a site engineer and a labourer) and about 40 subcontractors and suppliers (see table 2). The size of the subcontracting firm ranges from bigger firm with 1200 number of staff and smaller firm for 2 or 3 people. It is now becoming a practice to engage a single subcontractor for 3 or more elements/packages for economies of scale. It prevents dispute and allow cohesiveness, better schedule management, dispute elimination on the site. Most often dispute occurred between the suspended ceiling specialist and M&E because of damages or stains to already completed work.

PROJECT SCHEDULE

The contractor makes the master programme which is broken down into weekly programme and daily work chart. As the project progresses reprogramming and rearrangement of the work is done and reflected in the new programming. In the actual fact, the planning office register the drawing, follow up the entire requirements, look after all the problems and can be used for planning the future jobs and used by the estimators.

SUBCONTRACTOR'S AGREEMENT

The subcontractors are sourced both from local area and from the main contractor's catchments area. The mechanical company is from Manchester and most of the subcontractors are from the Greater Manchester area. In a competitive bid, the client normally has a select list of six or more subcontractors which are formally presented to the main contractor for selection. This will not follow normal nomination procedure as stated in the Joint Contract Tribunal (JCT) conditions of contracts. Therefore, there is no legal nominated subcontractor agreement with the client but the subcontractors will act as the contractor's subcontractor. For instance, Ironmongery is specified in the bill of quantities with the name of the company. This does not give the subcontractors or main contractor any negotiating power to reduce the cost.

The problem with the subcontracting is the many layers of subcontractors in carrying out a single trade. For instance, aluminium glass windows and doors are designed by a Danish company which has a subcontractor in the UK for fixing the components. Although the components are delivered on site but there are problems in fixing the standardised components due to incompatibility with the overall design and actual constructability on site. The contractor's site manager requested for contractual or official instruction on how these components can be fixed.

The subcontractors are nominated by the client depending on the phrase in the bill of quantities, e.g. "as equally as good and approved" which implies that the contractor can suggest an alternative subcontractor for the job. As part of quality management, the site manager is responsible to review the performance of the subcontractors during and after the completion of the project.

The main contractor must approve the subcontractor but this will not affect the contract price for the work section because they are agreed beforehand. There are nominated subcontractors but the contractor can suggest another subcontractor with equal quality with cost savings. Example of sub-sub-subcontracting: a mechanical subcontractor involves a separate ventilation ducting company who manufactured and fixed the components on site.

QUALITY AND SAFETY

There are subcontractors' quality assurance criteria to be followed before, during and after construction process:

- Submission of quality assurance plan (subcontractor quality plan)
- Tender clarification through interviews of meetings which is not contentious but for clarification
- Visual inspection during construction
- The main contractor's quality procedure
- Competitiveness among subcontractors resulting to better quality
- Checking and vetting before the subcontractors are used
- Clarification meetings
- Method statements
- Based on the previous experience with the subcontractors in previous jobs
- Standard pricing pro-formal but often not used by the subcontractors because they prefer their own template. This will allow them to eliminate contentious on site waste disposal issue backed by statutes regulation.
- Risk assessment
- Section of the subcontractors quantities in the bill of quantities are directly priced by the subcontractor but most often they decline in pricing it.
- Operational procedure
- Considerate contractor people always have impromptu visit assessing 8 key issue from point 1-5
- Putting in place an auditable environmental procedure. Environmental issue is becoming important due to statutory regulation, e.g. no discharge of waste water to drainage or water course. Waste should be carried to the subcontractor's office or disposal site (e.g. concrete mix)

CLAIMS

The project was 14 weeks behind schedule because the client/architect and other consultants did not release some vital information to

move the project forward. For example, the redesign of the M&E conduit lines because of the conflict between the size of the conduit and the size of the ceiling. This issue caused 6 weeks delay, 4 weeks for design and 2 weeks for ordering the conduit. In another example, there is a missing supporting column for a projection of upper floor. The site manager spotted most of the problems on time but the response of the client/consultants was slow. Early involvement of the contractor should have solved most of these problems where buildability would have been taken on board at design stage. Even when partnering principle is tentatively agreed upon there is always a miss-match due to the architect failure to follow the procedures. In another example, the client informally agreed to engage the main contractor for the first to third phases of the project. The project was promised to follow partnering arrangement in order to achieve continuity and eliminate tendering costs. This agreement was not follow through by the client which destroys the trust between the team.

The project was delayed for an additional four weeks because of the changes to the first floor layout which had a knock-on effect on the other floor layout and associated works. Another problem is the design of the roof which is causing delay especially the internal cladding and rendering. This is because the roof was design in two levels, the lower level exposes the cladding and the rendering of that section to the external environment. All the delay caused by these problems are documented and officially sent to the client representative. The resultant effects of insufficiency of design and late responses from the client/consultant is additional claim due to increment weather, time related cost in the preliminaries/length of the contract, drying time and other one-off cost associated with the project. The subcontractor can as well claim some money from the main contractor depending on the subcontracting agreement which is always back-to-back in that case. The good thing about delay due to client or his representatives is that it buttresses the contractor's argument for more collaborative and partnering working arrangement. This will eliminate some of the problems especially in project design.

HEALTH AND SAFETY

- Appraisal questionnaires if it is a company that has not worked with the main contractor
- Subcontractor's appraisal by the main contractor at least twice in a year
- Personal Protective Equipment (PPE) rule of usage on site
- Health and safety file which need to be provided to the client after the completion of the project

DISCUSSIONS

Errasti et al. (2007) state that few companies in the construction industry can claim to possess the entire technical expertise, resource base, or investment capital required to fully accomplish a construction project. Therefore the option for outsourcing part of the process or product was in place through subcontractor and nominated subcontractor as stipulated in the JCT conditions of contracts. The extent of outsourcing and the nature of agreement which is shifting risks and responsibilities are close to the management route as oppose to the traditional system. The system as demonstrated in the cases allows for different level of outsourcing, i.e. the contractor outsources to subcontractors and subcontractors to sub-sub contractors. However, the multilayer subcontracting has been alleged to be one of the major causes of poor construction quality in Hong Kong (Yik and Lai 2008). On the positive note, the system is said to be highly efficient in mobilising workers to cope with fluctuating labour demand and is effective in ensuring workers will perform reasonably efficiently. The system, however, is prone to problems of non-payments for lower-tier subcontractors and workers, which will lead to project delays and work quality problems (Yik and Lai 2008). For instance, in one of the case projects 39 first-tier subcontractors which is an evidence of multi-layer sub-subcontracting.

The shift in the traditional contracting practices and procedures is client driven in order to minimise cost through open accounting system. The open accounting system used in the case project precluded the main contractor or its subsidiaries to bid for any of the job packages. Another reason why layers of the subcontracting approach is been used is because of the need by the main contractors to improve their performance in terms of quality, service and cost.

Second, it encourages inter-functional approach to process improvement through specialisation along trades. The party that is carrying out actual implementation is responsible for managing material suppliers and also outsourced activity suppliers with oversight management by the main contractor. This form of project organisation can be referred to horizontal and collaborative structure which often in practice does not encourage partnering due to the one-off nature of the arrangement.

There were evidences that regulations are also driving the changes, for instance waste disposal is a major factor for the contractor to shift the responsibilities and risks to the subcontractors. The site waste management plan (SWMP) is required on project which

is more than £300,000 (excluding VAT). Another important factor is the rigidity on the part of the national government on how allocated money should be spent and the type of procurement route that can be used. The contractor thinks that there should be more flexibility on how the local authorities procure their construction works. National directive serves as impediments to effective procurement strategy.

FURTHER STUDIES/FUTURE WORK

- The authors have carried out a small number of cases studies and still seeking access to more cases
- The authors intend to carry out a benchmarking study to determine the KPIs perception of project players before the transformation and after the transformation of traditional contracting system
- The authors intend to carry out full KPIs studies in the area of satisfaction, safety, project and site management, economic indicators, health and safety, people indicators and environmental indicators

CONCLUSIONS

The traditional contracting system is undoubtedly going through a period of rapid change by shifting risks and responsibilities. The traditional contractors are now performing the role of management contractors. This paper provides a case example of such change. The study is intended to measure the impact of the transformation to the stakeholders, on health and safety issues, environmental issues, project, process and site management issues as well as economic indicators. Measuring the old and transformed traditional method through performance indicators will provide a useful framework for measuring and comparing the performance of procurement routes, projects and processes. This can be used in making informed decisions in selecting procurement routes and in furnishing project managers, clients and other stakeholders with useful information needed to implement a project to a successful completion.

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DO PUBLIC PRIVATE PARTNERSHIPS (PPP PROJECTS) PROVIDE VALUE FOR MONEY FOR INFRASTRUCTURE DEVELOPMENT IN AUSTRALIA?

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Public Private Partnerships (PPP's) are becoming an increasingly popular method for procurement of infrastructure in Australia and around the world. In this current day and age, following the recent financial crisis, it is becoming ever important for governments to achieve value for money. This paper will aim to determine whether Public Private Partnerships as a procurement process provide value for money for Public Infrastructure Development in Australia. It will also try and determine what the Australian and State Governments consider value for money. The paper used mainly secondary data through a literature review and archival analysis of various forms of secondary data which produced the following key findings; value for money is a combination of the service outcomes to be delivered by the private sector, together with the degree of risk transfer and financial implications for the government (Infrastructure Australia 2011); PPP on average produce a lower cost over-run from the budget than traditionally procured projects; and as the size and the complexity of the project increases so does the advantage of using PPP procurement process. The paper also recommends further research involving primary data collection to determine the size and types of projects for using the PPP procurement method. It also recommends a completed comparison of Traditional and PPP Projects in Australia along with a survey of general opinions of industry personnel on PPP projects and what is that they consider value for money.

Keywords: public private partnerships, value for money, public infrastructure

INTRODUCTION

Public Private Partnerships (PPP's) are a procurement method used in numerous countries throughout the world. During the last two decades in Australia, they have become an increasingly common method utilised by state and national governments to satisfy the ever-increasing need for infrastructure. There are several PPP projects in their operational phase in Australia as well as many in construction and development phases. Key infrastructure projects typically utilizing this procurement method are transportation (roads and rail), utilities (electricity and water) and social (hospitals and prisons) infrastructure projects. Two important PPP Projects in Victoria currently under construction are the Royal Children's Hospital (Parkville, Victoria) and the Victorian Desalination Plant (Wonthaggi, Victoria). The purpose and reason for increasing PPP's use within Australia, is to deliver an improved service and allow large projects to achieve greater value for money. This is achieved through optimal risk transfer, management synergies, encouraging innovation, efficient asset utilisation and integrated whole-of-life asset management (Infrastructure Australia, 2008a and 2008b). However, as no PPP has reached the end of its lifecycle and consequent handover back to the Government, the success and benefits remain undetermined.

The aim of this research paper is to determine what is value for money to the Australian Government and whether Projects that utilise the PPP procurement process are providing it. This involved examining the factors and requirements that provide value for money in public sector projects.

The main question which authors asked was "Do Public Private Partnerships (PPP Projects) as a procurement process provide value for money for Public Infrastructure development in Australia?" Because of the time constraints, this short study exclusively utilized secondary data both in the literature review and discussion with the literature focusing on a broad range of literature including; journals, government reports, general conference papers, theses and dissertations while the discussion will involve an in – depth review of benchmarking and government reports. The paper provides the State-by-State review of the Definition of 'Value for Money', the Methods used to assess value for money and Value for money drivers for each State in Australia.

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VALUE FOR MONEY

In determining whether or not Public Private Partnerships deliver value for money, first it is necessary to determine what is 'value for money'? In terms of Public Private Partnerships, Grimsey (2005) gives a general definition of value for money as the best price for a given quantity and standard of output, measured in terms of relative financial benefit, it is assessed through a comparative analysis of the costs of different solutions that generate the same outputs in the form of a comparison between bidders' cash flows and those of the public sector alternative.

The Australian Government however defines value for money as a combination of the service outcomes to be delivered by the private sector, together with the degree of risk transfer and financial implications for the government. It is measured by comparing the costs of the PPP proposals against a benchmark created by the Public Sector Comparator which is adjusted for risk that is taken on by the contractor as well as other qualitative and broader VFM considerations (Infrastructure Australia, 2008a).

In 2008, the council of Australia Governments (COAG) which includes all state and territory governments adopted the 'National Public Private Partnership Policy Guidelines 2008' prepared by Infrastructure Australia. The guidelines allow for a level of uniformity across all jurisdictions however Volume 6 Jurisdictional Requirements of the National PPP Policy Guidelines details the specific requirements of the individual jurisdictions where it differs from the National Framework (Infrastructure Australia, 2008b). Therefore aside from varying circumstances as detailed in each state/territories separate Jurisdictional requirements, the different States and Territories share the same definition of what is 'value for money' for PPP projects in Australia. The definition shared by the states and territories is that value for money is the quantifiable amount of service outcomes that will be delivered by the private sector at a certain level of risk and financial implications to the government.

The two methods used by the Australian Government to assess value for money of PPP's are the Public Sector Comparator (PSC) and the other qualitative and broader VFM considerations. The PSC is the financial benchmark in the quantitative assessment of PPP value for money. It uses the whole-of-life Net Present Cost (NPC) adjusted for risk of projects delivered by the government under traditional procurement as a benchmark to compare to the same projects if they were delivered under the PPP process.

All risks not explicitly taken by the Government are borne by the Special Purpose Vehicle (SPV). The PSC should reflect the same level of quality and specification as the expected finished project. The whole of life cost of the PPP project is then compared to the PSC to evaluate value for money (Infrastructure Australia, 2008a). Grimsey (2005) identified that in countries other than Australia, value for money could be measured much the same as the PSC method adopted by the Australian Governments by estimating a benchmark cost of providing a specified service and then by comparing it to the cost of providing the same specified service under a PPP scheme.

Grimsey (2005) identified that another quantitative method used for assessing PPP's in other countries was the evaluation of competing bids, where price and non-price factors were assessed. Essentially this meant comparing bids that were received for project and identifying the strengths and weaknesses of each to determine which one delivered the best value for money out of the received bids. This is a common method used in the United States for procuring private prisons, and requires that prisons be delivered at between 5-10% less than the cost of traditional procurement to be awarded as a PPP.

The other method used by the Australian Government to assess PPP value for money is the qualitative and broader VFM considerations which are the consideration of the qualitative factors associated with the RFP which have not been explicitly valued, including design such as proposed delivery solutions, interface/ relationship and project management, and design considerations.

Infrastructure Australia (2008a) has identified several value for money drivers including:

- Sufficient scale and long term nature – Major capital investment over a long term.
- Complex risk profile and opportunity for risk transfer – A high amount of risk assessment and transfer of risk to the private sector to whichever party is best suited to taking the responsibility of the risk. Government ensures risk is dealt with appropriately by only paying when performance indicators have been met.
- Whole-of-life costing – The SPV is responsible for the design and construction costs with ongoing service, maintenance and operation costs over the life of the building. This improves efficiency as the whole-of-life costs are taken into consideration up front and are integrated into the design and construction.
- Innovation – competition is an incentive for private parties to use innovative solutions to meet service specifications.
- Asset utilisation – Costs to government are reduced by utilising more efficient third parties to meet deliver services.

- Integration of design, construction and operation requirements – the delivery and ongoing operation and maintenance becomes the responsibility of a single private party, the SPV, for the life of the PPP.
- Competitive Process – competitive tender process encourages the SPV to develop innovative delivery, operation and maintenance methods while meeting government cost objectives.

Grimsey (2007) compared the value for money tests across varying countries and concluded that there were six main value for money drivers which coincided with those drivers identified by the Australian Government including; risk transfer, the long term-nature of contracts (including whole-of-life cycle costing); use of an output specification; competition; performance measurement and incentives; private sector management skills.

One of the value for money drivers identified by Murphy (2008) that was not identified by the Australian Government was that PPP's can deliver value for money through accelerating construction. Construction can be accelerated solely through adopting the PPP process because where the progress of a traditional procurement projects depends on payments throughout construction, a PPP model does not require any payments until a service is being delivered, therefore the SPV has a higher incentive to complete delivery earlier so that it can start receiving payments.

Murphy (2008) also identified that there was value through less cost and time overruns. Transferring the risk of the design and construction results in a higher incentive to construct within budget and on time otherwise the SPV has to absorb the costs of budget overrun and penalties for time overrun. The Public sector does not respond as well to these incentives due to 'optimism bias', which is when the public sector attempts to deliver the best possible outcome instead of the most likely.

Where governments were not required to disclose the whole-of-life costs of the PPP project, in other words, who papered their finances on a cash accounting basis, benefited if infrastructure spending could be done "off-book" by the private sector (Murphy, 2008). For example, instead of the Government recording the full amount it spent on a project in the budget of the year it purchased the project, the government would pay the SPV a lease amount and record only the lease amount in the budget. By doing this, the government is not required to pay the full amount for a project up front and essentially is able to stretch the payments so that it can build now and pay later as it uses the service. This could be misleading to the public if the PPP was not assessed using a discounted cash flow (DCF) analysis, however it could be a valuable asset for governments that required new infrastructure projects but did not have the capital to invest in the large projects. However, the method of "off-book" accounting is not effective in Australia as the PSC method has been adopted and all PPP projects in Australia are required to deliver value for money which is assessed through a Discounted Cash Flow analysis.

In Australia and in general, the definition of value for money, the tests for delivering value for money and the drivers are the same with the exceptions for each State and Territory outlined in the National PPP framework. The tests for value for money are both quantitative and qualitative. The PSC is the quantitative test used in Australia and similar benchmarking tests are used internationally.

The value for money for drivers are all focused on delivering the best price for a given quantity and standard of output and is measured in terms of the financial and non-financial benefits achieved. The value for money is likely to be increased for the tax payer through the accountability for the provision and delivery of quality public services. Unlike other nations working in partnerships globally to improve public services, Australia has in motion a fully functioning framework employed to decrease the risk to the taxpayer. These standards in place hold firm the best potential for a project to produce value for money.

VALUE FOR MONEY FOR THE AUSTRALIAN NATIONAL AND STATE GOVERNMENTS

To determine whether or not PPP projects deliver value for money, first it is necessary to determine who it is delivered to, and what is their definition of 'value for money'. This research is focused on the Australian demographic therefore the definition of the Government body that would be responsible for undertaking the PPP project has been used. In Australia, the different States and Territories are responsible for procuring and delivering PPP projects. In November 2008, the Council of Australia Governments (including Infrastructure Australia and the State, Territory and Commonwealth Governments) prepared and endorsed the National Public Private Partnership Policy and Guidelines as an agreed framework for the delivery of PPP projects. (Infrastructure Australia, 2008).

Table 1 outlines a general definition of 'value for money', methods used to assess it and its drivers. It also outlines Infrastructure Australia's definition, methods used to assess and drivers and evaluates the departures of the different State and Territories. The table illustrates that the states and territories of Australia as well as industry and other international governments follow closely the Australian National Government's definition of 'value for money', the methods used to assess value for money and value for money drivers. The definition adopted by the Council of Australian Government for 'value for money' is a combination of the service outcomes to be delivered by the private sector, together with the degree of risk transfer and financial implications for the government.

Value for money in Australia is assessed by comparing the costs of the PPP proposals against a benchmark created by the Public Sector Comparator which is adjusted for risk that is taken on by the contractor. This allows for a comparison between the evaluation of the project costs and benefits of PPP proposals and the costs and benefits of undertaking the project using an alternative procurement process. Value is also assessed by looking at the Qualitative and broader considerations (Infrastructure Australia, 2011).

There are several main value for money drivers including; a competitive bidding process, identification of the complex risk profile and of the opportunities to transfer that risk onto the private sector, determination of the whole-of-life cost of the project, innovation through private sector, private sector asset utilisation of both capital and other resources, integration of design from the architect, builder and facility manager to create an appealing design as well as an easy to build and maintain project, and sufficient scale and long term nature of projects.

CONCLUSION

Public Private Partnerships (PPP's) are a procurement method used in Australia and around the world, the use of PPP procurement is becoming increasingly common method for satisfying the increasing need of infrastructure. PPP projects are found in all sectors of infrastructure procurement including transportation (roads and rail), utilities (electricity and water), social (hospitals and prisons) and information technology. This paper has addressed the research question which was "Do Public Private Partnerships (PPP Projects) as a procurement process used by the Australian Government for Public Infrastructure development in Australia?"

Due to the limitation imposed on the research, an extensive literature review was conducted analysing and accessing various forms of secondary data including government reports, journals, benchmarking papers, newspaper articles etc. In conclusion the following key findings and recommendations are identified:

KEY FINDINGS

- *Value for Money Definition*
The definition adopted by the Council of Australian Government for 'value for money' is a combination of the service outcomes to be delivered by the private sector, together with the degree of risk transfer and financial implications for the government (Infrastructure Australia, 2011).
- On average PPP projects have a lower cost over-run from the budget than traditionally procured projects.
- PPPs provide superior performance in both the cost and time dimensions, and that the PPP advantage increases (in absolute terms) with the size and complexity of projects (Infrastructure Australia, 2011).

RECOMMENDATIONS

Due to the time and primary research unavailable this paper recommends that primary data be collected to answer the following questions; What size/ type of projects are best procured using PPP's?; Comparison on Traditional and PPP projects in Australia; and Survey of industry personnel to determine general opinions of PPP projects and what is they consider value for money.

Table 1

	DEFINITION OF 'VALUE FOR MONEY'	METHODS USED TO ASSESS VALUE FOR MONEY	VALUE FOR MONEY DRIVERS
DICTIONARY	Value for money as defined by Oxford University Press (2011) is used in reference to something that is well worth the money that was spent on it,	Value is assessed by the worth of something compared to the price paid for it.	A value driver is receiving a higher output (receiving more goods) with a lower input (paying less) i.e. paying little for something but receiving a lot in return.
INFRASTRUCTURE AUSTRALIA (COAG)	A combination of the service outcomes to be delivered by the private sector, together with the degree of risk transfer and financial implications for the government. It is measured by comparing the costs of the PPP proposals against a benchmark created by the Public Sector Comparator which is adjusted for risk that is taken on by the contractor. (Australian Government 2008)	<ul style="list-style-type: none"> • Public Sector Comparator (PSC) is the financial benchmark in the quantitative assessment of PPP value for money. It sets the whole-of-life Net Present Cost (NPC) adjusted as a bench mark if it were delivered by the government such as Construct only, Design and Construct, Construction Management, Project Alliancing and Managing Contractor. All risks not explicitly taken by the Government are borne by the SPV. The PSC should reflect the same level of quality as the expected finished project. The whole of life cost of the PPP project is then compared to the PSC to evaluate value for money. (Australian Government 2008) • Qualitative and Broader VFM considerations; consideration of the qualitative factors associated with the RFP that have not been explicitly valued, including: (Australian Government 2008) <ul style="list-style-type: none"> ◦ Design – including proposed solutions Service delivery and operation requirements; ◦ Interface/ relationship and project management; and ◦ Design considerations • Value for money may be determined by comparing competing bids. It should be noted that for a normal PPP bid, the Government does not reimburse any of the costs incurred by the unsuccessful bidders. (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> • Competitive bidding process • Identification of the complex risk profile and of the opportunities to transfer that risk onto the private sector • Determine the whole-of-life cost of the project • Innovation through private sector <ul style="list-style-type: none"> ◦ Private sector competition is used as a driver to promote higher levels of innovation • Private sector asset utilisation of both capital and other resources • Integration of design to create an appealing design as well as an easy to build and maintain project. • Sufficient scale and long term nature <ul style="list-style-type: none"> ◦ Capital investment will be over \$50 million with long-term requirements ◦ Whole-of-life net present value will be greater than \$100 million.
VICTORIA STATE GOVERNMENT	<ul style="list-style-type: none"> • The value for money definition of the Victoria State Government follows the National guidelines 	<ul style="list-style-type: none"> • Under the Council of Australian (COAG) the Victorian Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC, and the Qualitative and Broader VFM Considerations • Although both the National and state guidelines use the PSC, the Victorian legislation adopts a different methodology to calculate the discount rate for the Public Sector Comparator for social infrastructure projects. • PPP projects in Victoria must also complete a public interest test to protect the interests of the community • As well as the public interest test, all projects must be conducted in accordance with the Victorian Government Purchasing Board Policy for the Conduct of Commercial for probity purposes to maintain competitiveness. (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> • The value for money drivers of the Victoria State Government follow the National guidelines

NEW SOUTH WALES STATE GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the New South Wales State Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the NSW Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC, and the Qualitative and Broader VFM Considerations All PPP projects in NSW will undergo an evaluation to ensure they are in the public interest All PPP projects assessed by the NSW Government will follow a probity plan to ensure efficiency, fairness, impartiality and integrity in dealings. (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The NSW drivers are generally in accordance with the national guidelines but also identify the following drivers; Encourage maximum Australian and New Zealand industry Participation
QUEENSLAND STATE GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the Queensland State Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the Queensland Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC and the Qualitative and Broader VFM Considerations A Public interest assessment will be undertaken to ensure the project serves the public's best interest. All PPP projects assessed by the Queensland Government will be in accordance with the Queensland State Procurement Policy and Queensland's Probity and Process Governance PPP supporting guideline. (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The value for money drivers of the Queensland Government follow the National guidelines including; <ul style="list-style-type: none"> Deliver improved services and VFM through risk sharing Increased innovation Better use of assets; and An integrated whole-of-life management approach.
SOUTH AUSTRALIA STATE GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the South Australia State Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the South Australian Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC and the Qualitative and Broader VFM Considerations (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The value for money drivers of the South Australia State Government follow the National guidelines
TASMANIA STATE GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the Tasmanian Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the Tasmanian Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC and the Qualitative and Broader VFM Considerations All assessments with the WA government will remain open and transparent in the public's best interests (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The value for money drivers of the Tasmania Government follow the National guidelines
WESTERN AUSTRALIA STATE GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the Western Australia State Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the Western Australian Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC and the Qualitative and Broader VFM Considerations All PPP projects in WA will undergo an evaluation to ensure they are in the public interest. All assessments with the WA government will remain open and transparent. (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The value for money drivers of the Western Australia Government follow the National guidelines
NORTHERN TERRITORY GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the Northern Territory Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the Western Australian Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC and the Qualitative and Broader VFM Considerations Value should be assessed based on the national guidelines as well as in the public interest; Public interest should always be protected in infrastructure projects delivered through PPP process (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The Northern Territories drivers follow the National Guidelines however, due to the small dispersed population base and geographic isolation, drivers that would normally apply to social infrastructure may need to be applied to economic infrastructure.

AUSTRALIAN CAPITAL TERRITORY GOVERNMENT	<ul style="list-style-type: none"> The value for money definition of the Australian Capital Territory Government follows the National guidelines 	<ul style="list-style-type: none"> Under the Council of Australian (COAG) the Western Australian Government has generally accepted the National PPP Guidelines' method to assess value for money including both the Public Sector Comparator PSC and the Qualitative and Broader VFM Considerations (Infrastructure Australia 2011) 	<ul style="list-style-type: none"> The value for money drivers of the Australian Capital Territory Government follow the National guidelines
INDUSTRY AND OTHER PPP MARKETS INCLUDING OTHER COUNTRIES	<p>Grimsey (2005) defines value for money as 'the best price for a given quantity and standard of output, measured in terms of relative financial benefit'.</p>	<ul style="list-style-type: none"> 'It is assessed through a comparative analysis of the costs of different solutions that generate the same outputs in the form of a comparison between bidders' cash flows and those of the public sector alternative' (Grimsey 2005) Another test for VFM is the evaluation of competing bids, where price and non-price factors are assessed. It is assessed through a comparative analysis of the costs of different solutions that generate the same outputs in the form of a comparison between bidders' cash flows and those of the public sector alternative (Grimsey and Lewis 2005) In France, where there is a long history of PPP's, a concession model has been adopted which has a proven track record (Grimsey and Lewis 2005) 	<ul style="list-style-type: none"> The value for money drivers are very similar in most government internationally including all the value for money drivers of the Australian Government as well as; Accounting treatment of PPP projects is not a factor in selection of the procurement methodology and is NOT a value driver (Australian Government 2008) however this may be a value driver for other PPP markets which do not utilise the Public Sector Comparator to assess PPP financial viability. Governments that are not required to disclose the whole-of-life costs of the PPP project and only papered their finances on a cash accounting basis, benefited if infrastructure spending could be done "off-book" by the private sector (Murphy 2008). This essentially meant that they could buy a project without any funding upfront and not have to pay anything until service costs are incurred which may not be until the next government took over power. Delivers value for money through accelerating construction, where progress of a traditional procurement projects depends on payments throughout construction, a PPP model does not require any payments until a service is being delivered, therefore the SPV has a higher incentive to complete delivery earlier so that it can start receiving payments. (Murphy 2008)

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WHAT ARE THE BENEFITS OF STANDARDISED PPP PROCUREMENT PROCESSES?

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The processes and procedures adopted by different jurisdictions for consideration, procurement and implementation of PPP projects vary considerably. With respect to PPPs, the external context is increasingly global, and certain factors are driving the marketplace toward common practices and a degree of normalization. Alternatively, project strategies from jurisdiction to jurisdiction are frequently different, which consequently results in distinctive project implementation approaches. In short, standardization enhances open markets while customization accounts for the variance in project objectives, conditions, and stakeholders. By considering the motives driving particular processes for common models of PPP in the context of evolving markets, the advantages and disadvantages of standardized processes are assessed. Our framework of analysis is based on “business model” literature and is applied to evaluate a cross-section of case studies from Australia, Europe, and the United States. The findings confirm the presence of sound reasons and drivers for the different approaches adopted, e.g. the availability of finance and tendering norms. It is also clear that further standardization of policies, institutional approaches and project documentation may indeed lead to improvements.

Keywords: infrastructure, procurement strategies, public private partnerships, projects

INTRODUCTION

World-wide, governments are launching PPPs to cope with decreasing budgets and the urgent need for new infrastructure. The speed of introduction, however, differs markedly. Even within a country or market large differences are observed in the emergence of PPP schemes. This is, for instance the case in the US, Europe and Australia despite similar budget constraints and the high investment needs. Many believe that the absence of a common comprehensive procurement legislation hampers the development of PPPs (Jooste et al., 2011) while others stress the importance of aligning the PPP schemes with the situational characteristics (see Bult-Spiering and Dewulf, 2005). A delicate balance exists between the need for a standardized and common legal framework and the need for tailor-made solutions.

In this paper, we study the emergence of the PPPs in three different developed countries with varying maturity levels and contexts: US, Europe and Australia. In these three countries, we depict a similar trend towards a central and comprehensive PPP archetype. A frequent assumption is that a common framework will enhance value for money since transaction costs will decrease and competition will increase.

The concept of one common market framework fits with the idea of a common business model (see Davies et al., 2010). A business model articulates a value proposition to enable a customer to perform an important operational task or achieve its strategic objectives (Johnson et al., 2008) and identify market segments for profitable growth (Chesbrough and Rosenbloom, 2002). Translated to public infrastructure, this means that a common market framework should preserve and enhance public interest or value for money. In practice, however, various business models exist since clients such as local or state governments and projects with specific characteristics have alternative value propositions.

Hence, the challenge for large-scale infrastructure projects generally and PPPs particularly is balancing standardization, which is driven by market and socioeconomic forces, and customization, which is driven by end user expectations, local norms and objectives and unique project characteristics. We explore the challenge of standardization and customization by first describing the motives to standardize PPP processes on the one hand and the need for customized solutions on the other hand. Subsequently, we explain the multi-national case study approach used to examine this issue in distinctive jurisdictions. Finally, the results of the case studies are compared and some basic conclusions are made.

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STANDARDIZATION AND CUSTOMIZATION

DRIVERS OF STANDARD PPP PROCESSES

Generally, two major drivers are pushing the standardization of PPPs: market-based factors and socio-political factors. The market-based drivers are influenced by globalization, transaction costs and market precedents whereas the socio-political drivers are shaped by public and legislative scrutiny as well as procurement regulations.

Market Drivers

As the world becomes increasingly flat, large engineering and construction firms from many different regions of the world are quite active in the infrastructure project marketplace. Shortages in the labour market in both volume and specialism are also fuelling this development. Moreover, to enhance competition public sector clients have launched open tendering procedures enabling foreign companies to get more involved. The flow of capital made possible by the global financial markets further heightens opportunities for investors and financial intermediaries; not surprisingly, PPPs have become a popular target - despite the recent worldwide economic crisis. Today, the infrastructure market is, for the most part, an open global one, and normalized statutory requirements and regulatory procedures stimulate this open market system.

Many argue (see Grimsey and Lewis, 2004; Yescombe, 2007) that PPP projects have economies of scale. Projects need a specific volume (in terms of costs and contract period) to recover the transaction costs. Bidding costs are typically high, and certain procurement obligations such as security requirements like letters of credit can limit those qualified to participate. Consequently, the number of available bidders is often low. In addition, the nature of PPP projects often requires the development and negotiation of new or modified contracts for each project; this is time consuming. Consequently, key stakeholders in such projects are pushing for standardized procurement processes and contracts to decrease transaction costs.

Socio-political Drivers

As the new public management paradigm has evolved and been liberalized so too has the scrutiny of government. Legislative bodies, governmental auditing offices, non-governmental organizations and the public in general have focused their attention particularly on the public-private interface. In general, this scrutiny has increased efforts to improve accountability and transparency. For instance, Buxbaum and Ortiz (2008) describe such issues as well as governmental responses in the US PPP market.

Shaoul et al. (2009) distinguishes two streams of accountability: (1) upward - macro accountability to the legislature and the public as taxpayer and electorate, and (2) downward - micro accountability to the public as service users. To safeguard the public interest or taxpayers' money, governments have implemented various central governance rules and procedures. These rules and procedures increase the transparency of the decision-making and the ease of accountability at the macro-level. In Europe, for instance, PPP concessions are subject to rules and principles resulting from the European Union (EU) Treaty: the principles of equal treatment, mutual recognition, proportionality and transparency. These principles are translated in the EU Directives for the coordination of procedures for the award of public contracts. The transparency principle, for example, safeguards the clarity of the contracting public authority's steps in all phases of the procurement procedure. Similarly, contract provisions and performance standards function in a similar way at the micro-level; these requirements make PPP contractors deliver user services as contractually defined.

The literature focused on accountability and transparency tends to take a pessimistic view of PPPs (see Froud, 2003 as an example). Interestingly, a few have considered a different perspective while focusing on the transparency and accountability issue. Grimsey and Lewis (2007) recognize that long-term arrangements potentially limit government flexibility; however, they contend that a conventional delivery (i.e. unbundled separate contracts) is executed in an "environment largely removed from the economic signals to which private entities are exposed . . . and the principals involved are often insulated from the consequences of their actions and decisions" (p. 172). Certainly, infrastructure decisions have consequences across generations, but as Stone (2006) indicated politicians and government officials making such decisions bear little personal responsibility for their consequences and so have little incentive to change their behaviour. Conversely, mature policy and standardised PPP arrangements "can introduce clear lines of accountability, transparency of outcomes and performance, clarity as to the roles and responsibilities of the contracting parties, an assessment of project risks, competition for the delivery of services, and the motivation to succeed" (p. 172).

DRIVERS OF CUSTOMIZATION

Shaoul et al. (2009) criticized the general governance guidance codes since they tend to favour the upward accountability stream despite the fact that many policy programs and executive agencies emphasize the interests of consumers and taxpayers. To some extent, infrastructure agencies (clients) have tilted the balance towards citizens and business enterprises - the users of infrastructure

services - with recent initiatives. For instance, the UK Highways Agency's strategic focus on "safe roads, reliable journeys, and informed travellers" emphasizes the centrality of the motorways' users. Indeed, flexibility to delineate specific project requirements and service provisions is a necessity to satisfy the interests of the diverse users of infrastructure. Further, motives for infrastructure programs and projects differ by country, region and situation; therefore, customized approaches are essential. For instance, a highway segment may be needed to either open a new mobility corridor or provide congestion relief. While each need can be satisfied physically with a new paved route, the conditions related to the demand, adjacent network, site, environment, surrounding communities, local ordinances, etc. are likely to differ significantly. Consequently, the delivery, funding, and management approach taken to meet each need must account for the alternative circumstances.

As the end users of infrastructure receive more attention, the means for doing so should evolve. This "bottom-up" perspective will balance the "top-down" policies and practices of the past. Davies et al. (2010) provide a lens to examine this transition adapted from the literature on business models; they contend that the utilization of Ps represents an effort by clients, consultants and contractors to provide better value to infrastructure end users through the implementation of different business models. A business model refers to how a firm, endowed with given technology, capabilities and assets successfully configures its organisational structure (Teece, 2010) and transactional relationships with external stakeholders (Amit and Zott, 2001). Further, it focuses on the way to deliver value for the customer and identifies both a firm's strategic choices and operational implications and profit potential, which can be analysed, tested and validated (Shafer et al., 2005). Put another way, a business model describes how all of the elements or components of a business - such as a firm's capabilities, resources, and position in the value network as well as its strategy - fit together as a whole to create value for the firm and its customer (Magretta, 2002).

Davies et al. (2010) depict a variety of infrastructure provision business models in practice. Generally, these business models differ in three important ways: a) responsibilities in the value chain; b) risk allocation and c) organisational and transactional relationships. Their typology characterizes alternative client-led business models in infrastructure provision:

- Type 1 - Risk Transfer Model: Prime contractor provides systems integration and manages subcontractors; risks are transferred to the prime contractor and competitive tendering is used; and transactions are arms-length in nature.
- Type 2 - Risk Negotiation Model: Prime contractor provides service-led integrated solutions; risks are delineated through a dialogue during a negotiated procurement process; and a temporary but autonomous project organization is created.
- Type 3 - Risk Sharing Model: Client-consultant establish a partnership to provide systems integration while consultant helps coordinate contractors; client shares risks with consultant and targeted costs are established; and co-located project teams are the norm and selective tendering is used.
- Type 4 - Risk Bearing Model: Client provides systems integration with support from specialized suppliers; client bears the risks and typically uses cost-plus arrangements often with not to exceed amounts; and agreements established with contractors but integrated project teams are common.

TENSION BETWEEN STANDARDIZATION AND CUSTOMIZATION

As the prior discussion highlights, the market-based and socio-political factors tend to force the PPP market toward common frameworks and processes to open markets, lower transaction costs and increase the transparency and legitimacy of transactions. At the same time, the importance of infrastructure users as well as the demand by clients for some project-to-project flexibility cultivates the need for customized or tailor-made arrangements; this has prompted implementation of various business models (i.e. differing configurations of the infrastructure value chain). These two prevailing trends are often at odds with one another. For instance, a heavily regulated procurement environment may oblige an infrastructure client to adopt a particular type of business model, which may or may not satisfy the wishes of the client or the end users. Without the right to use the business model to fit the circumstance, clients may be deprived of the ability to make a strategic decision that could enhance overall welfare and value.

RESEARCH METHOD

The method employed to examine the interplay between standardization and customization was a multi-national case study among Europe, Australia, and the United States. The case data were gathered in different settings. These settings provided us opportunities to analyse the drivers for standardized market frameworks and drivers for customized business models. A similar approach was followed by Bechky and Okhuysen in AMJ (2011) comparing responses of organisations to surprises in two different settings. The three different settings are comparable in their strive for standardized procedures and framework but substantial differences are found between the business models used in the cases. The case from each jurisdiction is considered from the external context and at the project-level. Once each case was developed, comparisons and observations between the jurisdictions were made.

EXTERNAL CONTEXT

The external context describes the circumstances in each jurisdiction that led to the utilization of PPPs; this context is studied along two dimensions: (1) the political and institutional motives and (2) the market dynamics. Delineating the external context relied on the review of policy white papers, existing legislation, executive regulations or guidelines (e.g. procurement requirements), and third-party accounts and documents (e.g. audits, professional publications, media reports, etc.)

PROJECT-LEVEL

To examine how PPP projects are implemented, the business model concept introduced previously was used. In each jurisdiction, we analysed a specific project to characterize how it was developed and implemented. In doing so, we looked for evidence of the business model adopted as well as the influence of common market frameworks on the implementation strategy. In each case, our goal was to identify a business model type (I - risk transfer to IV - risk bearing) for the project studied. In general, we expected that the external context factors would be fairly similar but the project characteristics and the motives would be quite diverse. Consequently, we anticipated that the PPP business models would be rather different.

CASE EUROPE

EXTERNAL CONTEXT AND MARKET DRIVERS

The emergence of concession concepts in most European countries can be seen as a reaction to government needs for funding. Public sector financing of large-scale projects have become difficult in the last decades and governments have been increasingly relying on private sources. This was the case with the emergence of the well-known Private Finance Initiative in the United Kingdom but took place in continental Europe as well. In the Netherlands, for instance, the two first PPP projects were launched in the early nineties were the Wijkertunnel and Noordtunnel due the scarce public funding. But it took almost a decade before new projects were initiated. In 1998 the liberal social democratic Administration was confronted with insufficient public funds to meet the enormous investments needed to realize the transport infrastructure. Consequently, private contributions were considered as a possible solution and private finance projects were put on the political agenda (Koppenjan, 2005).

SOCIO-POLITICAL DRIVERS

The objective of the European Union's public procurement policy is 'to achieve fair and open competition for public contracts, thereby allowing suppliers to gain the full benefits of the single market'.ⁱⁱ The European jurisdiction regarding PPPs is aimed at stimulating an open market and guarantee transparency and fair competition. At European level, governance rules and procedures are developed to safeguard open and fair competition. These rules and procedures increase the transparency of decision-making and the ease of accountability. Besides, member states have implemented national standard rules and procedures. In most European member states, a PPP unit has been installed with clear and strict procedures enabling the emergence of PPPs. In the Netherlands, the PPP unit was installed in 1999 advising government agencies and providing private companies with general PPP information. Three years later, the PPP unit gained a more active role encouraging the use of PPP and improving capacity of the public and private sector.

The European Commission has been encouraging member states to launch PPP programs. For instance, the stimulus of PPPs has been an important element of large policy programs as the Trans-European Transport Network (Ten-T). An important milestone in the PPP policy development at European level was the publication of the Green Paper in 2004 focussing on the public procurement of PPPs and more in particular the selection of private partners. To increase transparency and public spending accountability the Dutch government has developed a standardized procurement system and procedures. For instance, since 2005 the PPC is systematically used to assess all projects above 112,5 million euros (kenniscentrum, 2005). Based on previous pilot projects procedures and documents are standardized. By doing so, the government attempted to reduce transaction costs and times of completion (kenniscentrum PPS, 2005). Besides, the government introduced the concept of listed risks as a fair mechanism to discuss potential risks during the procurement phase (Bos, 2009) and in 2008 a handbook for DBFM was published by the government.

The rules and procedures by the EU prescribes that the government awards contracts to develop public projects through a process of competitive tendering. For complex projects, such as most DBFM projects, the competitive dialogue procedure is advised (this procedure is known as Interactive Tendering in Australia). This procedure entails that any economic operator may request to participate and where the contracting authority conducts a dialogue with the candidates admitted to that procedure. The aim of this

ii. Green Paper. Public Procurement in the European Union; Exploring the way forward. Communication adopted by the commission on 27th November 1996

procedure is to develop one or more suitable alternatives, capable of meeting its requirements, and on the basis of which candidates chosen are invited to tender.

The competitive dialogue procedure is a procurement system that consists of several discussion rounds between the principal and potential suppliers, during which all aspects of the tender can be discussed. The CD procedure assists contracting authorities to procure complex projects because matters such as technical specifications and price levels can be defined during the dialogue rather than being predetermined. It is assumed that the CD procedure adds value to alternative procedures since it is aimed at aligning the complex demands of principals with the several possible solutions that contractors have to offer (Hebly et al., 2006). Under the competitive dialogue procedure, the contracting authority issues a contract notice specifying that the competitive dialogue procedure will be followed and that the contract will be awarded to the most economically advantageous tender (MEAT). The contracting authority then conducts a dialogue with selected suppliers to identify acceptable solutions well suited to satisfying its needs. If the contract notice or descriptive document so provides, the contracting authority may choose to conduct the procedure in successive stages. The procedure was supposed to ensure the possibility of conducting dialogue with more than one candidate about all aspects of the tender, without favouring one candidate over another, and without entering the post-tender negotiations which were common under the negotiated procedure (Hoezen et al., 2011).

PROJECT CASE: THE SECOND COEN TUNNEL

An example of the CD procedure in practice is The Second Coen Tunnel in Amsterdam. This project is large (estimated value €300 million NPV) and complex, and involves the maintenance of an existing, forty-year old tunnel plus the construction of a second tunnel alongside the current one. The contract for the Coen Tunnel project was signed in 2008, and the maintenance of the existing tunnel was then transferred to the contractor. The construction stage for the new tunnel started in 2009. This concession project, the first to be procured using the CD procedure in the Netherlands, consists of widening approximately 14 kilometres of highways at the north and south entrances to the existing Coen Tunnel, and expanding the tunnel's capacity from two lanes to three in each direction plus two further reversible lanes, enabling five lanes of traffic in one direction during peak hours.

The decision to procure the project through a DBFM contract was made by the Dutch Minister of Transport in March 2005. Shortly after this, it was decided to apply the CD procedure because of the technical and financial complexities of the project. In June 2005, the market was formally informed about the project and the procurement method selected. The duration of the contract has been set at 30 years, from 2008 to 2036, and consists of the construction and maintenance of new infrastructure (construction due for completion in 2013) and the renovation and maintenance of existing infrastructure (roads and original tunnel). The service component in this project consists of making available eight traffic lanes passing under the Noordzee Canal which connects Amsterdam to the North Sea.

Five consortia met the qualifications criteria and were therefore invited to participate in the dialogue. Certain Critical Aspects, as identified by the contracting authority based on risk management (items such as the stability of the existing tunnel, air quality and lane availability during the construction stage) formed the basis for some of the dialogue products which had to be submitted by the candidates at the end of the dialogue stage. These dialogue products had to meet a minimum quality level before the candidates were invited to bid. Four further Critical Aspects of the Action Scheme, plus the acceptance of Risks and Optional Requirements were part of the conversation during the Consultation stage. The Optional Requirements set by the contracting authority were additions to the project's scope, and candidates could choose whether or not to meet them. In a similar way, candidates could decide whether to accept Risks, based on a pricing scheme, or leave these in the hands of the contracting agency. Finally, a consortium comprising of Arcadis, Besix, CFE, Dredging International, Dura Vermeer, TBI Bouw, and Vinci was selected. The contract was signed in April 2008.

CASE AUSTRALIA

EXTERNAL CONTEXT AND MARKET DRIVERS

The involvement of private finance and PPP agreements in major the provision of public infrastructure in Australia, has, and continues to evolve as particular governmental jurisdictions seek to optimise the relationship between prudent financial management and stewardship of the underlying assets on behalf of the community. Early agreements in the 1990s were typified by governments constrained in their ability to directly borrow funds to meet glaring requirements for infrastructure investment. This led to a range of BOOT schemes for roads, tunnels and water treatment plants based around maximum risk transfer to the private sector. By 2000 Australian governments were typically operating in surplus budgets and the drive for PPPs became centred efficiencies of

procurement and the ability to bring forward multiple projects such that the focus shifted to delivery of particular services (including health, justice, schools and community facilities as well as the more traditional economic style projects).

The Australian Government comprises a federation of States and Territories and the respective responsibilities of these jurisdictions have in part driven the behaviour of the PPP market. States and Territory governments are primarily responsible for infrastructure within their jurisdiction and funds for projects come from either jurisdiction derived taxes and charges, via grants from the Federal government, or directly from users. Until the establishment of Infrastructure Australia in 2008 project priorities were totally set by each jurisdiction. There is a healthy level of competition between each jurisdiction to maximise the opportunity for their constituents and this is most evident in discussions around requests for Federal government funds. Major complaints from the market in respect to such behaviour relates to the lack of integration in the flow of projects approved and coming to the market, sectors of the market could face either feast or famine and this in turn impacts on the availability of resources and the level of competition in the market to offer the value for money outcomes sought.

The demand for resources in Australia is compounded by the booming mining demands on similar resources, the vast distances between major activity centres, the relatively few major consortia and constructors in the market, and the relatively small market required to service a population of just under 23 million. Public investment in infrastructure has recently been in the order of 2.7% of GDP (Coombs and Roberts, 2007).

SOCIO-POLITICAL DRIVERS

Public policy for Australian PPPs has been relatively consistent since about 2000 when the Victorian government released its Partnerships Victoria policy and then developed numerous associated guideline documents to facilitate education and clarity in the market. These documents along with best practice from all other jurisdictions were pooled in 2008 by Infrastructure Australia to develop an Australia wide policy and set of documents and procedures for adoption for PPP projects. The general aim of these documents is to maximise the efficiency of infrastructure procurement, reduce costs and remove distinctions between different jurisdictions. The general approach articulated in these documents involves: a) competitive and transparent mechanisms, b) the combination of public and private skills to create innovative solutions, and c) to improve services and achieve better value for money. As such detailed consideration is given to: the service required, what services are to be contracted and which services remain in governments control, risk allocation, public interest, whole of life considerations and achievement of value for money.

Having standardised policy and process for the procurement of PPPs it becomes interesting to reflect on what occurred prior to this standardisation and which areas of practice have in fact not been standardised. New South Wales (NSW) and Victoria were dominant in the number of PPP projects delivered. Both states are larger than other jurisdictions and it would be probably fair to say they are more experienced in the delivery of large and complex projects. Both had subtly different arrangements for economic projects as opposed to social projects, with NSW having expectations that consortia would directly offer compensation to government if they were successful in being granted a concession.

In considering specific aspects of delivery it is proposed to discuss the project initiation stage, market engagement, and then delivery and ongoing management of the infrastructure to deliver the required services. Both NSW and Victoria were transparent and clear to the market of their intent to deliver via a PPP and Victoria went a step further to commit to a project once it was released to the market provided the market offered value for money as evaluated against a public sector comparator. Other jurisdictions reserved their rights until evaluation tenders and fully considering the specifics of the market offering. A major lesson learnt was that market clarity and certainty was required if the private sector was to respond positively. This necessitated governments understanding the benefits gained from projects far more than may have been documented previously and the development of detailed robust business cases has now become the norm for major projects. The approval process to sanction projects is strongly linked to the confidence the market has. The Cross City tunnel project in NSW demonstrated that the community expects the engagement process to strongly consider their interest and when bids were biased toward those with the highest compensation offered to government (as encouraged by traffic funnelling). This policy was discontinued with the introduction of the National policy.

In terms of commercial terms and risk allocations, each Australian project built on the lessons from the former project and thus the market effectively standardised itself. Similarly, the number of consultants and PPP specialists came from a relatively small pool of experts and thus again market standardisation occurred for reasons of familiarity and efficiency. The relevant government guidelines generally reflected best practice as it emerged.

There are numerous governance arrangements for the ongoing management of the facilities and these arrangements reflect the

organisations and industry involved rather than specific PPP policy. The introduction of an Australia wide PPP policy has further standardised the project management and market engagement process now employed across Australia. Interestingly this policy and associated guidelines still provides the flexibility of individual jurisdictions to develop and adapt to the circumstances of the day. Jurisdictions still establish their service needs and manage their process for prioritising projects, and/or handling unsolicited approaches from the private sector. The way by which specific approvals are taken and how the projects are managed on an ongoing basis also remains fully in the control of each jurisdiction. The pipeline of project has in part been assisted by Infrastructure Australia as this body is responsible for the development of an infrastructure priority list (seeking Federal government support) and this has in turn been used as a mechanism to raise the standard of infrastructure related decisions.

CASE PROJECT: EASTLINK TOLLROAD

An overview of the Eastlink tollroad is provided as an example of the context of Australian projects. This project comprises 39km of tolled motorway and 6km of bypass roads in the State of Victoria and it incorporates twin, three-lane, 1.6km tunnels, it is the largest urban road project ever constructed in the State of Victoria. It was brought to a mature PPP market pre the Global Financial Crisis. The project was an amalgamation of two previously proposed state capital projects, one of which had been put to the market but did not attract cost effective bids. The DBFO form of PPP contract was executed with the successful consortia, ConnectEast, in October 2004 and was commissioned in 2008 (some six months early) with a 39-year concession period for a final construction cost of \$2.5billion AUD.

Two consortia were shortlisted as a result of an Expression of Interest process and both consortia were taken to the final selection in a competitive environment. The road was to be totally parallel to the existing arterial road network and one of the major selection criteria was the proposed toll. The tolls bid for this project produced the cheapest tolls in Australia by some margin for comparable roads. From a policy perspective, the approach on this PPP was quite different to that adopted in New South Wales for its Cross City tunnel (completed 2005) and Lane Cove tunnel (completed 2007) projects, both these NSW projects had specific concessions in terms of traffic management and required the bidders (in part) bid a compensatory payment back to government for the privilege of the concession. The NSW projects were not well received by the community and failed the concessionaires failed. The Eastlink style of project became the foundation for the new Infrastructure Australia policy.

From a project delivery strategy, Eastlink followed a proven standard. It utilized Interactive Tendering, followed standard commercial principles, was based wherever possible on allocation of risk to the party best able to manage the risk, used the services of an Independent Reviewer (to accept the final product to be in accordance with the output specification), and was structured on contracts that built heavily off contract for previous PPPs. Management of the ongoing performance of the concessionaire was through the use of detailed Key Performance Indicators (with abatements returned to customers) and the holding of performance bonds. The detailed Request for Proposals was released to the two short listed bidders in October 2003 and dual negotiations followed until the contract was awarded in October 2004.

Post the GFC and with difficulties in gaining market acceptance of demand risk the most recent Australian road PPP has been based on availability charges. However, the commercial and procurement principles applied to Eastlink remain as the main driver for governments to gain value in the Infrastructure Australia policy.

CASE USA

EXTERNAL CONTEXT

While PPP-type arrangements in the US may be traced to the late 18th century (Garvin, 2007), a contemporary resurgence of such projects began in the late 1980s and early 1990s. Fuelled primarily by a lack of public budgetary resources, prohibitive regulations on public procurement approaches, and indirect incentives from the federal government (such as Executive Order 12803), states and municipalities began to experiment with privately financed and delivered infrastructure projects. One of the most notable programs was in California where following the passage of special state legislation (Assembly Bill 680), the California Department of Transportation (Caltrans) was authorized to solicit proposals and enter agreements with private entities for the construction, lease and operation of up to four public transportation demonstration projects; a key condition of the legislation was that no state or federal funds could be required or used. The SR 91 Express Lanes is the most well-known of these demonstration projects; however, only two of the four projects were completed and are in operation. Similar limited initiatives also occurred in other states in the US from the late 1980s to early 1990s.

By the mid-1990's, some states, such as Virginia, enacted legislation allowing fairly broad levels of private participation particularly in transportation systems development. The Virginia's Public-Private Transportation Act of 1995 recognized that the "public need may not be wholly satisfied by existing ways in which transportation facilities are acquired, constructed or improved," so it authorized private entities to "acquire, construct, improve, maintain, and/or operate one or more transportation facilities" when doing so would "result in the availability of such transportation facilities to the public in a more timely or less costly fashion." In effect, this legislation and the subsequent executive actions and guidelines established the P3 market in Virginia. Several other states followed suit.

By the start of the century's second decade, the landscape for P3s in the US has evolved; it remains heavily focused on the transportation sector with some limited activity in public education facilities. The transportation environment is characterized by selected federal programs to support P3 transactions and enabling legislation in 23 states and 1 territory. At the federal level, the Office of Innovative Program Delivery was created in 2008 within the Federal Highway Administration to serve as a resource for state and local transportation agencies when implementing "innovative strategies to deliver programs and projects." This office has oversight of the US Department of Transportation's Transportation Infrastructure Finance and Investment Act (TIFIA) loan program. Established in 1998, TIFIA provides loans, credit assistance and loan guarantees for surface transportation projects of national and regional significance. By far, TIFIA loans have been the most popular tool; such loans have been used in 8 P3 projects to date with a value of \$14 billion (FHWA 2011). Besides TIFIA, tax-exempt Private Activity Bonds (PABs) have played a role in several P3 transactions. Established in 2006 as part of a federal demonstration program, project sponsors may request authorization to issue PABs for qualified projects.

At the state level, state laws and guidelines vary and overall P3 activity is decidedly scarce - Alabama, Colorado, Florida, Indiana, Texas and Virginia have projects in operation and/or under construction. From state to state, the nature and structure of P3s authorized differs. For instance, some states permit unsolicited proposals while others do not. Further, the procurement process from state to state may vary significantly. Given this diversity, the "normalizing" forces within the P3 environment have come from investors; lending institutions; concessionaires; and financial, legal and technical advisors. The major players in the P3 market are somewhat limited, so frequently potential projects may have the same key organizations involved. Further, recent agreements have often looked to prior agreements for precedents with respect to risk allocation, contractual terms, etc. In short, the US P3 market is rather decentralized and standardization occurs incrementally through diffusion of "successful" practices.

CASE PROJECT: I-595 EXPRESS LANES

Opened in 1989, the I-595 corridor, in southeast Florida in the United States, is a key east-west link connecting several transportation arteries in southeast Florida's transportation network. The corridor was originally designed to accommodate a 20-year projection of traffic demand, with a planned capacity of 120,000 vehicles per day. Strong population growth in the region combined with changes in land use, though, caused the six-lane corridor to experience substantial congestion. Daily traffic rose to 180,000 vehicles in the road's first decade, with traffic studies predicting a demand of 300,000 vehicles per day by 2034 (Turnbell, 2009).

By 2006, FDOT had made significant progress and statutory requirements and scope development; the central facet of the emerging project was the addition of three reversible lanes in the roadway's existing median, thereby adding express lanes to the general-purpose lanes. The corridor would receive additional upgrades and features to include inclusion of a future transit envelope within the corridor (FDOT, 2009a).

From the outset, FDOT had planned to deliver the I-595 improvements through its conventional practices: "pay-as-you-go" funding and separate design and construction packages. This approach, however, would likely require 20-years for completion. Realizing this, FDOT began considering its alternatives for accelerating delivery of the needed improvements. One possibility was to bundle the separate packages and finance the arrangement with a bond; FDOT, however, had never let an individual contract of this magnitude, and the contemplated bond would absorb a significant portion of the department's debt capacity (FDOT, 2009a). FDOT had the necessary legislative authority to solicit proposals for PPP-type arrangements; moreover, the federal climate at the time was favourable. Consequently, the department began to seriously consider PPP delivery as an option. FDOT's consideration of an alternate project delivery method was driven by four main goals (FDOT, 2009b): (1) to provide capacity improvements much sooner than possible under the traditional approach; (2) to maximize corridor throughput, rather than toll revenue, from the express lanes; (3) to minimize required FDOT outlays while transferring cost, performance, and delay risks to a private concessionaire; and (4) to enhance long-term lifecycle cost efficiency and service quality. Throughout 2007, various decisions were made that ultimately shaped this project.

FDOT conducted a Value for Money (VfM) analysis to assist in the selection of a delivery method, by comparing the projected costs of a DBF and a DBFOM scheme in terms of net present value.

The results showed that the base-case DBFOM's VfM over a 35-year period was 4.2% superior to the DBF option, assuming an availability-payment structure in comparing the two scenarios. FDOT considered three possible payment mechanisms: real tolls, shadow tolls and availability payments. Although the real-toll model had been the only approach used in the US to date, FDOT recognized the availability-payment mechanism, which was in place on several projects internationally, could offer distinct advantages for the I-595 project. By retaining control of toll-setting authority, FDOT could structure the toll rates to maximize the throughput of the entire corridor: "We didn't want to have a perverse incentive there to maximize toll revenue at the expense of the toll-free general purpose lanes. So we were looking for a payment structure that would really align both interests: maximize throughput and at the same time bring private innovation," noted Joe Borello, FDOT's project manager for I-595. "The availability payment seemed to be the best match" (Podkul, 2009). Ultimately, FDOT chose to pursue a DBFOM arrangement using an availability payment structure. Under this approach, officials anticipated the improved corridor would be available for use by 2014, almost sixteen years earlier than through the pay-as-you-go method (Bernos and Stutts, 2008).

PROCUREMENT

In October 2007, FDOT initiated the first phase of the PPP procurement, issuing a Request for Qualifications to invite potential bidders to express their willingness and ability to participate in the project. By the closing date a month later, six prospective bidders had submitted Statements of Qualifications.

In an effort to stimulate price competition, FDOT advanced several financing initiatives on its own with the intent to make them available to all proposers. In July 2008, FDOT received approval from the US Department of Transportation (USDOT) of a conditional allocation of \$2 billion in Private Activity Bonds (PABs). Further, FDOT began the process (SEP-15) with USDOT to pre-approve a Transportation Infrastructure Financing Innovation Act (TIFIA) loan that would cover up to 33% of the project's eligible costs. To further aid the shortlisted proposers in developing their final proposals, FDOT provided these four teams a draft concession agreement.

As the date for proposal submission approached in September 2008, several events unfolded. ACS Infrastructure Development assumed 100% responsibility of the equity for its team with Macquarie moving into a financial advisory role; the Express Access Team changed the mix in equity contributions between Babcock and Brown and Bilfinger-Berger. FDOT approved these adjustments. Two days prior to the submission deadline I-595 Development Partners indicated that they would not be submitting a proposal.

The selection of the "best-value bidder" was based on a combination of technical and financial merit, with the specific evaluation process detailed in the RFP. Based on the results, ACS Dragados-Macquarie Partnership was selected as the concessionaire for the I-595 corridor improvements project in October 2008, only 13 months after the project's RFQ was issued.

PROJECT FINANCING

ACS had opted to raise capital by issuing Private Activity Bonds (PABs) instead of borrowing from banks (recall FDOT had obtained approval for allocating nearly \$2 billion in PABs). In late 2008, the bond market was barely functioning due to the national/global economic crisis. This forced ACS to revisit the bank-debt option. Although banks would also have been very hesitant to risk their capital then on a project whose revenue stream involved traffic risk and depended on toll collections, the availability-payment model used proved advantageous. With the concessionaire's revenues backed not by tolls but rather by the state of Florida, I-595 was viewed as a much safer investment.

The \$1.8 billion project was financed jointly by public and private sources, with the anticipated funding sources at financial close as shown in Table X. From public funds, the project received a federal loan of \$603 million at a 3.64% interest rate under the TIFIA program - a very attractive rate, given the instabilities in the external lending market at the time. Under the loan agreement, principal repayments were deferred until 2031, with June 2042 set as the final maturity date (TIFIA, 2009).

The project's private funds were composed of \$207 million in equity from ACS, \$71 million in the form of capitalized interest, and a \$780 million loan with a ten-year maturity from an international consortium of banks.ⁱⁱⁱ

iii. This 12-bank group included Santander, BBVA, Societe Generale, Calyon, Banco Popular Espanol, La Caixa, Caixanova, Caja Madrid, WestLB, National Australia Bank, and Banco de Sabadell (Project Finance 2009).

COMPARATIVE ANALYSIS

Studying three different settings enabled us in analysing the drives for standardized market frameworks and procedures. In all three cases we depict similar economic drivers to launch PPP projects, e.g. the financial crisis in the public sector and increased mobility of capital. Besides, the socio-political drivers are similar. Neo-liberal ideas formed the basis for the emergence of PPP policies in the various countries. The need for transparency, accountability and fair competition stimulates governments to introduce PPP programs and standardized procurement schemes. Moreover, the PPP policy programs assume that consistent or standard approaches will drive value as well as market confidence and stability.

In the three countries analysed we depict a similar evolutionary development. The first cases could be seen as pilot or learning cases; the later cases followed a more standardized approach. Moreover, in the more mature PPP countries as Australia and the Netherlands a more standardized approach to develop a project specific business model is adapted. The outcome of the US case was not the result of a standard approach.

However, the projects analyses revealed that different business models are chosen. The business models can be seen as the result of a negotiation process between the awarding authority or client and the contractor. Although the countries analysed followed a strict and transparent tender procedure the outcome of the negotiation between client and contractor differ strongly for a variety of reasons (see Table 1 below).

The three cases can be seen as an example of type 1 business model. All cases intended to transfer risks from the client to the contractor but the outcome of the tender procedure is type 2 or negotiation model. Risks and revenues are negotiated during the process resulting in different business models as originally intended. In the European case this was even the result of the competitive dialogue, an institutional and standard framework. In the US case the business model, including the pricing and risk model, changed during the course of time.

Table 1: Comparative analysis of the cases

		EUROPE	USA	AUSTRALIA
DRIVERS	Market/Economic	Early projects driven by Budget constraints, recent projects driven by value for money	Budget constraints; timely delivery and state control over tolls	Early projects driven by budget and borrowing constraints, recent projects driven by value for money
	Socio-political	Transparency/fair competition		
(standardised) frameworks		European PPP Policy	Federal financing programs	National PPP policy
		National and European PPP procurement rules	State and federal procurement rules	State, Territory and Federal procurement rules
		National PPP units	Market participants	Market participants, various government models for engagement
Business models		Risk transfer but negotiated	Risk Negotiation	Industry established risk transfer profile with negotiation at the margin

CONCLUSIONS

This paper has considered the issue of standardization of processes for PPP procurement and cross analysed the situation in Europe, Australia and America. Throughout this study it has become apparent that PPPs have become a global market place and that whilst there are still many local norms there are also areas of common practice.

Commonality is typical in commercial approaches taken by governments to strive for Value for Money outcomes and the response received from the market. It is clear that financial institutions generally operate on a global level and seek their best investment options on a balance of risk and reward. Similarly when it comes to infrastructure provision business models, the three continents explored in the case studies all were based on a risk transfer model where risks are transferred to the prime contractor via a competitive

process with parties being clearly accountable for specific activities that undertaken at arm's length. Europe and Australia also had elements of risk negotiation within the procurement process. It would also be fair to say that transparency and fair competition is an underpinning philosophy in all jurisdictions explored.

In all cases, an early motivator for consideration of PPPs was budgetary constraints but as market matured this changed to a focus on obtaining value for money in the procurement process. Standardised policies for procurement and financing are emerging however, specific procurement rules still vary between jurisdictions, and this is even true within specific countries. This paper is still very descriptive. The next step in our research is to determine the extent to which current processes and standardization are actually delivering benefits.

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THE TRANSITION TOWARDS A SUSTAINABLE PPP REGIME

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Policy makers interested in setting up PPP enabling environments often look for best practices that work elsewhere. Many PPP policy programs all over the world have been drawn on the PFI policies in the UK. It is however unlikely that identical PPP regimes will be found across countries due to different economic and cultural contexts. PPP enabling fields have evolved and function in a variety of different ways, despite some amount of similarity.

Our research is aimed at understanding the emergence of PPP policies. By analysing and comparing the PPP developments in various countries we try to depict the barriers and enablers for the expansion of PPPs. We analysed the emergence of the PPP policy programs in 9 different countries. Our framework of analysis is based on three different theories: new public management, new governance and strategic niche management.

The evaluation of the development of PPPs in the various countries revealed that cultural, political and economic circumstances often hamper or speed up the emergence of PPP. PPP Structures and frames have to be aligned with the specific situation of each country. For a successful implementation of a mature PPP policy a major regime shift is needed.

Keywords: new public management, PPP enabling fields, new governance, strategic niche management

INTRODUCTION

Several governments across the world are increasingly embracing the use of Public Private Partnerships (PPPs) to deliver infrastructure services. In part the rationale for the use of PPPs is the need to buffer public finances with investment from the private sector in order to create or refurbish infrastructure assets. In addition, the private sector is expected to bring in efficiencies in service provision, due to the ability of market forces to optimize the cost of these services, as well as the potential for performance based incentives to improve operational efficiencies. These outcomes are based on the assumption that the private sector, whenever possible, is likely to attempt to maximize its profits.

This shift in the procurement philosophies of many governments has been influenced by intellectual movements such as the New Public Management (NPM) philosophy which advocates the use of competition and market-based incentives in public sector governance, and indeed the inclusion of the private sector in the delivery of the government's responsibilities. In other words, NPM advocates a shift away from direct provision and towards a contracting-out strategy on the part of the government. NPM made an appearance in the 1980s, influencing a series of contracting-out and privatization approaches in the 1990s. The UK was one of the early adopters of this approach with its Private Finance Initiative (PFI), while several other countries soon followed suit.

Given its status as one of the early proponents of PPP, several countries have often looked towards the UK for formal and informal guidance on setting up their own PPP programs. Jooste, Levitt and Scott (2011), in their study of the PPP enabling fields in British Columbia, South Africa and Victoria, argue that some amount of institutional convergence can be witnessed in these PPP environments due to the influence of the PPP program in the UK. Policy makers interested in setting up PPP enabling environments often look for templates or best practices that work elsewhere and attempt to 'cut and paste' them in their home environments. For instance, delegations from several countries such as the Netherlands have visited the UK to observe the PPP implementation first-hand. Partnerships UK (PUK) the coordination agency in charge of PPPs in the UK played a proactive role in advising India on its PPP policy. Initial PPP policy drafts, particularly in India have often drawn directly on sections of the policy in the UK and elsewhere.

It is however unlikely that identical PPP fields will be found across countries. Contextual factors and the persistence of existing

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institutions (Zucker, 1977) can be predicted to interact with new PPP regimes to create a field that is unique to a particular country/state. Indeed, the Jooste et al. (2011) study shows how the PPP enabling fields in British Columbia, South Africa and Victoria have evolved and function in a variety of different ways, despite some amount of similarity with regards to form.

Our research is aimed at understanding the emergence of PPP policies. By analyzing and comparing the PPP developments in various countries we try to depict the barriers and enablers for the expansion of PPPs. When one looks at the landscape of PPP projects that have been implemented across the world, some have succeeded, while a large majority has resulted in failures. These failures are often not due to any inherent instability within PPPs, but more often due to the lack of an enabling environment that can foster sustained success with regards to PPPs (e.g. Mahalingam, 2010). Projects often fail due to poor capacity to structure and govern PPPs on the part of the public sector, award procedures that are not transparent, weak or non-existent dispute resolution mechanisms and so on. From a policy maker's perspective, it is important to have a strong, mature and stable enabling field/environment for PPP programs to flourish.

THEORETICAL FRAMEWORK

To enable our understanding of the emergence of PPP programs we build up a framework based on insights of three different theoretical concepts: strategic niche management, new public management and new governance. These concepts are derived from the business management and public administration literature.

NEW PUBLIC MANAGEMENT

The rationale for several of the early PPP projects around the world is based on the New Public Management philosophy (NPM) emerging in the late eighties. The rise of NPM ideas and instruments as a counterpart for traditional, input-oriented management styles, resulted in an increasing interest in output management, evaluations, and separation of policy making and enforcement.

The defining themes of NPM are the achievement of objectives through economy and efficiency and an explicit emphasis on the dominance of individual over collective preferences (Minogue et al., 1998). In effect, the emphasis of NPM is on issues such as contract-based competitive provision, private sector management styles, output control and adaptation of other private sector methods in public administration (Hood, 1995)

In the last two decades these principles have had a far-reaching impact on public project delivery and more specifically on the emergence of PPPs. Size and activities of the public sector have been reduced and many governments have involved the private sector in the funding and delivery of public infrastructure. This introduction is part of a wider belief that one can improve the public sector through the introduction of private sector methods, management, and expertise under the NPM (Dunleavy and Hood, 1994; Broadbent and Laughlin, 1999).

NEW GOVERNANCE

Beyond NPM, a more recent development in the public administration literature has been the emergence of the "New Governance"ⁱⁱ model. As Stoker (1998) suggests, New Governance entails a greater blurring of the boundaries between public and private sectors, requiring "mechanisms which do not rest on recourse to the authority and sanctions of government." Salamon (2002) argues that the new approach is required specifically due to the increased complexity of public problems, the lack of consensus on the proper ends of public action, and the limits in the authority of government to enforce its will on the new network of actors.

In stark contrast to NPM, the New Governance literature views governance as a collaborative process, where the government is viewed as a "conductor" of a network of private and public service providers (Salamon, 2002). To this end, New Governance is less focused on the "internal workings of public organizations" and more on "the networks of actors on which they depend" (Salamon, 2002). In this view the public sector no longer acts to command and control the other actors within the hierarchy, but rather focuses on negotiating and persuading other participants in the network to achieve the optimum output from the increased complexity of

ii. Actually this second movement has not been as effectively coined as the first one. A variety of terms have been used for this second stream of reform, including "governance" (Stoker, 1998), "Intergovernmental Management" (Rhodes, 1996), and more recently "New Public Governance" (Osborne, 2006). I stick with the term introduced by Salamon (2002) as it stresses the two parts of the follow up movement that I believe are significant: (i) "new" indicates the substantial departure from the foundations of NPM, and (ii) "governance" underlines the move of the focus from narrow "management" to wider "governance."

relationships within the network. For this reason New Governance requires a shift in institutional capacity from “management skills” to “enablement skills,” which can be defined as “the skills required to engage partners arrayed horizontally in networks, to bring multiple stakeholders together for a common end in a situation of interdependence” (Salamon, 2002).ⁱⁱⁱ

New Governance is less concerned with outcomes than New Public Management, and more with the process of engaging with private providers while building on a public sector tradition based on procedures and rules (Peters and Pierre, 2002). In this way, the focus is on specific tools and mechanisms that governments can utilize in addressing this new process of governance (Salamon, 1989, 2002).

STRATEGIC NICHE MANAGEMENT

The rationale for the emergence of PPPs is derived from the NPM philosophy, whereas the manifestation of PPP programs has often borrowed from the new governance arrangements for managing public infrastructure and services. The change from traditional project delivery towards PPP requires a major change in project organization and procurement and asks for different capabilities and knowledge from both the government organization as well as the private partners. Moreover, the introduction of a PPP policy program requires some major institutional changes or a regime shift.

To describe the transition pathway towards a mature PPP policy we can adapt the concept of Strategic Niche management (SNM). SNM is a concept from business management literature describing system transition. The ultimate goal of Strategic Niche Management is to develop a transition pathway towards a new sustainable system that constantly improves (Geels, 2010). SNM focuses on stimulating learning about problems, needs and possibilities of a system, building actor networks, alignment of different interests to a goal, and fostering institutional adaptations. SNM tries to make “institutional connections and adaptations” (Kemp et al., 1998: 186).

SNM describes a transition pathway that evolves through three levels: the niche formation process, the socio-technical regime and the socio-technical landscape. (Geels and Schot, 2007). Innovation takes place in niches or experiments. These niches are characterized by much freedom and few regulations. Kemp et al. (1998) argue that policies can be a barrier to the niche formation process due to uncertainty about the future resulting in ineffectual support for the niche formation process. Another barrier that Kemp et al. (1998) describe is the protection of one regime that hinders the development of another regime. For our study this can be taken to mean that some of the early PPP projects could then be seen as experiments or ‘learning’ pilots, and that institutions act as enablers or barriers to the success of these pilots.

Whether these pilots will lead to a movement towards a sustainable and mature policy will then depend, according to SNM, on the socio-technical trajectory or the pattern that emerges from dominant practices in engineering, policy making, research etc. (Raven, 2006). Raven argues that the stability and structuration of regimes is crucial to the development of niche innovations. Basically, the more stable and structured the socio-technical regime, the more difficult it is for a niche to emerge. For the development of PPP this would imply that that traditional market or institutional structures have to change in order to learn from the early PPP projects and develop a mature PPP regime. Moreover, the success of early projects will then have a strong impact on the change process or as David (2001) points out ‘social change is a path-dependent, incremental process’ (David, 2001, cited in Jooste et al., 2011), as later developments build upon and are shaped by earlier developments.

The third level that SNM distinguishes is the sociotechnical landscape. “The sociotechnical landscape forms an exogenous environment beyond the direct influence of niche and regime actors (macro-economics, deep cultural patterns, macro-political developments). Many governments still believe that implementing new schemes and procedures will lead to successful projects but do not realise that changes in the landscape level usually take place slowly (i.e. decades)” (Geels and Schot, 2007: 400). Our assumption is that cultural, political and economic circumstances may hamper or speed up the emergence of PPP. Structures have then to be aligned with the specific situation of each country.

According to SNM, changes are taking place in an interplay between the three different levels. A comparison can be made with

iii. Salamon (2002) suggests these “enablement skills” have three aspects: activation skills, orchestration skills, and modulation skills. Activation skills are needed to set up the networks needed to address each of the different public problems. As third parties are not compelled to participate in any projects, the public agency can address this directly, by marketing the new opportunity and encourage new partners to step forward. This can also be done indirectly through ensuring the terms of the “tool” being used are attractive enough to stimulate sufficient interest. Orchestration skills are taken from the analogy of an orchestra conductor, trying to guide a variety of members to perform in sync and on cue. The focus is one the fact that the conductor (representing the state) cannot play all the instruments himself (do all the work), but rather needs the cooperation of the other players in order to attain the goal. Modulation skills are needed to apply rewards and penalties in order to extract cooperative behavior from the different players in the network. This requires the skillful use of incentives to obtain the optimum outcomes for the ultimate benefit of the general public.

structuration theory as proposed by Giddens (1979). According to this theory, actors, structures and interaction processes mutually enforce each other. New institutional forms will compete with existing institutions corresponding to traditional public procurement, and will attempt to modify the behavior of actors who procure infrastructure services. Over a period of time, actors and institutions evolve in a context-influenced manner towards a state that is unique, path-dependant, and different from the origin. Barley and Tolbert (1997) in their work on institutional change, also argue that institutional arrangements go through a process of encoding, enactment, re-enactment or revision and objectification, followed by further encoding and so on. This revision of institutions can be influenced by exogenous forces (the landscape in terms of SNM), which are situated in a particular context.

FRAMEWORK FOR ANALYSIS

The three theoretical insights are useful to describe the emergence of PPPs in the various countries. Put together, we expect PPP regimes that are influenced or based upon the New Governance philosophy to be more successful than regimes influenced by NPM or other movements. Also, the particular form that a PPP environment will take will depend on the dominant ideology (NPM or New Governance) as well as contextual circumstances that shape the creation of the field, as described by SNM theory.

In order to provide further insights into such dynamics, we first will start with describing the (evolution of the) rationale behind the emergence of PPP regimes in various countries as well as a description of the landscape, e.g. the political and economic changes. The concept of SNM is further used to describe how PPP policies and programs evolve from the dominant practice. We will describe how this pattern emerges and how characteristics of the socio-technical regime influence this development pattern. Based on New Governance we distinguish between two major regime characteristics that enable the development of PPP:

- Legal and formal procedures: procurement schemes, formal tools, and PPP policy programs
- Capacity building: networks, PPP units, training programs, etc.

METHODOLOGY

We conducted a cross-case comparison of the PPP environments in 9 different locations, to ascertain how the enabling fields in these environments compared with each other. To do so, we created case histories of each of these PPP enabling fields. We worked in large part with secondary data that we obtained from archival records. However, we also conducted several interviews in each location with senior players from the public and private sector in order to ascertain their views on the composition of these fields. The number of interviews conducted per location varied, but in total we spoke to over 50 respondents. While collecting data we attempted to understand the current configuration of the PPP enabling field, as well as the path that was taken to arrive at this configuration. Needless to say, the former was comparatively easier to map as compared to the latter.

We coded our case histories individually (Strauss and Corbin, 1998) and attempted to generate a list of codes that are based in the literature and could serve as a useful set of constructs to compare the various cases. Through this process, we selected the following parameters for comparison: (i) The stated rationale for PPPs; (ii) Regulatory supports for PPP programs; (iii) Key actors; (iv) Formal schemes and practices; and (v) Capacity Building Initiatives. Through this analysis, we compared the selected PPP programs on their formal and informal characteristics. A brief description of each case, followed by our results, are presented below.

CASE STUDIES

GUJARAT, INDIA

Gujarat is one of the most developed states in India. Gujarat has many PPP projects underway in various sectors and has a significant thrust towards private sector investment in infrastructure. The state thus looks at PPP's to augment public resources for investments in infrastructure as well as to provide operational efficiencies. All infrastructure projects are to be first investigated for PPP feasibility. Gujarat was the first state in India to create a legal GID Act that provided a framework for private financing, development, construction and operation of infrastructure projects. However, the government enacted PPPs even before the act came into existence. After the creation of the Act, a new organization was created, viz., the Gujarat Infrastructure Development Board (GIDB) to facilitate the setting up of projects. The Act has helped to bring in transparency and facilitate a level playing field for various participants. GIDB has adapted and created Model Concession Agreements (MCA), RFP and RFQ models for projects that are freely available to all bidders. The political and bureaucratic will seems to be a persistent feature in the state of Gujarat from the top political leadership to the line agencies implementing projects. Bureaucrats and elected representatives are willing to take up projects on a PPP basis. The historical

perception of Gujarat being an investor friendly state has helped the cause here. The private sector seems to be more comfortable in doing business in Gujarat. The state also has implemented projects for some time now and the willingness has slowly built up with successes in major sectors such as ports and roads. Regulation of the sector is done at two levels. GIDB acts as a regulatory body during the project conception and award phase. Once the project is completed and operations begin, then sector specific regulatory agencies take over the responsibility of regulating the project. The GID Act lays down the framework for dispute resolution. The state is known for quick turnarounds in terms of clarifications. The state has initiated major training programs to strengthen public sector capacity, and more than 1000 personnel have been trained. However, it is felt that further scope for strengthening capacity exists. Some sectors have built a lot of in-house capacity while others are still in nascent stages of developing such capacities. There is a general acceptance of the public towards private sector participation in many areas of economic activity. Government representatives opine that the people understand the role of the private sector in infrastructure. A number of discussions revealed that that the government agencies are of the opinion that people are indifferent on who provides the service so long as they think the service is being provided at good quality and reasonable price.

KARNATAKA, INDIA

Karnataka is a very active state with regards to the use of PPPs for infrastructure development but has implemented fewer PPPs as compared to Gujarat and is at an earlier stage in its PPP evolution. The Infrastructure Development Department (IDD) in Karnataka is a key cross-sectoral player in Karnataka's PPP environment. One of the key objectives of this department is to promote private investment in infrastructure through public private partnerships (PPPs). Karnataka's Infrastructure Policy (2007) attempts to enable and encourage systemic, programmatic and sustainable implementation of PPPs across sectors. The policy states that some of the benefits that accrue from PPPs will be due to "Savings in costs due to innovative designs, timely project implementation and higher efficiencies in operations; Enhanced quality of services to users due to better managerial practices and efficiencies"^{iv}. The policy seeks to set out a consistent and transparent framework for undertaking PPPs in Karnataka. The policy notes that the PPP Cell hosted within the Infrastructure Development Department will act as the nodal agency that will coordinate and assist line agencies in shaping PPPs in infrastructure. Our interviews indicate that the spread of willingness towards PPPs on the part of policy makers is still relatively minimal within the government of Karnataka. Policy makers within the infrastructure development department show a high willingness to undertake PPPs. Others do not. The Government of Karnataka has laid down a clear process by which projects are to be awarded. The line agency that requires a PPP project first prepares a pre-feasibility report. Consultants are then hired to conduct detailed studies and to modify the structure of the project accordingly. The project documents are then forwarded to the IDD. Once the project is approved, a Single Window Agency can then award all necessary permissions and the IDD will identify the nodal agency and the transactions advisors to bid out the project. The Infrastructure Development Department has also provided several templates or model documents that can be used by line agencies to award projects. Several efforts have also been made to strengthen the competencies of individuals within line departments. 6 training programs and around 10 workshops and seminars have been hosted for government officials by the PPP cell between November 2007 and November 2009. The overall capability to deliver projects however is comparatively weak. There is for instance a concern among private developers that although several PPP opportunities are brought to the table, a large number of them, particularly in the roads sector, are not viable as PPPs. Project monitoring capabilities do not seem to have been well thought out. Not much trust exists between the public and private sectors, and very little awareness of PPPs exists among the broader stakeholder community.

SOUTH AFRICA

Traces of NPM can be seen in the South African case from the mass privatization of public corporations through the early 1990's^v. The PPP program in South Africa dates from about 2000 with the establishment of a PPP unit within the Department of Treasury (although selected projects were undertaken prior to this, notably in the Transportation sector). From its inception, the unit's primary focus has been on project oversight, to ensure both the quality of PPPs and to protect the larger government against imprudent commitments made by sponsoring departments. Responsibility for project delivery however rests with Line Departments, in line with the wider governmental drive for decentralized accountability. The delivery of PPPs is allowed for under the Public Finance Management Act (PFMA established in 1999) and guided by the detailed PPP guidelines that were published in 2004. The guidelines outline a detailed project development and delivery process which includes formal approvals, granted by National Treasury, at four formal approval gates. Although PPPs have generally been promoted in political rhetoric, the actual success of the program has revealed a clear lack of political will to implement projects. In addition, the program has suffered from a distinct lack of capacity - although the PPP unit is very capable, the capacity for PPP implementation in line departments is distinctly lacking (but supported

iv. http://idd.kar.nic.in/docs/infra_policy.pdf Last referred to on 7/1/2011

v. This included the quasi-privatization of the public telecommunication provider (Telkom in 1991), airport operators (ACSA in 1993), and the public transport company (Transnet in 1990). More recently the public electricity provider, Eskom was also turned into a public company in 2002.

by a strong and capable advisor market). As a result, project development and procurements have been very protracted, and only a limited number of projects have been delivered to date. The PPP unit has attempted to address the capacity issues by developing practice notes or “toolkits” that guide PPP implementation in specific sectors, and by initiating training programs for both public and private sectors. PPPs are generally accepted by stakeholders: Although pockets of resistance remain specifically on ideological grounds (notably labour unions), there is a high level of vocal support the private sector. Unfortunately the program suffers from a low level of trust between public and private sectors. On the public side this is generally driven by ideological biases, while on the private side it is the result of the mentioned delays in project development and lack of political will.

VICTORIA, AUSTRALIA

Victoria is arguably one of the leading international PPP programs, with projects having been delivered consistently, across a variety of sectors, since the mid-nineties. PPPs were first delivered under the conservative government of Jeff Kennett, but were formalized and strengthened under the liberal governments of Steve Bracks and John Brumby (see Jooste et al., 2011 for a full discussion on the history of the Victorian PPP programme). This formalization included the establishment of Partnerships Victoria (PV, the PPP unit within the Department of Treasury and Finance) and the comprehensive PV policy and guidelines. More recently these guidelines have been subsumed into the Australian National PPP Policy and Guidelines. The main rationale for PPPs is that they provided greater Value for Money in government procurement, and they are pursued only if this value is anticipated. Projects are developed in a detailed project development and procurement process which include six formal approval gates. This process is for the most part overseen by the PPP unit, with the Line Agencies doing the actual project development work. The business case development phase is however overseen by the commercial advisory services team (another team within Treasury). Approvals are granted by a Treasury sub-committee. The political willingness for implementing PPPs in Victoria has remained high through the different political administrations mentioned above. Most recently their implementation has been strongly supported by John Brumby. The program has developed a very high capacity to implement PPPs. This capacity has been built within both Partnerships Victoria and in line departments. It should be noted that the sequential delivery of a number of projects in specific sectors (notably in the Health sector) has allowed delivery teams within line departments the opportunity of building deep project development capacity. Our interviews further revealed a generally high level of acceptance of PPPs by stakeholders, although selected opponents remain (mostly on ideological grounds). The delivery of PPPs is generally characterized by a high level of trust between public and private sectors. This has specifically been strengthened by the continued successful delivery of PPPs, even during the recent Global Financial Crisis.

BRITISH COLUMBIA (B.C), CANADA

In contrast to the case of Victoria, the delivery of PPPs in the Canadian state of British Columbia has only been under a conservative government, that of Gordon Campbell. As we’ve shown elsewhere (Ibid) the rapid growth of the program has been directly due strong political will, as reflected in the central delivery role taken by the PPP Unit, Partnerships BC (PBC), which is structured as a fully publicly owned incorporated company. PPPs are delivered under the Capital Asset Management Framework (CAMF, 2002) which includes the “Capital standard” (introduced in 2006). Under this stipulation all projects over \$50 million capital value are required to be done as PPPs unless there is a compelling reason to do otherwise. The formal PPP process is not explicitly published, but follows roughly five steps. As mentioned, PBC has a very strong role in carrying out project development, but final approval is made by the Treasury Board (a committee of the Cabinet). The main rationale for PPPs has evolved slightly over time, generally related to issues of efficiency, but more recently also entailing a focus on schedule and budget certainty. The program has a high capacity to deliver PPPs. The centralized nature of project delivery means that PBC has a very high level of capacity, with additional capacity in a relatively limited number of line departments. Our interviews however revealed that the program suffers from a distinct polarization of the issue of PPPs along political lines, with strong opposition from labor and significant criticism at the local government level. Regardless of this political opposition, there is a high level of trust between the public and private sectors, possibly due to the strong pipeline of projects delivered to date.

UNITED KINGDOM (U.K)

Despite the relatively young history of PFI, the UK PPP concept, many governments and private parties in the Western World see the UK as the frontrunner in concessions. Although PPP-type projects were launched elsewhere prior to 1992, often as one-off projects, the Private Finance Initiative (or PFI) is widely regarded as the birth-date for systemic programs aimed at encouraging PPPs (Jooste, 2011). Since the introduction of PFI schemes in the early 90s, PFI practice has been well established. An important basis for the development of PPP concessions was formed by the Treasury’s rules of the 1980s. These rules defined that privately financed projects could only proceed if the PPP contract offered better value for money than a hypothetical public sector “comparator”. The rationale for PPP consisted of two major elements: a) the genuine transfer of risk to the private sector; b) the generation of value for money in the use of public resources. Until today these two rationales are still the major selling points for PPP.

Before 1997, only a few concession projects were launched. But the year 1997 indicated an important turning point. In 1997 the Paymaster General announced the end to universal testing - the rule that all capital projects had to be tested for private finance potential. In that year, a Treasury Taskforce was established helping departments when negotiating with the private sector and with defining the output specifications in order to get value for money. The Taskforce furthermore published a number of guidance documents and statements on Private Finance arrangements. This was followed by Partnerships UK in 2000, a joint venture between private and public sector. Partnerships UK is a limited company which has to be funded by project fees on a non for profit basis. The Partnerships UK provides expertise and advice for each PFI project and gives financial support.

The establishment of the Treasury Taskforce (later on taken over by the Office of Government Commerce), Partnerships UK, and the local counterpart 4Ps all indicate the importance of knowledge transfer and professionalization of both the public and private sector is according to the UK government.

THE NETHERLANDS

Since the late eighties of the previous decades, PPPO received much attention in the political debate but the major impulse came in 1998. The second liberal-social democratic Administration led by Kok was confronted with insufficient public funds to meet the enormous investments needed to realize the transport infrastructure. As it in Victoria and the United Kingdom, the rationale for PPPs is value for money but we do depict a major difference between the early and recent policy rationale. Financial motives ('money') were the driver of the first wave of project in contrast to quality improvements ('value') for the second wave of projects. This change in motives is also reflected in the increasing role of the Line departments in the procurement process. The decision to pursue a PPP project is no longer the sole responsibility of the Ministry of Finance (the PPP unit). Today, the responsibility for a concession project is a joint responsibility of the specific Ministry, in the case of infrastructure the Ministry of Transport or the Highways Agency.

Comparable to the UK and Victoria, the Dutch government uses the Public-Sector Comparator to compare the net present value of the concessionaire's proposal with the traditional cost of design, construction, maintenance, and operation in the traditional method. This instrument forms a crucial role in the decision-making.

Another similarity with the UK is the focus on knowledge dissemination. Comparable to the Partnerships UK a knowledge centre PPP was established in order to initiate and stimulate partnerships. The knowledge centre advises government agencies and provides private organizations with general information. In the last decades, knowledge centers were established within the line departments illustrating the shift from the focus on saving public money towards a focus on service quality. The PPP policy is broadly accepted in society and the level of trust between the private and public sector has grown.

PORTUGAL

Today, Portugal relies more on PPP to meet public investment than most of the other European countries. The Portuguese history of infrastructure concessions started around the turn of the century but the number of projects boomed in recent years. In 1991 Portugal's roadway network included only 431 km of concessions. In 2009 2500 km or ninety-four per cent of the 2660 km motorways in Portugal was under a PPP arrangement (US Department of Transportation, 2009)

An important institutional driver was the establishment of a central PPP government unit in 2003 - as part of Parpublica, the unit of the Ministry of Finance that is responsible for privatization operations and outsourcing activities - has been installed. With the establishment of this PPP unit, procedures became more streamlined.

Another major shift in legislation took place in 2007. "Estradas de Portugal-EP" was converted into a state-owned commercial law company which means that Portugal is now capable of becoming insolvent and this fact, together with uncertainties over its sources of revenue has led a number of financial institutions to abstain from lending to new road PPPs.

The rationales for Portugal to launch PPPs are: (1) Portugal's entry into the European Union, (2) the need to strengthen its trading ability, and (3) to control the budget because Portugal exceeded the three per cent deficit rule by the European Union. Concession arrangements gave Portugal an opportunity to reduce its budgetary deficits and consequently to attain the criteria to enter the monetary union. Recently, however, the motives have changed. Today, concession proposals are evaluated on efficiency. Besides, one important change in recent years has been that in the past the line minister was primarily responsible for the decision to pursue a PPP, while recently the Minister of Finance has been more involved, as the establishment of the PPP unit as part of Parpublica of the Ministry of Finance, indicates.

AUSTRIA

Despite the many political and economic similarities with other European countries Austria does not have a mature PPP policy. The PPP Ostregion Autobahn project in Austria (A5) was the first road concession project and concerns the planning, construction, financing and operation of the newly to be constructed road section of part of the A5 and the Vienna Northern Perimeter Expressway. The total project comprises 51 km motorway including a tunnel of 2 km. The construction costs are estimated at € 800 million. Several reasons were given by the Awarding Authority (Asfinag) why this project was suitable for a concession contract: a) the project was complex; b) it has an appropriate scale which ensures competition and bankability; c) costs and risks are clear and d) it has an optimal size for operation.

This project was primarily launched to gain know-how about concession contracts. Despite the evaluations this project no further concession contracts were launched. The unique situation of the Austrian concession structure – Asfinag, the promotor of this project is a 100% public owned limited company and generates its returns from tolls and does not receive any federal grant – is not supportive for concession contracts.

CROSS-CASE ANALYSIS

Table 1 below shows a comparison between the formal attributes of the PPP enabling fields. As the table indicates, there are similarities in procurement schemes, tender procedures, and contractual frames. We do however find a great variety in the acceptance of PPP, motives and ideology, capacity, development rate, and the role of institutions. These differences have translated into varying outcomes of PPP programs. In the UK, for instance, the emergence of PPP underwent an exponential growth after it was introduced by the UK Administration in 1991. In Austria on the other hand, the PPP development never transcended the pilot phase. We also observed major differences in the transition pathway towards a new technical (PPP) regime and the role of niche experiments. Each case follows a different pathway towards a mature PPP program. Some states and countries (UK and Victoria) went through a few cycles, others showed a more incremental approach (the Netherlands) or even a linear pattern (British Columbia) starting with pilot cases and slowly building up deal flow and a systemic PPP program. In some cases in India we actually see projects being executed long before the policy framework or even full legislation is in place. The policies and frameworks then evolve in response to failures in these “pilots” as in the case of South Africa (see Jooste et al, 2011). This analysis validates our existing stance that although PPP programs attempt to mimic each other, it is virtually impossible to transplant PPPs across regions. This translates into a change in policy thinking and governments must therefore find ways to tailor PPPs to their local environments.

In other words, structures are similar across arenas but cognitive and normative logics differ. PPPs not only require the introduction of new rules and procedures but also a fundamental regime shift. This requires engendering different competences, capacities and relationships between key stakeholders. The introduction of new structures often leads to new interaction patterns and relations between stakeholders. However, governments must realize that trust development and interaction patterns are hard to transform. These are often deeply rooted in historical patterns and cultural traditions. More attention should be paid at these transition processes which require a clear understanding of each country’s institutional contexts. We next propose a new approach for governments to support the development of a PPP policy program by applying the concept of Strategic Niche Management (SNM) which provides guidelines and lessons for the transition of public policy programs in differing environments. SNM helps us to understand how different strategic niches and strategies emerge in different contexts. SNM helps us to design a transition pathway for governments and is discussed in the next section.

Table 1: PPP Enabling Fields in 9 Regions

	GUJARAT	KARNATAKA	S.AFRICA	VICTORIA	B.C	UK	NETHERLANDS	PORTUGAL	AUSTRIA
RATIONALE	Efficiency	Efficiency	Efficiency, Cost effectiveness, Preferred Procurement	Value for Money, but shift towards budget and cost certainty	Value for money, but shift towards budget and cost certainty	Value for Money but focus on Money	Value for Money Shift towards more focus on money	Budget constraints EU	Learning
REGULATIVE SUPPORTS	GID Act	Policy	PFMA, MFMA	Australian National PPP Policy and Guidelines	CAMF, and the “Capital Standard”	Policy	Policy	Policy	Pilot
KEY GOVT ACTORS	GIDB	Infrastructure Dept, PPP cell, KUIDFC	PPP Unit, National Treasury	Partnerships Victoria, Infrastructure Australia, Treasurer (and later Premier) John Brumby	PBC, Premier Gordon Campbell	Partnerships UK ; 4Ps; Treasury	PPP Unit Line Departments	Parpublica	Asfinag
SCHEMES	Model Concession Agreement, 2 stage procurement process	Model concession agreements, 2 stage procurement process, tender act	Four approval steps in project development, 2 stage procurement	Six approval steps in project development, 2 stage procurement	Five approval steps in project development, 2 stage procurement	2 stage procurement process	2 stage procurement process	2 stage procurement process	Not relevant
CAPACITY BUILDING INITIATIVES	Training programs	Training programs	Training, and publication of guidance notes	Initiatives with local universities, cross-project knowledge sharing, and updated guidelines	Workshops, information sessions, best practice documents, and in-house training in PBC	Information sessions, guidelines, Unit supporting procurement	Information session, workshops, open debates		

CONCLUSIONS

The first PPP projects could be characterised as niches or pilots. Niches can be characterized by much freedom and few regulations. This was also the case with the first PPP projects. The rationale behind the first projects was derived from the NPM and later on the NG philosophy in public administration and the increasing budget constraints in most countries.

In most countries, the early PPP projects were not followed by a continuous stream of projects. This is in line with Kemp et al. (1998) who argue that policies can be a barrier to the niche formation process due to uncertainty about the future resulting in ineffectual support for the niche formation process. The emergence of PPP policies was often hampered by the uncertainty about future support or the expected lack of a flow of projects. .

The cases revealed that the emergence of PPP requires a shift of the socio-technical regime. Dominant practices have to be changed and to enable this change regulative supports for PPP programs and new formal (procurement) schemes enabling the implementation were needed. Most countries introduced a PPP Unit to stimulate knowledge diffusion and to give support to line departments. These mechanisms enabled the government to address this new type of governance as PPP is. The early PPP policy programs were primarily concerned with the outcomes and emphasis on efficiency. Little attention was paid to supportive mechanisms enabling the engagement of private partners. In the second PPP policy wave the role of PPP Policy framework and capacity building initiatives as training programs and workshops was acknowledged. Hence, in the late nineties many governments introduced training programs and information sessions to develop capacity building.

Raven (2006) argues that the stability and structuration of regimes is crucial to the development of niche innovations. Basically, the more stable and structured the socio-technical regime, the more difficult it is for a niche to emerge. The fast emergence of PPP in the UK could only happen because the socio-technical regime changed drastically in the early nineties. Similar arguments can be made for the emergence of PPPs in Victoria and British Columbia. In other countries such as the Netherlands the development went slowly due to the more stable technical regime. Once the Dutch government made clear statement about increasing the involvement of the market the number of PPPs increased drastically. Governments have to realise the necessity of changing the socio-technical to a regime that is supportive to PPP: especially relying more on the market and building up trust. However, changing a social structure or regime is difficult. Most social change is a path-dependent, incremental process (David, 2001, cited in Jooste et al., 2011), as later developments build upon and are shaped by earlier developments.

Many governments still believe that implementing new schemes and procedures will lead to successful projects but do not realise that changes in the landscape level usually take place slowly (i.e. decades)” (Geels and Schot, 2007: 400). The description of the development of PPPs in the various countries revealed that cultural, political and economic circumstances may hamper or speed up the emergence of PPP. Structures have to be aligned with the specific situation of each country.

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INNOVATIVE SOLUTIONS IN DBFMO PROJECTS

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Integrated building contracts are assumed to result in lower costs, better performance and more innovative solutions as a result of a collaborative environment, output specifications and long-time commitment. Life cycle costs can be reduced when investment and exploitation costs are brought in line with one another. The Dutch government some years ago gave the green light for the Public Private Partnership (PPP) model to be applied in the construction and renovation of government real estate. This means that market parties can become involved in renovation and new-build projects, but also in maintenance, facility services, operation and financing. DBFMO (Design, Build, Finance, Maintain & Operate) is the core of public-private partnerships. The DBFMO model covers the entire process, from the production of a design to a fully operational building with all the associated services. A study was focused on finding empirical evidence for product innovations effecting maintenance costs and energy-use in DBFMO office projects compared to traditional delivered office projects. It is assumed that in DBFMO contracts innovations effecting maintenance and energy-use are of direct benefit for the contractor and thus the most easy to find. Two DBFMO office projects were compared with five traditionally delivered office projects. Applied research methods were explorative interviews with clients and contractors about DBFMO contracting, case-studies focusing on maintenance costs and energy-use calculations and expert interviews with contracting parties. Within the DBFMO projects four design choices could be considered to be product innovations. Besides some incremental maintenance process innovations were found. The innovations found can be considered as the successful transfer of knowledge between consortium members that would have worked separately in case of a traditional build project.

Keywords: DBFMO, innovation, maintenance costs, energy-use, performance specifications

INTRODUCTION

The Dutch government wants to enforce DBFM(O) contracting to realize the construction, maintenance and operation of properties, including their real estate on which tis research is focussing, like central government offices and penitentiaries. The Governmental Buildings Agency controls the tendering of a PPP contract. The tendering procedure involves a competitive dialogue and award criteria based upon the economically most advantageous offer (EMAT). The concession period is 20 or 25 years.

Evaluations by the Ministry of Finance show that, compared to traditional projects, DBFM(O) projects result in extra value between 10 and 15% and are delivered on time and within the budget (Ministry of Finance 2011). DBFMO projects for schools hardly exist in the Netherlands. The main reason is that the budget for construction and the budget for maintenance and operation are managed by separate institutions. Also there are no DBFMO projects for care buildings, mainly due by the lack of clarity of given the complexities financing the care system.

The DBFMO model covers the entire process, from the production of a design to a fully operational building with all the associated services. An integrated approach is the keyword here. The idea behind this approach is that better and most likely cheaper buildings can be developed when the consequences of a particular design are thoroughly examined in the early stages of the development process. Life cycle costs can be reduced when investment and exploitation costs are brought in line with one another. The Ministry of Finance advocates for future projects gave a scope for operational services as great as possible, to maximize the benefits of DBFMO. Shared Service Organisations of the Dutch Government will control the contracts during exploitation (Ministry of Finance 2011).

Several benefits are often assumed, with regard to these project types as listed by amongst others Blayse and Manley (2004), Akintoye et al. (2005) and Leiringer (2006): lower project cost, shorter construction time, competitive advantage, higher overall quality of the end product and benefits accruing from letting the private sector be innovative in its solutions.

In the Netherlands the emphasis of PPP and DBFMO contracts is on better performance and lower costs. This compared to the UK

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where in PPP/PFI contracts private finance is the core, because of the enormous quality backlog in public buildings and infrastructure and the lack of public finance. Edkins et al. (2011) studied the use of the PFI as a procurement method for capital school projects. Their results include that total facility services costs in PFI schools are higher (though not significantly) in six of nine of the elapsed years following renewal. In the Australian PPP context the designers or architects within a PPP project are regarded as 'subcontractors' to others and may be treated simply as a provider of services rather than generators of innovative solutions Raisbeck (2008). In the Dutch DBFMO model output specifications, an architectural ambition document, the EMAT criteria and the value per criterion, are aimed to steer architectural quality and provide room for innovations. During a competitive dialogue period before the Bid and Final Offer, the architect can speak a few times with the users of the building. Innovations have to prove themselves in lower costs or higher performance. Architectural quality is almost not quantifiable except by expert judgement (Fokkema 2009; Prins 2009; Volker 2010).

CONDITIONS FOR AN INNOVATIVE ENVIRONMENT

The research is focused on finding empirical evidence for the assumption that DBFMO projects stimulate product innovations effecting maintenance costs and energy-use. The supposed conditions to achieve innovations within DBFMO projects compared to traditional projects are the integration of activities and therefore a more collaborative environment, the use of output specifications, the possibility of optimizing costs and performance through whole life commitments and risk transfer from public to private parties. These issues will be further discussed, because they appear not to be as obvious as they might look at first sight. The first argument is about the collaborative environment. A consortium is responsible for the delivery of several activities over a relatively long time period (20-30 years). Therefore a common view is that this could lead to better collaborative working between the different disciplines involved. Sogol (2010) found that even in case of large developing contracting firms, there appears to be a lot of inefficiencies between the different departments in terms of collaboration and the strive to optimize project outcomes. In practice often a special purpose vehicle is established which is concerned with the bidding. Even within DBFMO projects there might be struggles between the construction department and the departments responsible for operations like maintenance and facilities management. The different activities are often subcontracted separately by the special purpose vehicle, resulting in fragmented interests and non-collaborative working, as is the case in traditional projects. Leiringer et al. (2009) present a case study of a large construction firm in the UK that works with PPP projects. The case study clearly illustrates how managers responsible for service operations struggle in having any real impact on key design and construction decisions.

Whereas traditional project delivery approaches focus on a detailed description of buildings, within DBFMO projects performance specifications are being used. A provider can therefore choose solutions that are able to deliver the performance in the most efficient way (e.g. Sexton and Barrett, 2005). In a publication of the Dutch Regieraad Bouw (2005) it is claimed that formulating the demand in performance specifications is an important stimulant for letting a provider be innovative in choosing a solution. The output specifications and the award criteria, especially the weighted value per criterion, steer the architectural quality and the room for innovations (Fokkema 2009). However, Leiringer (2006) suggests that due to the performance approach a provider will likely choose a solution that fits best to the existing knowledge and available techniques within their organization, so reducing project risk, instead of choosing new or unique innovative solutions.

The focus within DBFMO projects is on providing accommodation services for a given period and less on the physical building as a product delivered at a certain moment in time. Due to the longer obligations it can be suggested that a DBFMO provider focuses on life cycle costing by optimizing initial investments and operational costs. Nevertheless studies like those of Leiringer et al. (2009) and Sogol (2010) claim in their case studies that there is little contact between the maintenance and construction department and therefore the possibility to influence the design is minimal: "Such decisions remain dominated by an institutionalized mindset that prioritizes traditional cost cutting over any consideration of through-life operational value" (Leiringer et al. 2009).

Sogol (2010) found in a case study executed at a large developing contractor, that the traditional differences in organisational culture, even in case of integrated projects largely is hindering good collaboration between the different departments involved. The last argument for an innovative environment of DBFMO projects is about the risk transfer from the public side to private parties. The PPP approach is most effective if the party that is best able to control a particular risk also bears the risk in question. This can be beneficial to a public client because the chances for budget overruns are smaller (HM Treasury 1999). Whether a larger risk transfer to private parties will lead to innovative solutions is questionable (Leiringer 2006). Especially the development and application of innovative solutions entails additional risk, therefore the doubt in the previous mentioned reasoning seems logical.

It might be concluded that there are different opinions and types of reasoning whether or not a DBFMO provider will be innovative in its solutions to deliver the accommodation services asked for. However evidence for this of researched building projects is very scarce. The main research question is: Do DBFMO office projects contain product innovations that effect maintenance costs and energy-use? It is assumed that in DBFMO contracts innovations on these aspects are of direct benefit for contracting parties and thus the most easy to detect.

RESEARCH METHODOLOGY

In order to get a better understanding of innovations from a maintenance and energy-use point of view, and to define these, explorative interviews were held with staff members of a large construction firm, an architect's firm and a client, all involved in DBFMO projects. In total 11 people were asked the following questions: (1) How to define innovations effecting maintenance costs and energy-use within a context of DBFMO projects? and (2) how to find and to measure these innovations?

A qualitative case study method was adopted as part of an engagement with a construction company, which has executed a large number of PPP and DBFMO projects in the Netherlands. This company is a leading DBFMO contractor at the Dutch market and has provided the data that was needed to conduct this research. The case study research held two DBFMO projects each consisting of two components. First the 'better performance' on maintenance costs and energy-use had to be defined. Second a maintenance and energy cost analysis was used to get an idea where possible innovations on components or their aggregations could be found. Indications resulting out this cost analysis of a better performance by lower maintenance costs of elements or lower energy use were discussed, in terms of their possible innovation behind, by means of expert interviews. For this seven interviews were held with staff members from different departments and advisors involved in the design phase of the DBFMO projects. Per better performing, in terms of cost, element on maintenance costs or on energy consumption the interviewees were asked the following questions: (1) Can the better performance be understood by other design solutions or the application of other products?; (2) Is the motivation for other solutions and products direct or indirect?; in other words do they focus on reducing maintenance costs and/or energy-use, or is it a secondary advantage?; (3) Can the applied solution be seen as innovative as defined in this research? and (4) Is the solution project specific or not project specific?

INNOVATION

The concept of innovation and its definition is frequently debated. Construction innovation literature emphasise often technical product innovations to compete in the market (e.g. Blayse and Manley 2004). Garcia and Calatone (2002) define technological innovation as an iterative process initiated by a the perception of a new market and/or a new service opportunity for a technology based intervention which leads to development, production and marketing tasks striving for the commercial success of the invention. Slaughter (1998) defines innovation as the actual use of a nontrivial change and improvement in a process, product, or system that is novel to the institution developing the change. All definitions mean that innovations stand for more than knowledge development; they should be implemented. Second the innovation is the whole route from knowledge development till market introduction. Finally, products, processes and/or organisational structures are new for the own organisation. In case of determining innovations in DBFMO projects effecting maintenance and energy-use, these definitions should be made operational.

DFBMO CONTEXT

When a DBFMO contract is applied, the client is demanding an accommodation service instead of a building delivered as a product at a certain moment in time. Within a predetermined performance specification a client buys usable space or functionality for a certain period. This is in sharp contrast with a traditional contract where an amount of square meter floor area is bought as a building. A provider of a DBFMO project delivers the accommodation services through a system consisting of process parts and physical parts. The process parts consist of different activities that have to be performed during the contract period: designing, building, maintaining and operating the physical parts. Based on decomposition models for design decision making, a building is decomposed in physical parts in terms of single components, component compositions and ensembles. Components and their aggregations must have meaning in terms of usage, construction and/or their life cycle, and as such are meaningful for design decisions as well as maintenance and operations (Prins 1992).

The process parts were not investigated within this research, because it is not clear how the process parts influence exactly the design decisions and whether they stimulate innovations. So it is assumed that all the supposed advantages of the integrated process parts have to work out on the physical parts of the structure (components, component compositions and ensembles).

INNOVATIONS EFFECTING MAINTENANCE AND ENERGY-USE

The explorative interviews show that innovations by almost all respondents (10) are seen as a result of the systematic application of life cycle costing. The application of products and solutions that in a traditional setting are considered to be too expensive, can be seen as innovative. The majority of the interviewees answered on the second question that innovations effecting maintenance costs and energy-use can be found in the design process in terms of low life cycle cost solutions and in the physical parts of the structure due to the uniqueness of product choices and materials.

Based on the outcomes of the explorative initial study, innovations effecting maintenance costs and energy-use are defined as: A better performance compared to similar traditional build projects by developing and applying new and improved products and solutions in the physical parts of the building (components, component compositions and/or ensemble level), which are integrated into a structure and delivering accommodation services at an agreed level for a predetermined period.

Innovation according to this definition is not a goal on itself, but has to contribute value to the accommodation services. Innovation is measured via the so-called object method, meaning that innovations themselves are investigated and not the company that creates the innovations (Archibugi and Sirilli 2001). The possible innovations are classified into project specific and project non-specific innovations, due to the ‘relative’ unique nature of buildings.

CASE STUDIES

Two DBFMO projects from a large contractor in the Netherlands were investigated. Long-term maintenance budgets and expected energy consumption were compared with those of five traditional delivered projects to identify innovations. The traditional projects were selected based on criteria for their properties in terms of comparability. As no standardized cost databases are available for this the data of the traditional projects was received from maintenance consulting firms and facility management organizations involved in the projects analysed. In Table 1 the different characteristics of the cases and projects studied as well as the methods used for data retrieval are shown.

MAINTENANCE COSTS DATA-ANALYSIS

Comparing buildings on maintenance costs is difficult due to the unique nature of buildings as a whole. “Every building is affected by its location, height, composition, energy consumption and a plethora of other differentiation points – all of which make each building unique” (Hughes et al. 2004). When a building is decomposed to smaller parts e.g. elements, the uniqueness is more relative. Maintenance costs are generally found in practice, related to a classification in elements. The maintenance costs were not re-classified and aggregated to components, component compositions and ensembles. Besides practical reasons for not doing this, it was not a necessity because the cost analysis is used to get an idea where possible innovations on components or their aggregations could be found. Also according to the applied definition it might be assumed that components and their aggregations are project specific and cannot easily be compared.

Table 1: Characteristics DBFMO cases and traditional projects

	Case DBFMO 1	Case DBFMO 2	Trad 1	Trad 2	Trad 3	Trad 4	Trad 5
Location	The Hague	Groningen	-	-	-	Middelburg	Apeldoorn
Function	Office	Office	Office	Office	Office	Office	Office
Building type	Low-rise	High-Rise	Low-rise	Low-rise	High-rise	Low-rise	Low-rise
Project size (GFA)	68,000	48,000	12,500	25,000	50,000	12,000	14,000
Floors	5	24	5	5	23	5	5
Maintenance quality (1)	3	3	3	3	3	-	-
Consideration period (years)	25	20	40	25	30	-	-
Operating time (hours per day)	14	13	N/A	N/A	N/A	N/A	N/A

(1) Minimum condition mark on a six-point condition scale

COMPARATIVE DATA

According to Daly et al. (2003) a number of factors have a strong influence on the maintenance costs. To compare different buildings on maintenance costs, the factors shown in Table 2 were identified. These factors were used, given the characteristics of the two DBFMO cases, as for the selection of traditional build projects getting comparative data and to correct the data by differences in building characteristics.

Table 2: Comparative data DBFMO cases and traditional projects

Function	Office	
Year of construction	After 2001	
Project size	Over 10,000 m2	
Floors		Indicative
Maintenance quality	Equal or higher if DBFMO	
Gross floor area	Equal	Corrections per m2 GFA
Consideration period	Over 20	
Operating time	Equal	Corrections
Price level	Equal	Corrections using building costs index

A long-term maintenance plan is in essence an activity planning where dissimilar sequences of costs are modelled for a certain period. In the different maintenance plans different types of maintenance are identified. In the analysis the following types of technical maintenance were taken into account: preventive maintenance, corrective maintenance and replacements. Besides the nominal value, the net present value as calculated, was used to compare different sequences of costs. The net present value method seems more suitable because identical project lives are taken into account in the comparison. The maintenance costs are calculated per element in €/m2 gross floor area (GFA).

Within maintenance to the building structure the costs for floor finishing and ceiling finishing are good comparable being almost equal to the gross floor area of a building. Elements like façade finishing and roof finishing can result into disturbing outcomes due to different shape factors. For the building services the following elements seem to be comparable: heat generation, cold generation, ventilation and lighting.

Energy-use data-analysis

The energy consumption of a building is also related to a number of factors, which are mostly unique per building. In the research the energy performance is expressed in consumption per gross floor area instead of costs. Energy costs are affected by the oil price which can give a disturbing effect in a comparison. According to a publication of SenterNovem (2007) the following factors can be distinguished that influence the energy consumptions in buildings: function, project size, year of construction and the operating time. With regard to energy consumption the use of gas and electricity was taken into account and are diverted into the unit Mega Joules (MJ) per year/m2 GFA.

FINDINGS

MAINTENANCE COSTS PROJECTS

For case one only the structural maintenance costs could be analysed because the cost data for the building services maintenance were not available. The values shown in the Figure 1,2, and 3 are nominal values because the net present values showed a similar trend as the nominal values. The absolute values as shown in the graphs are fictitious, the relative differences are real. The graphs show significant lower cost levels for the DBFMO projects.

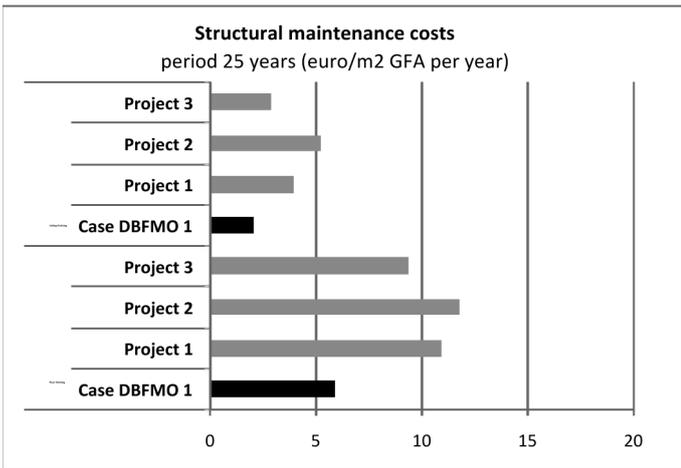


Figure 1: Maintenance costs floor finishing and ceiling finishing DBFMO project 1

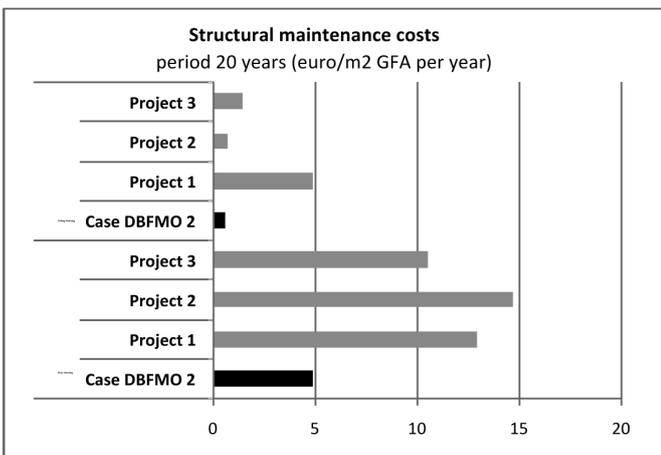


Figure 2: Maintenance costs floor finishing and ceiling finishing DBFMO project 2

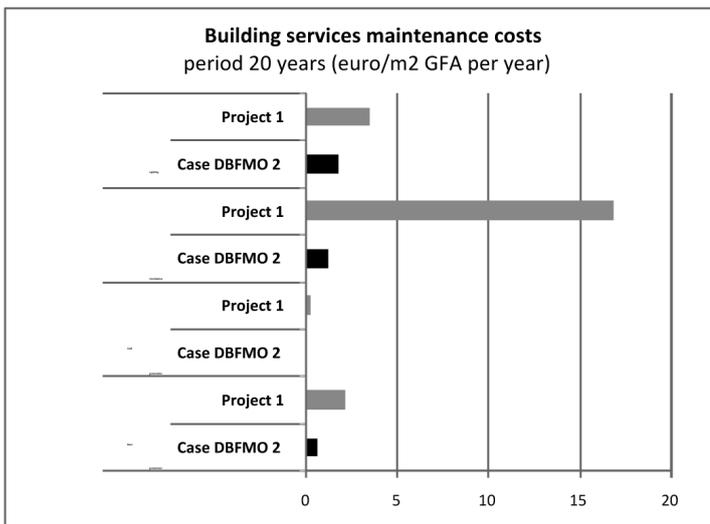


Figure 3: Maintenance costs heat generation, cold generation, ventilation and lighting DBFMO project 2

ENERGY-USE PROJECTS

It was not possible to compare the energy consumption at element level because the data was only available per energy carrier (gas and electricity). Figure 4 shows that the DBFMO projects are performing better than the traditional projects even without corrections for longer opening hours for the DBFMO cases.

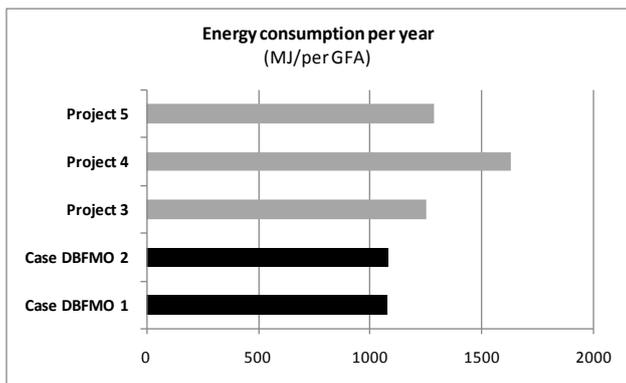


Figure 4: Energy-use projects

Expert interviews

By means interviews with experts, involved in the projects, the results of the cost data and energy use analysis' were discussed, including the researchers ideas on innovations found within the DBFMO projects according to the constituted definition.

INNOVATIONS ON MAINTENANCE COSTS

Floor finishing

Carpet is the dominant floor finishing in the two DBFMO projects. In case one a carpet tile is applied. During the design phase a specific carpet tile was developed by the architect, contractor and supplier, resulting in seven different tiles differing in colour, weaving and pattern. The tiles are randomly produced, packed and mounted in the structure. Because of these special developed carpet tiles it is less visible when a single tile has to be replaced. The new tile does not stand out as a new tile in a 'carpet' with the old tiles. Therefore fewer replacements are expected to take place during the operation period. This solution can be seen as an innovation on the ensemble level because this solution improved the use of a special designed and developed carpet tile. The carpet tile itself is not an innovation; the pattern that is developed that only works when seven or more tiles are placed together, can be seen as an innovation.

Ceiling finishing

The solution for the ceiling as applied in the DBFMO projects has an indirect link with maintenance. The choice for a climate sealing in case 1 has been based on energetic considerations. The advantage for the maintenance can be considered as indirect. The ceiling finishing for case 2 is also based on energetic considerations and therefore it is not an innovation on maintenance.

Heat generation/cold generation

In case 2 a heat pump is applied to warm and cool the structure. Out of the analysis a better performance can be discerned. However the interviewees refute this outcome. The heat pump is according to a number of interviewees more expensive on maintenance than a traditional heat system but has energetic advantages. In contrast with the data analysis the interviewees cannot see any advantages with regard to maintenance. Therefore the heat pump is not considered to be an innovation on maintenance within the context of this research.

Ventilation

The choice for the ventilation concept of case 2 is driven by a maintenance point of view. The fresh air is blown into the room via a raised floor and the exhaust air is collected in the room and exhausted via a central duct. This solution entails no ventilation ducts within the office spaces. Less ventilation ducts means less maintenance. The contractor and advisors developed this solution in the design phase of the project. Therefore this solution can be seen as an innovation on maintenance.

Lighting

Due to lower lighting level demand less lighting elements are installed in case 2, which are compensated with individual desk lights. Interviewees could not explain the better performance that came out of the maintenance costs analysis. It can be argued that less base lighting result in less maintenance. However, interviewees argue that this is compensated for by the extra individual desk lighting. So this aspect cannot be seen as an innovation on maintenance.

INNOVATIONS ON ENERGY-USE

Façade concept

The façade concepts of both DBFMO projects are not commonly applied solutions. Case 1 is in essence a renovation project. The existing structure was posing a problem for the transportation of exhaust air within the building and large thermal bridges were present. In order to overcome these two design issues, a double skin façade is applied to reduce the thermal bridges and to transport fresh and exhaust air in the façade. The individual elements cannot be seen as innovations. However, the solution as a whole is an innovation on ensemble level, which enables a reduction in energy consumption. The façade concept of case 2 is specially developed with regard to sun influences. The façade consists of a fin, which differs in length and height to optimize sun radiation and light entry in all seasons of the year. In this way a reduction of energy consumption is expected because less heating, cooling and lighting has to be applied. This second façade concept can also be seen as an innovation on ensemble level.

Heat/cold generation

In both DBFMO projects the heat and cold generation is produced by a heat pump. This system can generate more efficiently heat or cold in relation to traditional heating systems. Interviewees conclude that it is a fairly normal system within offices. Therefore this is not classified as an innovation within the context of this research.

Innovations in maintenance service delivery

Besides innovations found on the physical parts, other small incremental innovations in maintenance service delivery by the DBFMO contractor were mentioned in the interviews, e.g. monitoring the condition of building components in-situ and adapted traditional preventive maintenance schedules. These process innovations will have a minor effect on the maintenance costs, however might be crucial to meet the performance specifications during the concession period.

CONCLUSIONS

Within the two DBFMO cases four design choices can be considered to be innovations effecting maintenance costs and energy-use: (1) carpet tiles, (2) ventilation concept, (3) façade case 1 and (4) façade case 2 (see Figure 5). The design choices perform better on maintenance costs or energy use than the traditional projects selected for comparison. The four design choices are applied new and improved products and solutions, related to the way the project was procured by a DBFMO model.

Considering the findings of the research the DBFMO construction organization has a positive influence on the development of innovations on maintenance and energy-use. A number of conditions could be of influence on an innovative environment of DBFMO projects: the collaborative environment, the use of performance specifications, optimising life cycle costing and risk transfer between public and private partners. The innovations found in the case studies can be considered as the successful transfer of knowledge between departments that would have worked independently in case of a traditionally procured project. As the prime focused in this research was on finding real innovations in built projects comparing DBFMO to traditionally procured ones; we cannot provide detailed causal relationships on our findings and the potential causes.



Figure 5: Innovations on maintenance and energy-use (Meyer en Van Schooten Architecten and Strukton)

RESEARCH LIMITATIONS

Only two DBFMO cases were investigated due to limited number of DBFMO projects in the Netherlands, making the conclusions difficult to generalize for all DBFMO projects. However, at least indications have been found that the conditions of DBFMO projects shape an innovative environment. The performance data of the DBFMO cases on maintenance costs and energy-use is based on prognoses, as the delivery dates were too recent for reliable actual cost data. The data used was provided by the contractor, which has made the calculations of the maintenance costs and energy-use on the basis of the preliminary designs. In this research it has been assumed that this data should reflect the real costs rather accurately, because risk-averse parties like the contractor in case are liable for these expected costs over up to two decades. The maintenance costs data and expected energy-use performance is calculated based on confidential data sets, therefore the validity could not be determined. There was no reliable data about investment costs, making life cycle costs comparisons between DBFMO cases and traditional cases not possible.

Comparing buildings on costs is in general rather problematic due to the unique character of buildings. In terms of project selection often the researchers were faced with limited available data on life cycle costs, long-term maintenance plans and energy consumption. Instead of comparing buildings as a whole it proved possible to compare a number of elements. The maintenance costs and energy consumption analysis was meant to found possible innovations and not to compare similar solutions on cost or energy consumption efficiency.

FURTHER RESEARCH

The study has to be repeated with more cases and should be based upon actual cost data and real energy performance data for better validity. Moreover further research is needed to have a better understanding of procurement models like DBFMO and innovations. Further research could be conducted on e.g. the conditions why exactly innovations arise in DBFMO projects, on the life cycle cost efficiency of projects related to innovations and on the role of the architect in a risk-avoiding environment. Also the causal relations often assumed to be effective in case of DBFMO in terms of process and contractual characteristics related to the type and amount of innovations found needs to be further explored.

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A COMPARATIVE REVIEW AND EVALUATION OF THE NEGOTIATED AND COMPETITIVE DIALOGUE PROCEDURES AS EFFECTIVE PROCUREMENT ROUTES TO DELIVER PRIVATE FINANCE INITIATIVE (PFI) PROJECTS IN THE UNITED KINGDOM (UK)

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The procurement strategy utilised by UK government since 1989, the Negotiated procedure, when selecting a public private partnership (PPP) to deliver design, build, finance and operate projects, often referred to as private finance initiatives (PFI) as introduced into the UK in 1992 changed significantly in 2006 when the Competitive Dialogue procurement process was introduced. The aim of this research is to compare the two procedures to evaluate their cost effectiveness as procurement strategies. The research methods applied to test the aims have included detailed case study analysis, supported by grounded theory and literature reviews. The results currently show that both methods of procurement strategy are costly when negotiating a PPP/ PFI deal but that the benefit of a competitive dialogue arena has distinct advantages for government contracting authorities above the negotiated procedure. Consequently the research highlights areas where efficiencies could be made in the future procurement of PPP/PFI deals.

Keywords: cost, efficiency, private finance initiative, procurement strategy, public private partnerships

INTRODUCTION

In order to analyse the cost effectiveness of the Negotiated procedure and the Competitive Dialogue procedure as effective procurement routes to deliver Public Private Partnerships (PPP) and Private Finance Initiatives (PFI) in the UK; it is also necessary to understand the political, social and economic influences which directly impact upon the reasons for the procurement of public sector projects and a contracting authority's choice of procedure to be used. The analysis is important in terms of addressing the inefficiencies which are evident within the current practical application of the legislation governing the UK procurement strategies and by identifying the inefficiencies the aim is to develop a method of addressing the way in which contracting authorities implement and carry out the procedures used.

The consequence of this can provide benefits to the PPP/PFI markets in the UK in terms of reducing time and cost of the procurement process. This work expands previous academic works through the analysis of detailed case studies undertaken by the author. The cost effectiveness of the practical applications of the implementation of the Negotiated procedure and the Competitive Dialogue procedure are reviewed and comparisons made.

THE SOCIAL, POLITICAL AND ECONOMIC TRANSITION OF THE UK (1970-2012)

The historical changes in UK procurement strategies from the 1970's to date, have been brought about as a direct result of central government policies and the UK accession into the European Economic Community (EEC) in 1972 (Arrowsmith, 2005) (now referred to as the European Union EU); introducing inevitable changes to accommodate the principles of the Treaty of Rome (1957) in the form of Council Directive 71/305/EEC (Terbrack, 2011) which gave the UK the Open and Restricted procurement procedures to implement into national practices.

The UK at this time was also transforming politically and economically. The Conservative Government came into power in 1979 against a backdrop of rising inflation with a strategy to privatise nationalised industries and an ambition to re-invent the UK's economy. The UK was reliant almost entirely upon industrialisation and manufacturing but the changes made by the Conservative

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Government moved the UK to an economy centred upon the financial and the services sector. This shift in the economic strategy of the UK meant that it was ever more important that barriers to trade were removed and a competitive market encouraged not just locally within the UK, but globally to ensure that the UK could retain the ability to benefit from industrial and manufacturing advances which were now taking place in other countries.

Whilst the Conservative Government introduced PFI and had utilised that form of procurement since 1986 with the build of the Dartford Bridge; it was only from 1997 when the new Labour Government came into power that the growth in the PFI market developed. Inevitably the growth in this sector contributed to a 9-year period of high employment and prosperity.

The 2008 financial crisis concluded with the formation of Conservative led coalition government which immediately cut public sector spending and withdrew rapidly from the use of PFI. A 40% reduction in public sector budgets, which was announced in the 2009 October spending review, has also meant that contracting authorities have cut back from investing in capital projects and therefore build programmes have stopped. The impact of this is that the construction and supporting industries have very few infrastructure projects in the UK to bid for. Unemployment is rising and recession has taken its toll.

THE DEVELOPMENT OF UK PROCUREMENT LEGISLATION WITHIN THE UK (1970S-1990S)

Government procurement strategies in the UK started to change in the 1970s when there was a traditional reliance by contracting authorities to use in-house providers (Direct Service Organisations) which have been described as monopolistic practices (Bivand and Szymanski, 2000) or obtaining informal quotes from several usually known providers (Arrowsmith, 2005); the UK saw a shift in strategy focussing upon achieving value for money through competitive tendering known as Compulsory Competitive Tendering (CCT). This was an unpopular imposition upon contracting authorities and the Conservative Government were uncompromising in their assertion that the tendering of certain in-house provisions must be competitively tendered (Cirrell, Bennett and Hann, 2000). Arguably this approach aligned with the privatisation agenda and a number of legislative changes were made to entrench the rules into a contracting authority's processes. Whilst the two forms of procurement process Open and Restricted procedures as introduced by the EEC Directives as above, set a base line from which contracting authorities could work in compliance with the CCT process, the mechanisms were heavily criticised for focusing upon price above quality (Arrowsmith, 2005). It soon became apparent that the Open and Restricted procedures were inadequate for the advancing requirements of contracting authorities. The Directives were left un-amended for 10 years during which time contracting authorities worked within the parameters set but often manipulating the processes to fit the purpose or contract required. In 1986 the European Commission commenced its review of the procedures and subsequently determined that there was a need for a further procedure, to allow contracting authorities the room to consult contractors and negotiate with one or more of them (Terbrack, 2011) and in 1989 the Negotiated procedure was introduced.

PRIVATE FINANCE INITIATIVES ARE INTRODUCED (1992)

In 1992 the Private Finance Initiative was formally introduced by the Conservative Government; albeit they had been used since 1986, their uptake was slow with only 10 projects being undertaken from 1986 to 1999, the reason for this early failure in PFI was seen to be as a result of the high cost and risk consequences to the bidder. (House of Commons Treasury Committee, 2000). The realisation was that in order for the UK to be a global competitor, it needed to modernise its neglected infrastructure (HM Treasury, July 2003); The PFI initiative was perceived to be the way to deliver this. Once the Local Governments (Contracts) Act 1997 was enacted the Labour Government increased its investment into PFI programmes and by 2006 the UK had used the Negotiated procedure in approximately 1,195 PFI deals (HM Treasury, 2006). The Labour Government ambitions to develop world class public services were based on the premise "that strong and dependable public services lay the foundation for a flexible and productive economy...whilst promoting opportunity for all..." (HM Treasury, July 2003). In addition to the investment benefits which such transformation agendas confer upon communities through innovative and modern infrastructure each community also benefits directly from increased employment prospects which such programmes promote.

The construction industry was the first sector to respond to the needs of these new forms of PFI development. In organising themselves and arranging the appropriate consortia of specialists to provide the designs, construction, financing and facilities management needs to facilitate the PFI market local and national economies began to recover from the downturn experienced in the 1980s. This was not only in terms of construction industry contractors, but also from the wider employment benefits in the financial, legal and technical sectors as they developed into specialised advisors to the PFI industry (The Egan Report, 1998).

However, the 1999 Gershon Review of Central Government Procurement highlighted that it was still costing contracting authorities more in procuring goods, works and services compared to the private sector (Cirrell, Bennett and Hann, 2000). The review focused upon the fact that contracting authorities could be more efficient in terms of their processes and that the CCT process was not achieving the cost efficiencies it was meant to achieve. The report was also critical in terms of how best value could be achieved. Just prior to the Gershon Review, Treasury had also commissioned a review of the PFI process and its aims in achieving value for money by Sir Malcolm Bates and this set out its own recommendations of how PPP/PFI procurements should be undertaken to ensure that value for money could be achieved. The Local Government Act 1999, was introduced by the Labour Government shortly after coming into power, as an attempt to address the misgivings of CCT which was abolished in 2000, this system of procurement when enacted into legislation placed on local authorities a legal duty to secure best value throughout a contractual period in the form of continuing improvements. The best value strategy emerged amidst criticisms that it was ill defined and subjective but it was not until the Byatt Report in 2001 that strategies for improving government procurements were suggested along with efficiency measures which could be taken. These included training of public sector staff and the establishment of procurement systems and frameworks to gain benefits from collective procurements. It was believed that over bureaucratic processes were in fact adding to the cost of procurement and where private sector cost efficiencies could be achieved, public sector objectives of probity and accountability were of equal importance to the requirement to achieve best value (Arrowsmith, 2005).

THE NEGOTIATED PROCEDURE IN USE (1989- 2006)

Contracting authorities in picking up the advantage of redeveloping their infrastructures through PFI used the Negotiated procedure from its inception in 1989 to 2006. Two of the justifications enabling contracting authorities to use the Negotiated procedure, as set out in table 1, below, are that the circumstances of the contract are exceptional and that prior overall pricing cannot be assessed by the procuring authority. In organising the process the contracting authority must inform prospective bidders at the outset that there will be a staged evaluation process during which bidders can be rejected until a preferred bidder wins the competition. Under the Negotiated procedure it is only at the preferred bidder stage that the commercial negotiations with the final and preferred bidder can take place. The immediate problems which arise for the contracting authorities are that the substantive commercial negotiations become one sided with the contracting authority being at a distinct disadvantage either because of a lack of experience both in the commercial aspects of the deal or in the ability to undertake negotiations. Experienced contracting authorities could perhaps seek to turn the tables slightly by requiring very detailed submissions at the stage of best and final offer, but that still leaves a vulnerable and inexperienced contracting authority negotiating with an experienced and commercially astute private sector consortia.

It is interesting to note that up-to 1996 the UK had put to the market 40 PFI deals utilising the Negotiated procedures (HM Treasury, July 2003). This was in contrast with other EU countries, which were not advanced in the number or type of PPP/PFI deals as the UK (Mirjam & Dewulf, 2006). It can be of no surprise therefore that the European Commission basing its opinion upon the number of advertised contract notices, complained that the UK were over using the Negotiated procedure. It took a further 8 years for the Commission's ensuing Green Paper to be developed, discussed, agreed and finally transformed into legislation; this Green Paper debated the procurement processes of PPP/PFI and how to develop a continuing procurement strategy which would ensure adherence to the overarching principles of the Treaty of Rome. As identified by (Braun, 2003) discrepancies had previously existed between EU procurement directives and PPP/PFI procurement practice and the legality of the use of the Negotiate procedure for PPP/PFI questioned. The UK took a further 2 years to introduce the Public Contracts Regulations 2006 (SI 2006 N0.5) which introduced the Competitive Dialogue process for the procurement of complex projects.

THE INTRODUCTION OF THE COMPETITIVE DIALOGUE PROCESS (2006)

This new Competitive Dialogue procedure was to address the issues surrounding the procurement of complex, high value PFI deals and was viewed by the contracting authorities as an opportunity to ensure that they got the best deal possible in the market. This could be secured whilst retaining a competitive advantage or competitive leverage which contracting authorities had not enjoyed the benefit of when using the Negotiated procedure. The UK Labour Government had released into the market a variety and significant number of PPP/PFI opportunities and finance. Treasury and the Office of Government Commerce (now the Efficiency Reform Group) issued guidance to contracting authorities embarking upon such projects which explained that competitive dialogue for the procurement of PPP/PFI was to be the procurement route of choice declaring: "the European Commission will expect the Competitive Dialogue procedure to be used for complex contracts such as PPP/PFI".

Therefore there is little surprise that the UK upon implementation of the Competitive Dialogue procedure would have immediately advertised through the Official Journal of the European Union (OJEU) a large number of PFI projects. HM Treasury statistics state the number to be more than any other EU country, the UK having undertaken 1,200 procurements using competitive dialogue (HM Treasury, 2010). Whilst Craven (2011) (awaiting publication) reports that from January 2006 to December 2009 (taken from

a count of published OJEU notices), that the UK advertised 1,380 Competitive Dialogue procedures which exceeded the number of projects arising from a selected number of other EU countries put together. Now, amidst EU complaints that the UK are over using the Competitive Dialogue process, HM Treasury are again reviewing the position (HM Treasury, 2010) and takes the stance that Competitive Dialogue should not be seen as the default procedure for all complex procurements.

Table 1 - The legislative comparisons of the Negotiated and Competitive Dialogue procedures

NEGOTIATED PROCEDURE	COMPETITIVE DIALOGUE PROCEDURE
The Negotiated Procedure requires prior publication of a contract notice. Can be used exceptionally when the nature of the work or works to be carried out, the goods to be purchased or hired or the services to be provided under the contract or the risks attaining to them are such as not to permit prior overall pricing.	The Competitive Dialogue Procedure requires prior publication of a contract notice and is used where a contracting authority wishes to award a particularly complex contract and considers that the open and restricted procedure will not allow the award of the contract. A particularly complex contract is defined as a contract where a contracting authority is not objectively able to define the technical means of satisfying its needs or objectives; specify either the legal or financial make up of a project or both.
Contract Notice to be issued to identify: Whether the procedure will take place in successive stages, the time limit to request documents and the administrative details of where, how and what language the documents should be returned to the contracting authority in. Evaluation/ Award criteria should be notified in the contract notice including details of minimum thresholds of achievements in terms of financial standing and technical ability in conjunction with the minimum number of tenderers the authority will take through to negotiate.	Contract Notice to be issued to identify: Whether the procedure will take place in successive stages, the contracting authority shall specify its needs and requirements and define those needs and requirements. In conjunction with informing prospective tenderers of the time frame in which to respond, where to send requests for information and how and the languages required for issuing the tenders in. It must also specify the minimum number of participants and that the contracting authority expects a minimum threshold of achievement in terms of financial standing and technical ability along with the evaluation and award criteria and any sub-criteria used by the contracting authority.
Not to provide information in a discriminatory manner and to award on the basis of the Most Economically Advantageous Tender, which does not necessarily mean lowest price.	Not to provide information in a discriminatory manner, to ensure transparency and fair dealing throughout the process and the only discussions allowed at Preferred Bidder stage is that relating to clarification of aspects of the tender and confirmation of commitments provided this does not distort competition or cause discrimination; award on the basis of the Most Economically Advantageous Tender, which does not necessarily mean lowest price.

Table 1 above, shows the Public Procurement (Contracts) Regulations 2006 legislative differences between each process.

COMPETITIVE DIALOGUE IN USE (2006 - TO-DATE)

Once a contracting authority has determined it has a particularly complex contract it wishes to procure, and it is such a complex contract that the contracting authority is not objectively able to define the technical means of satisfying its needs or objectives and is not able to specify either the legal or financial make-up of the project then the procedure which should be used is the Competitive Dialogue procedure.

OGC Guidance (2008) divides the competitive dialogue process into 7 stages before contract signature. This includes work to be carried out prior to the issue of the contract notice, the selection of bidders to be invited to compete in the dialogue process, the competitive dialogue stage, final tender process, post tender discussions and preferred bidder.

The contracting authority in embarking upon a complex project ought to be as informed about the project as it can be. This is to ensure that it is able to efficiently and intelligently provide information to the private sector to ensure its project aims are met. Projects undertaken in this arena are high value and long-term contracts. Certainly in the case of PFI, the contracts tend to be for 25 – 30 years with a minimum value of £20million (HM Treasury, July 2003). The costs associated with this type of procurement process and the time frames required to progress a number of contractors through the 7 stages are significant; not just for the public sector but also for the private sector.

Contracting authorities within the competitive arena have been criticised for requiring designs details from contractors which are too detailed (HM Treasury, 2010), whilst conversely a contracting authority wants certainty of design and cost, without risking designs which need engineering to be affordable, once a bidder has achieved preferred bidder stage; likewise in terms of the commercial and financial solutions and any risk sharing mechanisms to be provided. Treasury has highlighted that requiring such levels of detail not only adds to the costs for the private sector in bid submission cost, but also adds to the cost of the public sector in terms of prolonged evaluation time taken in considering bid submissions.

Whilst the criticisms highlight the need for improvement, what should not be forgotten in this rush to make efficiencies, is that the contracts are high value, complex and in terms of innovative commercial or financial solutions future implications need to be discussed addressed and understood. Whilst good programming, planning and time management is another area for improvement within the process the responsibility for this also sits with the private sector. The Competitive Dialogue process is designed to give contracting authorities flexibility to plan each stage to ensure that evaluations are carried out diligently. When the time for the call for final tender arrives negotiations have stopped, the competitive arena has concluded. Fine tuning, clarification and confirmation of commitments which do not have the ability to distort competition is the only remaining task. Yet what is evident from the case study undertaken and from previous academic work (Brown, 2004) is that the private sector funding consortia will not engage with their clients until the preferred bidder stage has been achieved.

At this time the financial institutions and their advisors embark upon their own commercial due diligence and raise the issues which they are not prepared to accept. Often, these commercial areas have been the subject of lengthy discussions which have previously been either accepted or rejected by the parties within a competitive arena. The funding consortia in behaving in this manner put contracting authorities to a number of risks. The contracting authority's main concerns arise in terms of breaches to procurement regulations. Additional cost and time consequences are suffered by both the public and private sector in this scenario. One example from the case study analysis shows that an additional 5 months were added into the programme to close, which was not in the control of the contracting authority.

Therefore whilst some criticisms which have been raised by Treasury that the time contracting authorities take in making their selections is inefficient, the process as a whole should be considered and the behaviour patterns of the private sector should be scrutinised and inefficiencies addressed overall.

ANALYSIS

In the Negotiated Procedure it is anticipated that the contracting authority is able to define its requirements in advance, excluding the requirement of prior overall pricing. In practical terms, the different approaches which are taken by the two procurement processes to provide the private sector with the information they need is based upon an input specification in the Negotiated Procedure, where the contracting authority is able to specify what it wants the contractor to do. An output specification is required in the Competitive Dialogue process. In the case of the output specification the contracting authority identifies what it is the contracting authority wants a building or project to achieve; thereby giving the contractor the scope to be innovative in determining what is best in the market to achieve the outcome. From this foundation, the blocks which need to be built to create an efficient procurement process require a significant amount of project planning. This will allow potential inefficiencies to be identified in each individual set of circumstances, in advance, whether the process being utilised is that of the Negotiated procedure or that of the Competitive Dialogue procedure, and programme management strategies can then be utilised to overcome any inefficient practices.

In communicating the contracting authority requirements to the market both procedures are required to publish a contract notice in the OJEU. This notice importantly is advertising to the market what the project is and asking for interested tenderers to come forward to compete for the contract. Advance preparation of this document and detailed consideration of this document can be the difference between an efficient procurement and an inefficient one. The contracting authority must give consideration to the term of the contract fundamentally PPP/ PFI contracts are for 25-30 years duration and therefore the contracting authority must be able to estimate the form and content of any solutions which may be brought to the table during negotiation, so as not to fetter the innovative solutions developed during negotiation to satisfy the contracting authority needs and any potential future development therefrom. The consequence of having to re-procure or refuse a fantastic innovative solution purely because the OJEU notice was inadequate would be substantial, not just in terms of the cost of renewing the process, but also political and reputational damage could also have a significant impact upon the credibility of the contracting authority.

The reason for going out to the market and using the Competitive Dialogue process is because the contracts are complex and contracting authorities are not in an advance position to be able to define their requirements. Inevitably this means that a contracting authority's requirements will be adjusted throughout the process (Brown, 2004), until the contracting authority is satisfied that it has a solution which, from one or more tenderer, will deliver its requirements on the basis of the most economically advantageous tender, not necessarily the lowest price.

In both procedures there is also the added complication of working out the evaluation and scoring mechanisms in advance when the contracting authority has no real indication of the content of the potential tender submissions and innovative solutions which may be proposed. This is a big area of risk for any contracting authority and has been the subject of many challenges within the European Court of Justice (ECJ). The risks which arise here could be managed in the pre-planning process with thorough advance preparation. The above elements which are particularly problematic and time consuming for contracting authorities have been accused of inefficiency and having a lack of skill in their ability to carry out a procurement process (Byatt, 2001) (HM Treasury, 2010), whilst arguably resources such as time and cost constraints are probably more realistic reasons for any defects in this process.

The next significant difference between the procedures relates to the de-selection of bidders and the successive stages used; whilst in the Negotiated procedure the contracting authority has a level of autonomy in terms of the choice of successive stages, the substantive negotiation of commercial terms in this procedure takes place after the receipt from the participants of the best and final offer, when the preferred bidder has been selected. In the Competitive Dialogue process, the stages are set out in part, but they are also sufficiently flexible to give contracting authorities time to programme the procurement allowing for consideration to be given to the complexity of the negotiations to be held and the innovative solutions to be developed. The substantive negotiation is held in a competitive environment until the selection of the preferred bidder when the competition and negotiations stop.

In spite of the criticisms raised against the use of Competitive Dialogue, HM Treasury has (HM Treasury, 2010) recognised that the introduction of Competitive Dialogue has improved procurement outcomes by enabling the public and private sectors to develop and deliver more appropriate and bespoke value for money outcomes. In addition the Treasury review stated that from a general survey undertaken 78% of respondents agreed that bidders had an increased ability to deliver improved solutions when compared to solutions delivered using the Negotiated procedures (HM Treasury, 2010). In terms of the cost of the Competitive Dialogue process the Treasury review states that compared to alternative procurement routes Competitive Dialogue is more costly than other procurement process to both the public and private sectors. In the results Treasury confirmed that 86% private sector respondents agreed with the assertion, where only 55% of public sector respondents agreed. In order to test the cost information the case study analysis has included comparisons of 2 school PFI projects.

Project A being a School PFI deal conducted under the Negotiated procedure at a cost of 34.43% less than the Project B a further school PFI deal which was conducted under the Competitive Dialogue procedure. Whilst the figures do not show the entire cost they give a comparable indication of which procurement process in these 2 studies undertaken gave the more efficient savings. The savings here are based entirely upon the actual cost of procurement and do not take into consideration the value for money considerations and the elements of most economically advantageous tender elements of the Competitive Dialogue procedure and the Negotiated procedure outcomes. Some successful bidders confirm that they have seen no difference in cost increase irrespective of the procurement process used and additional research (HM Treasury, 2010) would be interesting to establish why. One suggestion (Atherton, 2011) put is that the private sector carries out a costs benefit analysis for each bid they enter into and calculate % of wins against losses and incorporate the cost of bidding into the winning projects. On that basis eventually there should be a break-even point in recovery of bid costs.

CONCLUSION

The procurement strategies utilised by UK government the Negotiated procedure and the Competitive Dialogue procedure from the comparative analysis could both be effectively utilised by contracting authorities to procure high value, complex projects at a comparable procurement cost. Each project would have to be considered independently to determine whether the project fell within the ambit of particularly complex or exceptional and whether it was simply prior overall pricing which could not be determined by the contracting authority or whether the entire project could not be defined. Competitive Dialogue was introduced to address the complexities of PFI structures and on that basis maybe PFI or any replacement initiative should always be procured within the remit of the Competitive Dialogue process to ensure that financial, technical and legal complexities can be discussed within a competitive

arena. Complex in the future could be interpreted as being projects which have not been procured previously and which do not have a precedent to follow. That being said there still needs to be room for innovation.

The aim of this research was to compare the two procedures to evaluate their cost effectiveness as procurement strategies and whilst this is only an overview it is evident that both procedures have areas where cost increases are caused as a direct result of the behaviour of the parties which could easily be addressed; and in the authors opinion without intervention from additional legislative changes. The analysis also provides evidence to suggest that in order for the market place to be able to respond to advancements in contracting initiatives and strategies which a developing economy creates that there is sufficient scope to utilise both procedures in the future; and whilst there are advances from the Department for Business, Innovation and Skills with the Form of Commitment Procurement, which appears to be a re-branding of the Competitive Dialogue process and we still have the review to come from the Cabinet Office, Efficiency Reform Group. May be it is time to say let the contracting authorities and market forces dictate their parameters rather than flood the arena with legislative solutions which are not given time to work.

Whilst the Treasury Efficiency Reform Group are undertaking their current study of the Competitive Dialogue process, the results of which are anticipated in January 2012, the concern of the author lies in the fact that it would appear from the research undertaken that PPP/PFI and UK procurement processes have undergone what appears to be annual reviews, some of them simply restating what the other has said. One step forward to developing a method of addressing inefficiencies is to have in place a strategy to ensure that sufficient preparatory research and due diligence is carried out by the contracting authority. Whilst this might be a costly up-front resource, in the author's opinion it is a resource which can save time and money in the advancing process of dialogue: whichever one it may be.

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PPP ROAD PROJECTS IN BANGLADESH: IDENTIFICATION AND PRIORITISATION OF RISKS

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Bangladesh needs to develop its road sector with greater importance, which requires high volume of capital investment. The government of Bangladesh through its different agencies is taking initiatives to develop and maintain the road sector under PPP arrangement very recently with a view to relieving the pressure from use of public fund. However, a number of pressure groups, such as media, intellectuals, bureaucrats and even some political leaders are trying to oppose government's initiative to involve the private sectors in developing the road sector of Bangladesh. There are number of evidences of time and cost overruns and even complete failure of road projects in Bangladesh. Moreover, owing to complex nature such as large volume of capital investment, long- term concession agreement and multi-party involvement, PPP models have been adjudged to be full of risks. Thus, it is very important for all the stakeholders to understand the various risks associated with PPP road projects. Identification of risk factors and their significance on project implementation is one of the key elements for the success of any project. The objectives of this paper were set as: to explore level of importance of need and the reasons for adopting the PPP road projects in Bangladesh and; to identify and prioritise of risk factors associated with PPP road projects in the context of Bangladesh. 36 risk factors were identified through extensive review of literatures on PPP road projects and then a questionnaire survey was conducted among three groups of respondents in Bangladesh: public clients, contractors and consultants. A total of 120 questionnaires were distributed among the respondents, in which 82 were returned. Majority of the respondents agreed that PPP road projects are very important, which can reduce the pressure on public fund for developing the road sector. 'Availability of land' is the most significant risk factor affecting the success of PPP road projects in Bangladesh was ranked first by the respondents. Improper planning for PPPs, risk in financing, corruption in government sector and delay in land acquisition, are the other top ranked factors, which can significantly affect the success of PPP road projects in Bangladesh. There is a strong agreement of the rankings between the contractor and consultant groups. However, there is little disagreement of opinions between the clients and contractors and clients and consultants as well.

Keywords: Bangladesh, identification of risks, prioritisation of risks, public private partnerships (PPPs), road project

INTRODUCTION

Bangladesh is one of the most densely populated countries in the world with an average of about 1084 inhabitants per square kilometre having a per capita income of only US\$ 645 (Bangladesh Economic Review, 2010). The principal modes of transport in Bangladesh are roadways, railways, inland waterways, two sea ports, maritime shipping and civil aviation, amongst which roadway is the dominating mode for transporting passengers and freights (Bangladesh Bridge Authority, 2011). Being a developing country, to accelerate the GDP growth rate along with easement of traffic congestions in most of the major cities, the country needs to emphasise the development of the road sector with a greater importance. However, requirement of high volume of capital investment in road sector is one of the major impediments for the government to develop this sector. From this viewpoint, project implementation through Public-Private-Partnerships (PPPs) seems to be one of the best alternatives for the government to ease the pressure on public sector fund. The government of Bangladesh through its different agencies is taking initiatives to develop and maintain the road sector under PPP arrangement very recently with a view to relieving the pressure from use of public fund. However, a number of pressure groups, such as media, intellectuals, bureaucrats and even some political leaders are not appreciating the government's initiative to involve the private sectors in developing the road sector of Bangladesh.

In PPP procurement methods, the private partners can be engaged in delivering public services (Akintoye and Chinyio, 2005). It is widely used worldwide because of having some other features such as proper allocation of project risks and efficiency in project implementation with innovative design and construction, which encourage the public clients to initiate PPP-based infrastructure projects worldwide (Li and Akintoye, 2003). However, generally project implementation process comes across a number of risks in

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different forms such as political, cultural, technological, social, legal, environmental, financial, macroeconomic, project default risks etc. (Han *et al.*, 2005). In addition, owing to complex nature, large volume of capital investment, long- term concession period and involvement of diversified parties, project implementation through PPP models has been adjudged to be full of risks (Li and Zou, 2011). Moreover, in PPP road project, traffic revenue or demand risk, toll pricing and collection risks are other important factors that can create uncertainty in getting back the cost of capital and profit to the private entity by the end users throughout the long range concession period (Singh and Kalidindi, 2006).

Impact of risks in completing a PPP project is usually significant. Failure to manage the risks has the direct or indirect impact on goals and objectives of the organisation. Thus, all the parties involved in PPP procurement need to know the nature and complexity of project risks. The public sector clients need to address the project risks for assessing financial and economic viability before embarking on any project (Singh and Kalidindi, 2006), preparing a successful concession agreement and transferring the major risks to the private sectors as they are best able to manage them (Ibrahim *et al.*, 2006). On the other hand, the private parties need to know the nature of risks for taking investment decision in PPP projects, setting the risk premium while taking part into the bidding competition and preparing risk mitigation plan before going to implement the project (Hardcastle and Boothroyd, 2003). Thus, it is essential to have a clear understanding to all the parties involved about the risks associated with PPP projects in the investing country. This paper aims at exploring the importance of need and reasons for adopting PPP road projects in Bangladesh, identification of the significant risk factors in PPP road projects and prioritisation of those factors in the context of Bangladesh.

RESEARCH METHODOLOGY

The methodology of the research contains comprehensive review of literatures to identify the risk factors associated with PPP road projects. The risk factors were listed in tabular form in accordance with their number of citations. Then, primary data were collected through questionnaire survey to explore the need and the reasons for adopting PPP road projects in Bangladesh and to rank the risk factors in accordance with their degree of importance in the context of Bangladesh. The questionnaire was divided into two parts. In the first part, the respondents were asked to opine the importance of need for PPP road projects and the reasons for adopting PPP road projects in Bangladesh. In the second part, 5-point Likert scale (5=very important, 4=important, 3=moderately important, 2=less important, 1=unimportant) was used to rate degree of importance of the risk factors in PPP road projects in the context of Bangladesh. The respondents were chosen from three different groups, public clients; private contractors; and consultants, who were directly involved in road sector development or public procurement in Bangladesh.

METHOD OF DATA ANALYSIS

MEAN SCORING RANKING

Mean Score (MS) ranking technique is used to rank the risk factors based on the surveyed data. It is widely used in construction management researches to determine the relative ranking of the factors in descending order (Xu, *et al.*, 2010; Ibrahim *et al.*, 2006). The mean score (MS) for 5-point Likert scale can be calculated by the following equation (Chan and Kumaraswamy, 1996):

$$MS = \frac{\sum_{i=1}^5 (f \cdot s)}{N}$$

Where, f = frequency of each rating for each risk factor;
s = score given to each risk factor by the respondents, and
N= total number of responses concerning a particular risk factor.

Concordance analysis for agreement/disagreement between different groups of respondents

In order to test for any agreement/disagreement in rankings of the individual factors between various groups of respondents, Spearman correlation analysis for any two groups is used. The Spearman rank correlation coefficient is a commonly used tool to measure correlation between two sets of rankings viewed by two different groups of respondents (Chan and Kumaraswamy, 1996). The rank correlation coefficient (r_s) ranges from - 1 to + 1. A correlation coefficient of + 1 suggests a perfect linear correlation while a value of - 1 means negative correlation implying that high ranking on one is associated with low ranking on the other. In the case of zero value, no linear association exists (Chan and Kumaraswamy, 1996). The Spearman rank correlation coefficient (r_s) for any two sets of rankings is calculated by:

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2-1)} \quad \text{and,} \quad t = r_s \sqrt{\left[\frac{n-2}{1-r_s^2} \right]}$$

Where, d_i is the difference between the ranks given by two groups of respondents; and n is the number of pairs of values in the data set. To test the rank correlation coefficient, a t-test at a 95% confidence interval of the null hypothesis (H_0) is used. H_1 is the alternative hypothesis. The decision rule depends on whether the calculated values of t are greater than or less than the critical values of t for $(n - 2)$ degrees of freedom.

For top 10 ranked risk factors ($n=10$),

H_0 : two groups of respondents do not agree on the ranking of importance of risk factors;

H_1 : otherwise.

Reject H_0 if $t > 1.860$ or $t < - 1.860$, at a level of significance of 5 %

IDENTIFICATION OF RISKS IN PPP ROAD PROJECTS

Every PPP project, like any other projects, is adjudged to be full of risks. Much of the risks in PPP projects emerges from the complexity of contract agreement in terms of documentation, financing, technical details and sub-agreements along with the generic risks in construction projects (Grimsey and Lewis, 2002). In case of a concession based PPP project, absence of stable and long-term revenue stream significantly affects the core business objectives of the equity investors and debt providers (Ng *et al.*, 2010).

Several studies (Xu *et al.*, 2010; Chung *et al.*, 2010; Singh and Kalidindi, 2006; Thomas, 2003) were carried out to identify the significant risk factors in PPP road projects, their impacts and development of risk management tools for different countries. A total of nine available research papers on risk in PPP road projects were found. Through the content analysis of these nine papers, a total of 36 risk factors were identified and listed in a tabular form along with the number of citations by the authors.

Table 1: Identification of risks in PPP road projects

RISK FACTORS	Wang <i>et al.</i> (2000)	Thomas (2003)	Wibowo and Kochendorfer (2005)	Singh and Kalidindi (2006)	Ogunlana and Abednego (2009)	Chung <i>et al.</i> (2010)	Xu <i>et al.</i> (2010)	Rajan <i>et al.</i> (2010)	Li and Zou (2011)	Total number of citations
Fluctuating traffic /demand risk	x	x	x	x	x	x	x	x	x	9
Delay in construction	x	x	x	x	x	x	x		x	8
Delay in land acquisition	x	x	x	x	x			x	x	7
Change in policy /laws	x	x	x	x	x	x			x	7
Fluctuation of interest rate	x		x	x	x		x	x	x	7
Operation risks	x			x	x	x	x	x	x	7
Cost overruns	x	x	x	x			x	x	x	6
Pricing/fixing of toll rates	x	x	x		x	x		x		6
Delay in approval	x			x			x	x	x	5
Inflation	x		x		x		x		x	5
Project financial closure risk		x		x	x		x	x		5
Risk in contract management	x				x		x	x		4
Design risk					x	x		x	x	4
Force majeure risk	x			x	x	x				4
Risk in quality control				x	x		x			3
Competing/alternative routes	x				x	x				3
Risk in collection of toll		x						x	x	3
Debt servicing risk		x				x		x		3
Fluctuation of exchange rate	x				x		x			3
Environmental risk	x							x	x	3
Government intervention					x		x			2
Corruption in government	x						x			2
Lack of government support		x			x					2
Lack of competition in bidding						x			x	2
High bidding cost	x								x	2
Planning/pre-investment risk				x					x	2
Commissioning risks	x								x	2
Acceptance of toll road		x				x				2
Change of project scope				x			x			2
Health and safety risk	x								x	2
Availability of land				x						1
Resettlement risk				x						1
Residual value risks									x	1
Delay in annuity payment				x						1
Unstable law and order							x			1
Bid Evaluation risk							x			1

Table 1 shows that fluctuating traffic or demand risk is the mostly cited risk factors associated with PPP road projects in most of the countries. The commercial success of PPP road projects is usually depends on the toll collected from the traffic for the use of the assets if otherwise not compensated by the clients to the investors (Singh and Kalidindi, 2006). Delay in construction is another important factor discussed by my most of the authors. Construction delay is a general factor for any type of project which may be the result of insufficient experience of the contractors, use of inappropriate construction methods, inaccurate time and cost estimating, improper project planning and scheduling, incompetent project team, unreliable subcontractor, obsolete technology etc. (Long *et al.*, 2004). Delay in land acquisition, frequent change in laws/policies and risk in operation and maintenance are the other most cited risk factors associated with PPP road projects. All these 36 factors were then considered for further questionnaire survey.

CHARACTERISTICS OF THE RESPONDENTS

The questionnaires were distributed among 120 respondents, 40 in each of three groups of respondents (*public clients, private contractors and consultants*). Out of 120, a total of 85 questionnaires were returned in which 3 were left blank or partially filled up, which were screened out for analysis. Finally, a total of 82 completely filled-up questionnaires is considered for further analysis. The overall response rate is 68.33%, which is quite satisfactory compared to the similar studies done earlier. For example, Ibrahim *et. al.* (2006) had a response rate of 24%, Li *et. al.* (2005) had 11% response rate, Soetanto *et. al.* (2001) received a response rate of 18.9% and Chan and Kumaraswami (1996) got a response rate of 40% in similar type of questionnaire survey. Figure 1 shows the response rate for each group of respondents.

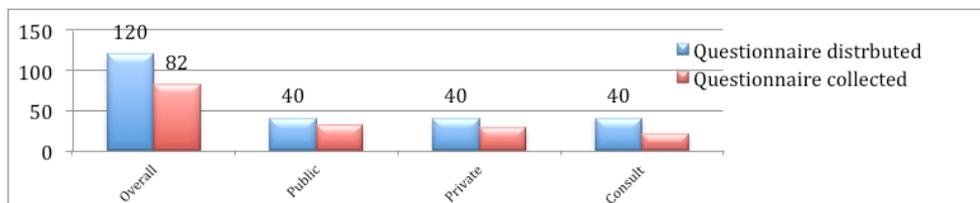


Figure 1: Survey response by different groups of the respondents

LEVEL OF EXPERIENCE OF THE RESPONDENTS

The respondents were asked to mention their level of experiences in construction of road projects in Bangladesh and/or experience in public procurement of Bangladesh. Table 2 represents the experience of the respondents, which shows that more than 60% of them have the experience of more than 10 years in the field of road construction and/or public procurement in Bangladesh. As majority of the respondents are the senior level construction professionals, their opinions ensure the acceptability of the results.

Table 2: Experience level of the respondents in road projects

YEARS OF EXPERIENCE	OVERALL		PUBLIC CLIENTS		PRIVATE CONTRACTORS		CONSULTANTS	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Less or equal to 5 years	9	11%	8	25%	1	3%	0	0%
5+ to 10 years	23	28%	12	37.5%	9	31%	2	10%
10+ to 20 years	38	46%	8	25%	13	45%	17	80%
More than 20 years	12	15%	4	12.5%	6	21%	2	10%
Total =	82	100%	32	100%	29	100%	21	100%

FINDINGS OF THE SURVEY RESULTS

IMPORTANCE OF PPP ROAD PROJECTS IN BANGLADESH

The respondents were asked on 5-point Likert scale (0= unimportant, 1= less important, 2= moderately important, 3= important, 4= very important) to rate 'to what extent PPP road projects is important' to develop the road sector in Bangladesh. The survey result shows that majority of respondents (52%) mentioned the procurement method as *very important*, 44% as *important* and only 3 respondents (4%) as *moderately important* to develop the road sector of Bangladesh. No one mentioned it as less important or unimportant.

REASONS FOR ADOPTING PPP ROAD PROJECTS IN BANGLADESH

The respondents were also asked to mention the reasons for adopting PPP road projects in Bangladesh. A total of 11 factors were identified. Figure 2 shows that 56 respondents (68.3%) mentioned 'lack of public fund' as the main reasons for adopting PPP procurement methods for development of road sector in Bangladesh. The other important reasons mentioned by the respondents are ease of pressure from the conditional foreign loans (26.83%), providing uninterrupted roadway communications (25.6%), timely completion of projects (24.4%) and ensuring quality of project works (23.2%).

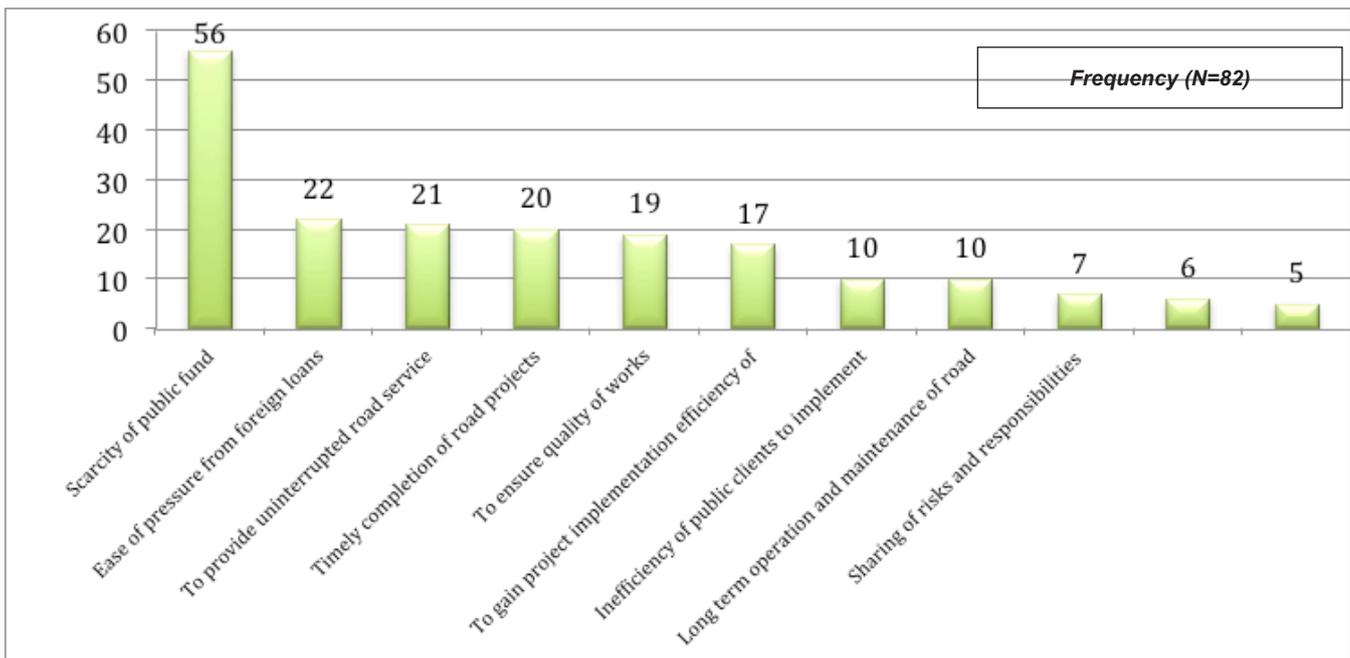


Figure 2: Reasons for adopting PPP road projects in Bangladesh

RANKING OF RISK FACTORS IN PPP ROAD PROJECTS IN BANGLADESH

The mean score (MS) for each factor from the surveyed data is used to get the relative ranking. The factors are ranked based on the mean scores from each of the view points of clients, contractors and consultants groups. Finally, the overall ranking of the risk factors is calculated combining the data given by all respondents. In case of same score for two or more factors, prioritisation has been made based on smaller standard deviation. The top five significant risk factors from clients' view points are: delay in acquisition of land for the projects (MS=4.50), initiating PPP projects without proper planning by the client organisations (MS=4.41), availability of sufficient land for construction of road projects in Bangladesh (MS=4.38), lack of qualified bidders to invest in large scale road projects (MS=4.13), risk of financing in PPP road projects in Bangladesh to get back the money (MS=4.06). From the view point of contractors, the highest ranked five significant risk factors are: risk in availability of land (MS=4.55), risk of financing in PPP road projects (MS=4.48), corruption in government sectors (MS=4.41), improper planning for PPP road projects (MS=4.34) and government intervention in large scale project procurement (MS=4.28).

Table 3: Rankings of risks in PPP road projects in Bangladesh from different perspectives

RISK FACTORS	WEIGHTED AVERAGE			CLIENTS		CONTRACTORS		CONSULTANTS	
	R	MS	SD	R	MS	R	MS	R	MS
Risk of availability of land	1	4.43	0.817	3	4.38	1	4.55	1	4.33
Improper planning for PPP	2	4.33	0.771	2	4.41	4	4.34	3	4.19
Risk of financing	3	4.27	0.847	5	4.06	2	4.48	2	4.29
Delay in land acquisition	4	4.24	0.639	1	4.50	6	4.14	6	4.00
Corruption in government	5	4.09	0.820	11	3.81	3	4.41	5	4.05
Risk in acceptance of toll road	6	4.02	0.801	10	3.88	7	4.10	4	4.14
Government intervention	7	3.98	0.875	13	3.75	5	4.28	7	3.90
Lack of qualified bidders	8	3.94	0.880	4	4.13	9	3.86	9	3.76
Unstable law and order	9	3.90	0.730	9	3.97	10	3.86	8	3.86
Delay in getting approval	10	3.80	0.761	8	4.00	11	3.76	11	3.57
Frequent change in laws	11	3.79	0.698	7	4.00	12	3.72	12	3.57
Delay in construction	12	3.59	0.816	12	3.81	14	3.31	10	3.62
Risk in collection of toll	13	3.55	0.996	18	3.25	8	3.90	13	3.52
Risk in resettlement	14	3.52	0.959	6	4.03	17	3.00	14	3.48
Inflation	15	3.29	0.839	20	3.13	13	3.38	15	3.43
Risk in contract management	16	3.29	0.853	16	3.41	15	3.21	17	3.24
Increase in project cost	17	3.28	0.879	14	3.47	18	3.00	16	3.38
Operation and maintenance risks	18	3.06	0.791	21	3.09	19	2.97	20	3.14
High tendering cost	19	3.04	0.909	31	2.81	16	3.14	18	3.24
Fluctuation of interest rate	20	3.00	0.770	24	2.97	20	2.93	19	3.14
Fluctuating exchange rate	21	2.98	0.769	27	2.94	22	2.93	21	3.10
Subjective tender evaluation method of PPP	22	2.94	0.998	19	3.22	23	2.55	23	3.05
Maintaining quality of works	23	2.91	0.973	15	3.44	29	2.24	22	3.05
Unwillingness of the government for PPPs	24	2.88	1.011	17	3.28	25	2.41	24	2.90
Fluctuating traffic volume	25	2.80	1.048	26	2.94	21	2.93	31	2.43
Force majeure risks	26	2.77	0.907	25	2.97	24	2.48	25	2.86
Existing/alternative routes	27	2.67	0.969	28	2.94	26	2.31	26	2.76
Fixing the toll rates	28	2.57	1.089	22	3.09	31	2.10	32	2.43
Variation in scope of works	29	2.55	0.918	33	2.75	28	2.28	28	2.62
Environmental risk	30	2.54	0.971	30	2.84	32	2.10	27	2.67
Delay of annuity payment	31	2.52	1.009	32	2.81	27	2.31	35	2.43
Changes in design of work	32	2.51	0.878	29	2.84	30	2.17	29	2.48
Payment of debt	33	2.51	1.009	23	3.00	33	2.00	30	2.48
Health and safety risk	34	2.34	0.864	34	2.72	35	1.86	33	2.43
Commissioning risk	35	2.23	1.010	36	2.63	34	1.90	36	2.10
Risk in residual value	36	2.13	1.167	35	2.69	36	1.34	34	2.38

*R = Ranking, MS = Mean score, SD = Standard deviation

The consultant group ranked the top five significant risk factors associated with PPP road projects in Bangladesh as risk of availability of land for road project (MS=4.33), risk of financing in PPP road projects (MS=4.29), improper planning for PPP road projects (MS=4.19), risk in acceptance of toll road by the users (MS=4.14), corruption in government sector (MS=4.05) and delay in land acquisition (MS=4.00). The overall mean scores of all the factors ranges from 4.43 to 2.13. Availability of land (MS = 4.43), improper planning for PPP project procurement (MS = 4.33), risk of financing in PPP road projects (MS = 4.27), delay in land acquisition (MS = 4.24) corruption in government sector (MS = 4.09), risk in acceptance of toll roads (MS = 4.02) are some of the top ranked risk factors rated by the respondents.

Concordance analysis: To test the agreement or disagreement on rankings of the top ten important risk factors between two groups of respondents, concordance analysis was done. The values of r_s and t-values are shown in Table-4. The hypotheses are tested at 95% confidence level.

Table 4: Test for agreement on the overall ranking of the 10 most important risk factors as perceived by different group of respondents

Groups of respondents	r_s	t	Reject H_0 ?	p-value
Clients and Contractors	-0.297	-0.880	No	Not significant
Clients and Consultants	-0.103	-0.293	No	Not significant
Contractors and Consultants	0.867	4.914	Yes	Significant, <0.05

* r_s = Spearman's rank correlation coefficient; t = t-statistics; H_0 = null hypothesis; p = probability that rejects the null hypothesis wrongly.

Table 4 tabulates the results of calculation of Spearman's rank correlation coefficients (r_s), the t-values, and the decision rule of rejection of null hypothesis for the 10 most significant risk factors ranked by the different groups of respondents. It can be said that there is general agreement between the consultants and contractors in respect of the ranking of the top ten risk factors, whereas there are significant disagreements between clients and contractors, as well as clients and consultants. This test reinforces the concordance of perception between the contractors and consultants.

DISCUSSION OF THE RESULTS

REASONS FOR ADOPTING PPP ROAD PROJECTS IN BANGLADESH

From this study it is explored that PPP could be one of the best alternatives for the government of Bangladesh to meet the fund requirement along with easement of pressure from foreign loans for developing the road sector of Bangladesh. Avoiding time overruns is another important reason for choosing PPP road project in Bangladesh, which can be ensured through PPP arrangement. Ensuring quality of physical works is one of the major problems in most of the projects in Bangladesh, which can be significantly improved by incorporating the private parties. Besides these, the government can go for PPP road projects to learn the technology know-how from the private sector, which will increase the project implementation efficiencies of the public clients.

RISKS ASSOCIATED PPP ROAD PROJECTS IN BANGLADESH

The prioritisation of risks in PPP road projects based on literatures for different countries is quite different from that of Bangladesh. For example, availability of land was discussed in only one available literature, whereas, it was ranked 1st critical factor in Bangladesh. On the other hand, fluctuating traffic revenue was cited in all the available papers; however, this factor was ranked as a least important factor in Bangladesh. Some of the top ranked factors are discussed in the perspectives of Bangladesh based on this study.

RISK IN AVAILABILITY OF LAND FOR PPP ROAD PROJECTS

The factor 'availability of land' for PPP road projects was ranked 1st overall. Though the factor was ranked 3rd by the clients, the contractors and the consultants groups ranked it as 1st. Availability of land is a very common problem for road projects in Bangladesh as it has a small area with high density of population. Construction of road projects needs considerable land. There also needs to be demolished high-rise buildings, markets and other structures which are located adjacent to the existing roads. Moreover, cost of the land in major cities in Bangladesh is extremely high as compared with the cost of projects. There are number of evidences of failure of road projects in Bangladesh due to scarcity of land.

IMPROPER PLANNING FOR PPP PROCUREMENT

Though 'improper planning for PPP procurement' was identified as one of the least cited factors in the available literatures, this factor was ranked 2nd in this research. The public clients ranked the factor as 2nd, while both contractors and consultants ranked it as 3rd. This is one of the critical risk factors in Bangladesh as most of the road projects in Bangladesh are taken into consideration on the basis of political choices. The financial and economic viability are often ignored while initiating the road projects in Bangladesh, which often extend the scope of projects in terms of time and cost overruns.

RISK IN FINANCING OF PPP ROAD PROJECTS

The respondents rated 'risk of financing in PPP road projects in Bangladesh as the 3rd most significant risk factor. The clients group ranked the factor as 5th, while both the contractors and consultants groups ranked it as 2nd. The risk is important to both contractors

and lenders as it may affect the project revenue and cash flow regime, which has a direct impact on payment for the services provided by the asset and consequently the recovery of capital invested by the lender.

DELAY IN LAND ACQUISITION

Delay in land acquisition was ranked fourth overall, while the clients group of respondents rated it as first. Both the contractors and consultants have ranked the factor as sixth. As most of the road project construction professionals in the public clients in Bangladesh have the bitter experience with land acquisition process in construction works. In Bangladesh, acquisition process requires number of steps to get the approval with lot of complexities, which causes for considerable time and cost overruns.

CORRUPTION IN GOVERNMENT SECTOR

Overall, the factor, corruption in government sector was ranked fifth. The contractors ranked it as third and the consultant group ranked as fifth, while the clients group ranked the factor as eleventh. Corruption exists in most of the public sectors in Bangladesh, which often cause for significant delay in project implementation. The contractors often make an excuse for causing delay due to corruption. The activities related to tendering process, getting approval for necessary documents, receiving the interim payments etc., involve some forms of corruption by the clients, which discourages the private investors to invest in PPP road projects.

CONCLUSIONS

The government is now considering initiating PPP procurement methods for development of the road sector of Bangladesh. However, some pressure groups including the public sector clients are trying to convince the policy makers not incorporating the private sector in developing the road sector of Bangladesh right now. The research shows that PPP road projects are very important to develop and maintain the road sector as the government is now not capable of providing large amount of public money to this sector. PPP procurement method can also improve the present project implementation inefficiencies including time overruns, inferior quality of physical works etc. However, PPP procurement method is adjudged of full of risks because of long-term concession agreement, multi-party involvement and large capital investment in addition to general project related risks. The private parties are not showing much interest in investing in Bangladesh as they are less informed about these risks associated with PPP road projects. 36 risk factors were identified through extensive review of literatures on risks in PPP road projects, which were used for ranking of these factors in the context of Bangladesh thorough questionnaire survey. The survey result shows that availability of land, improper planning for PPP procurement by the government, risk in financing in PPP road projects, corruption in public sector, government intervention and risk in acceptance of toll roads are some of the top ranked risk factors that might affect the success of PPP road projects in Bangladesh. To encourage the private sectors the government should emphasise minimising the impact of the above mentioned risk factors. Necessary land for road projects should be made available duly to the investors to make the projects successful. The policy makers should also motivate the pressure groups and the stakeholders including the mass people towards the requirement of PPP road projects in Bangladesh. Another important thing is creating the sound business environment for the local and foreign investors not intervening their activities by the top level of the government, which can ensure the return on investment for the investors.

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SESSION 9

CASE STUDIES IN FACILITIES MANAGEMENT

IMPROVING EFFICIENCY IN THE HOSPITALITY SECTOR DURING RECESSIONAL PERIOD

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The quest for cost reductions by owners of hospitality business has influenced the resurgence of the application of facilities management (FM) principles in recent years. Fierce competition within the industry means that organisations have to identify areas where cost-cutting measures can be made in order to maintain market edge. This application allows the hospitality clients to focus on core business which enables them to implement efficient and effective practical and cost saving solutions in the day-to-day operations of non-core facilities and services. This study presents preliminary results of an on-going research project on hospitality operations involving a leisure resort with four holiday villages situated in Nottingham, Suffolk, Norfolk and Cumbria in UK. These leisure resorts are located in 400 acres of land, consisting of hotels, sports facilities including a large swimming pool, retail and food outlets. The results discussed in this paper were derived from structured interview with a leisure company operations' manager and four case studies which clearly shows that effective management of the hospitality facilities and services requires a person who can multi task on both hard and soft facilities management. The research identified five key constructs where greatest value are added by the use of FM approach in the hospitality business namely accommodation package, reception operation, conference and banqueting, ground and maintenance works and laundry and linen services.

Keywords: hospitality, facilities management, cost savings

INTRODUCTION

The growth of hospitality facilities management (FM) in many countries in recent years has been led through many pull factors and demand elements associated with the financial success of businesses and organisations. These factors includes the need for cost reduction and value for money, increase in reliability in forecasting operating and maintenance costs and business focus on core business. The hospitality business covers a wide range of sectors offering accommodation, health clubs, sports facilities and theme parks (Losekoot, Wezel, and Wood 2001). The industry is divided into sectors according to the skill-sets required for the work involved. These includes entertainments and recreation, accommodations, meetings and events, health clubs, sporting activities, gaming and casinos, food and beverage, tourism services, and visitor information (Jones and Okoroh 2000). The adoption of a facilities management approach in the hospitality industry allows hospitality organisations to focus on their 'core' business whilst strategically contracting out their 'non-core' business. Medlik and Ingram (2000) argued that support functions surrounding a business may require specialist expert help therefore, outsourcing these functions offers practical business solutions to these activities. However, (Okoroh, Jones and Ilozor 2007) argued that the adoptions of FM principles within hospitality constructed facilities are primarily 'to improve their efficiency and add value to their performance and services'.

Other factors contributing to this growth includes effective and prompt implementation of changes in legislation and policies, the need for flexibility, increased applications of smart information technology and increased customer expectations. Thaker (2007) pointed out that 'the global hospitality playing field has been levelled and that the resulting impact on growth and profitability continues to push leading hospitality companies to explore more efficient business models.' It was then suggested (Apollo Sindoori Hotels Ltd 2010; Thaker 2007; Medlik and Ingram 2000) that there will be a continuous rapid change from tactical outsourcing to a more transformational approach where organisations will strive to continue being more efficient, more flexible, more productive and better prepared to handle external market dynamics especially during the economic downturn. Another reason for the rapid growth in the hospitality FM sectors is the increase in specialist hospitality contractors who now offer facilities management as part of their business solutions as hospitality managers strives to concentrate on their 'core' business.

Some in-house hospitality employees are also well trained and the environment in which hospitality employee's work has improved in recent years (Losekoot, Wezel, and Wood, 2001; Harkison, Poulston and Jung-Hee 2011). This means greater considerations being paid to life-cycle costing for the constructed facilities for which specialists contractors now offer their services often offering

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better value for money and much cheaper than the in-house team. Initial cost outlays to set up hospitality specialist business are also another pull factor which has represented the need for FM principles to be implemented into the hospitality sector. The majority of hospitality business today depends upon tourism and in a time of recession, it is essentially 'survival of the fittest' as many of these businesses embarked upon staving off bankruptcy due to dwindling number of their customers.

This paper discusses a preliminary result of research project into the growth of facilities management in the hospitality business in recent years.

RESEARCH METHOD

The survey instrument used was in two parts, the first part involved structured interviews with the leisure company operational managers. The objectives here was to elicit key constructs that contributes to the applications of FM principles in the hospitality sectors and the critical success factors of facilities management applications in the hospitality business. The second instrument involves a detailed case studies analysis into the management of Center Parcs resort. The operations manager has over 25 years experience in the hospitality business.

Center Parcs is a Leisure Company consisting of four holiday villages situated in Nottingham, Suffolk, Norfolk and Cumbria and this holiday village is used as the main case study. The four villages are located within 400 acres of land, housing 800 accommodation lodges, sports facilities including large outdoor and indoor swimming pools, sauna, gym, Jacuzzi, health and beauty treatments, a lake, retail and food and beverage outlets, modern meeting and conference venues with a family friendly relaxing environment (see Figure 1).



Figure 1: Outdoor swimming pool and reception area

The structured interview responses with the hospitality operations managers at Center Parcs complex were analysed and conclusions drawn. The reasoning behind the application of FM applications in the hospitality business were then deduced.

ANALYSIS AND DISCUSSION OF RESULTS

In order to achieve the main objective of this preliminary study which is to identify the key drivers for the growth of FM applications in the hospitality sector, qualitative discussions are used to analyse five key constructs where value for money is achieved by the use of FM approach. These include:

- Accommodation package
- Reception operation
- Conference and banqueting
- Ground and maintenance works
- Laundry and linen services.

ACCOMMODATION PACKAGE

The survey revealed that room sales represents approximately 40-50 percent of all the hospitality revenues and that it is the responsibility of the housekeeping department to refresh and maintain the rooms to high quality standards for the hospitality guests. Housekeeping duties are outsourced in order to maintain high quality of the room cleanliness and hygiene. Specialist contractors carry out both minor and major maintenance operations and repairs. Additional role within housekeeping includes a significant amount of laundry and linen in order to replenish the bedrooms daily. The manager stated that specialist contractors carry out planned refurbishment of bedrooms every 5 years. This is carried out in order to keep customer satisfaction to a high standard and it also help to attract customers to return to the resort for future visits and create the 'feeling of well being' as recommended by the Hotel Accommodation Package (Okoroh et al. 2007).

HOSPITALITY RECEPTION

According to (Jones and Jowett, 1998) without a well-managed reception, a hotel cannot function efficiently. In order to provide an efficient and robust service to customers, 'Center Parcs' employs a rigorous and excellent training programme for new receptionists to enable them gain confidence needed to cope with demanding and challenging periods. The staff training is tailored towards each specific role within the hospitality business. Whilst staff must complete inductions, there is also Bite Size daily training which is necessary for all new staff. Bite Size daily training is specific trainings tailored towards specific roles within the reception department. The training varies from the correct stacking of chairs to how to deal with customers in a satisfactory and polite manner. Reception is the first contact place for customers and therefore, the quality of the service provided must be friendly and courteous in nature and of exceptionally high standard in order to create a comfortable and inviting environment for customers. The reception has a modern reservation management system (Opera) used to allocate rooms to hotel guests and collates reports. The system has the function of amending guest requests with ease and can add or delete any extras. It is also capable of interfacing with different word processing software's, like excel, Microsoft Word or databases. It reduces the time spent in room's allocations, collating reports and calculating extras that receptionists traditionally carry out in a traditional fashion in some of the hotels. It also reduces human errors and saves money for the hospitality business.

CONFERENCE AND BANQUETING

The survey uncovered that only a minority of services in this department are outsourced although some small but key services are kept in house as it has the second highest sales figure with around 30 per cent of the total sales. The services that are outsourced include marketing and disco services which affords the hospitality business the opportunity to call the services of different DJ for various functions and at the same time, saves the cost of employing a fulltime DJ. The resort lies in a wonderful location with easy reach with an indoor and outdoor swimming pool, sauna, gym, Jacuzzi and health and beauty treatments, excellent restaurant and bar. It is the top choice for many companies to hold conferences, meetings and various functions. It has also the latest audiovisual equipments and PA systems, LCD televisions, video conferencing facilities to meet varieties of customer's needs and caters for different types of functions, like parties, wedding, birthdays and so on. Although, the in-house team carries out some marketing and sales, a large portion of their sales is done through additional external advertisements' and sales through websites such as Laterooms and Yellow Pages. This channel affords the company the opportunity to increase competition and make large number of people more aware of the company and some of the offers that are available. It is also cheap and easy to advertise sales on websites advertising firms like laterooms.com as much needed resources required for this are diverted elsewhere within the hospitality business.

GROUND AND MAINTENANCE WORKS

The ground and maintenance works are outsourced to specialist contractors. The contractor has specialist machinery and equipments needed to provide added value to the hospitality business. Acres of lands with large trees and beautiful gardens surrounding the

leisure resort require regular maintenance to comply with ever increasing health and safety regulations. The contractors' that looks after the ground and maintenance works carries out planned preventative maintenance (PPM). They also use reactive maintenance for minor works within the complex such as painting, rewiring and electrical appliance checks etc.

LAUNDRY AND LINEN

The Laundry and Linen services is also outsourced to a local contractor and covers things like washing, drying and ironing. In house team previously provided these services, however, they were almost always behind schedule due to the size of the laundry in the hotel and the influx of dirty linen from bedrooms and food and beverage. A decision was made in 2010 to outsource these services due to the poor performance, poor services, and large increase in the size of the laundry.

CONCLUSION

This preliminary survey has identified eight key indicators that encourage FM adoptions in the hospitality business which will be taken forward in the next phase of the research for an in-depth analysis. This includes:

- greater considerations to life-cycle costing for the constructed facilities in which specialists contractors now offer added value services often with better value for money than the in-house team.
- effective and prompt implementation of changes in legislation and policies
- increased demand for flexibility.
- increased use of smart information technology and growth in specialist hospitality contractors that offer facilities management services as part of their business solutions.
- increased customer expectations.
- rapid change from tactical outsourcing to transformational approach where organisations strive for continuous efficiency.
- increased flexible services and productivity, and;
- businesslike strategy to handle external market dynamics especially during the economic downturn.

By understanding the benefits behind these key indicators, trends might be established and a better understanding achieved on how and why FM techniques could be beneficial to the hospitality business. Increased profitability and quality has positive implications for hospitality organisation's performance and competitive position. The need for specialist skills and the importance of prompt compliance of health and safety regulations were perceived benefits to outsourcing maintenance work. The past few years have witnessed a major twist of events regarding market-orientation of some of the public sector, where competition and efficiency levels have been lagging behind the highly competition-gear private sector. In today's ever-changing business environment, built assets and service facilities are regarded as providing operational support services and the competitive niche that enhances any business success.

The past few years have witnessed a major twist of events regarding market-orientation of some of the public sector, where competition and efficiency levels have been lagging behind the highly competition-gear private sector. In today's ever-changing business environment, built assets and service facilities are regarded as providing operational support services and the competitive niche that enhances any business success.

The need for cost reductions as mentioned earlier is a pull factor which has influenced the resurgence of hospitality FM applications as fierce competition within the industry means organisations will have to identify areas where cost-cutting measures can be made in order to maintain the market edge.

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BUILDINGS AND PROPERTY AS STRATEGIC MEANS FOR EFFECTIVE HEALTH SERVICES

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The health sector is the most costly sector in all nations. In addition the sector undergoes an accelerating development within technical delivery, medical equipment, new organizational models, and challenging demographic changes. Both resource effective management and transformation of the building portfolio in line with the development of the health care services is necessary. One of the main objectives of the research is to contribute to further development of theories, and to the development of innovative and efficient methods and tools to support strategic planning and strategic FM, primarily on a portfolio level. Research methods used are a combination of qualitative methods (literature reviews, workshops, expert groups, interviews and case studies) and quantitative methods (questionnaires and mapping techniques). Innovative methods and tools for strategic property analyses and building evaluation with regard to the buildings viability, with a main focus on usability and adaptability, are developed and tested in several real life projects. The results give input to investment and development plans, and the usability assessment tools can also serve as an aid in the dialog between core business units and FM managers. Furthermore complex information is presented in a way that communicates easily with stakeholders, i.e. results are visualized by the use of easily understood diagrams and 3D BIM-models and Google Earth. The methodology will contribute to bridging the GAP and strengthening the interaction between core business and FM. This may lead to a more strategic and value adding FM practice.

Keywords: facility management, strategic asset management, usability, building portfolio

INTRODUCTION

NOK 103 bn are allotted to the Specialist Health Care Service (approx. NOK 20 800, or € 2700, per inhabitant) in the State budget for 2011 (Government Bill 1, 2010). This equals approx 10 % of the State budget. Employment in the sector equals approx. 95 000 man-years (NOU, 2010:13). Apparently, this organization's ability to function effectively and with adequate quality of service is of high societal value. In this context, the facilities serve only one purpose, which is to ensure that the Specialist Health Care Service will achieve its goals in the most resource-efficient way possible. This requires facilities well suited and customized for both current and future purposes. Buildings and property have an impact on the performance and effectiveness of the core business. If buildings and technical solutions limit the core services' efficiency and effectiveness, this will in the long run result in adverse consequences for the quality and range of services as well as the economy.

A four year long research project, managed by Multiconsult, with the title "Buildings and Property as Strategic Means for Effective Health Services" supported by the Norwegian Research Council was finished in 2010. An aggregate summary of the Specialist Health Care Service status (building stock, current practice of asset management) in Norway was for the first time established in this project. A strong demand for technical and structural upgrading is documented, plus a significant need to transform facilities in order to customize the locations for future health service packages (Larssen, 2011). The Specialist Health Care Service is facing a substantial need for investments, while the economic resources in general are limited.

Over the last years the literature, research and also what can be considered best practice within FM reflects a shift towards a more strategic approach and focus on added value (i.e. Then, 1999, Valence, 2005, Jensen et al., 2008). For the Norwegian Specialised Health Care Services Larssen (2011:19) found that *"In order to allow for elaborating a more professional and strategic facility management, it is necessary to develop a new understanding of roles for facility management, both within FM-units and in the management of the Health Trusts. A central element for such new understanding of roles is the focal shift from a responsive role with an operative perspective and major emphasis on costs towards a more active role and a strategic perspective, where more emphasis is put on the effects on the organization of core activities and FM's contribution to added value. The facility management in the Specialist Health Care Service is therefore required to focus more intensely on the contribution to added value, and to develop methods and tools, which allow for demonstrating the added value in buildings and property, and*

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the services of FM.” In order to obtain the best possible usability and added value for the owner, user and society this further includes FM to assume a more active role in the development of core activities within the health trusts (Larssen, 2011).

A central issue is the need to develop better and more integrated strategy and planning processes between the user organizations and FM, where the users’ changing needs and ability to operate effectively are in focus (Larssen and Kvinge, 2008).

Tools and methods for the evaluation of the usability of buildings in use could be useful in strengthening the Facilities Manager’s knowledge and understanding of the user organization and how buildings affect the effectiveness of organizations, and also serve as a basis for constructive dialogue and cooperation processes between the actors. Furthermore a building’s usability for the current core business combined with knowledge of the building’s ability for alterations (“adaptability”) are vital input for the strategic selection of further usage and the development of the respective building (continued utilization, rebuilding, new locations, and divestiture). Therefore the development of a method and tool for evaluation of usability of hospital building was initiated as part of the above mentioned research project.

The research related to the development of an overall strategic analysis model for building portfolios and of the usability assessment tools, which are one of several modules in the analysis model, are presented here. The results are implemented in MultiMap, a method for strategic analysis of building portfolios, which has become widely used in Norway.

THEORETIC FRAMEWORK

USABILITY

Usability is defined as “*Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.*” (ISO 9241 – 11). The definition is not originally developed for the usability of buildings, but for ICT and software products.

The CIB Working Commission on Usability of Workplaces (CIB 111) has operated since 2001, investigating methods and tools for assessment, and developing theory on usability for the built environment. In their latest report other key concepts than those mentioned in the ISO-definition have been identified as important for the understanding of usability, such as context, culture, situation and experience (Alexander (ed.), 2008). The report states further that “*...usability is a cultural phenomenon that can only be improved through a better understanding of user experience, considered as situated action in a specific context*” (Alexander, 2008).

The participants in the network also agreed that “*...usability is concerned with the effect rather than intentions or product – it is not POE and is a time, place, context and situation bound concept*”. This means that two identical buildings can have different effects on usability for their respective user organizations, or for the same organization over time. This also illustrates that functionality (the physical properties of the building) is not the same as usability. (Larssen and Larsen, 2009)

THE VIABILITY MODEL

The viability model (Larssen, 2011, adapted from Larssen and Bjørberg, 2004) combines the buildings’ usability and their adaptability, which in turn provides input on the strategic selection of further usage and the development of the respective building (continued utilization, rebuilding, new locations, and divestiture). The viability model is illustrated in Figure 1.

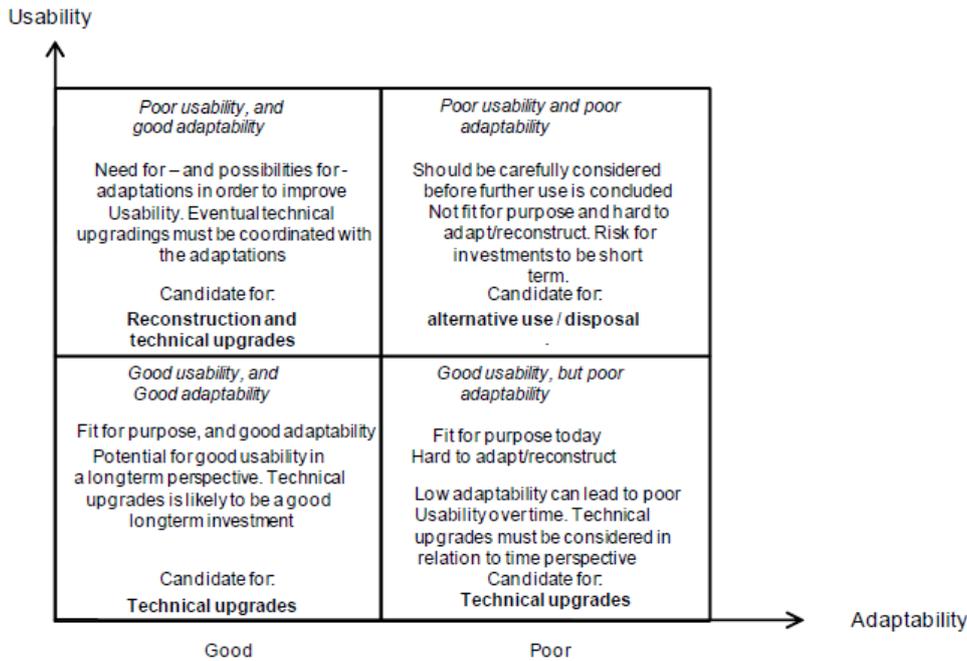


Figure 1 The viability model (In Norwegian: "Levedyktighetsmodellen". The combination of usability and adaptability (Larsen, 2011, adapted from Larsen and Bjørberg, 2004)

A widely tested module for the assessment of a buildings physical adaptability is already an established, and vital, part of the MultiMap methodology, and is not further described here.

RESEARCH APPROACH

The main objective for the research project was to develop an efficient method in terms of resources for the appraisal of usability related to organizational objectives and effectiveness. Preliminary results from the research on usability methods and tools were published by Larsen and Larsen (2009), where a set of criterias for the development of a method and tool for usability appraisals of hospitals were identified, based on theory and lessons learned from four case studies where pilot tools were tested. The criterias were:

- Sufficient information as input to analysis of building portfolios, or as a first scan of single objects.
- Resource effective (in data collection and analysis).
- Presentation of results must communicate easily with users, other stakeholders and decision makers.
- Serve as basis for further dialog and cooperation processes between users and FM, supply a common "language".
- The appraisal must be possible to repeat on a regular basis – process orientation.
- Possible to convert results to quantitative scores in order to compare, benchmark, make priorities, and follow the development of usability over time.
- Method and tool must be general and flexible enough for adaptation to different contexts and organizations.
- Cause and consequences of poor usability scores should be visualized more specifically than the methods we have used so far.
- A two-step approach can be relevant, where step 1 is indicative on a portfolio level, and step 2 is more detailed and based on closer dialog with users.

The further research has been based on these criteria and a closer study of typical objectives, activities and needs of different main organizational units in hospitals, in order to find specific parameters. A challenge has been to identify the most important parameters for usability appraisal of hospitals, to find a reasonable balance between generic and context dependent ones, and a sufficient level of detailing.

Buildings' impact on end users is documented through numerous evidence-based works, covering different aspects such as architecture, design, space, comfort, indoor climate, daylight and individual control, to mention some. In addition topics such as the effect on satisfaction, efficiency, productivity, health and patient recovery rates in hospitals are studied (i.e. Ulrich et al., 2008, McIntyre, 2006). Knowledge of the factors causing these different impacts on individuals is important for the supply of buildings that can contribute to best possible organizational performance. This is not discussed further here, but has been important input to the

development of criterions and parameters in the study on usability of hospitals.

Methods used in the development of methods, tools and parameters:

- Literature studies (on evidence based design, healing architecture, usability theory, evaluation methods and techniques etc.)
- Evaluation of several available existing assessment methods/tools
- Document studies
- Interviews
- Workshops
- Pilot testing and large scale cases using early versions of tools (Larsen and Larsen, 2009)
- After the research project was finished: Testing through several real life projects (2010-2011)

Several existing methods were evaluated against the predefined set of criterias for the methodology, and some has inspired the development of methods in this project, mainly in the identification of parameters. The study could not find any existing methods that met the criterias or aimed at usability in the context of organizational performance (at the time of the study: 2009/early 2010).

RESULTS

HOLISTIC ANALYSIS MODEL

The process of developing a longterm management and development plan for a building portfolio is illustrated in the analysis model in Figure 2. It is based on traditional demand-supply models, where the core business needs represent the demand for facilities, and the buildings represents the supply-side of the model. The model includes both the situation today and scenarios for possible future situations. MultiMap covers all areas in the Building Diagnosis box.

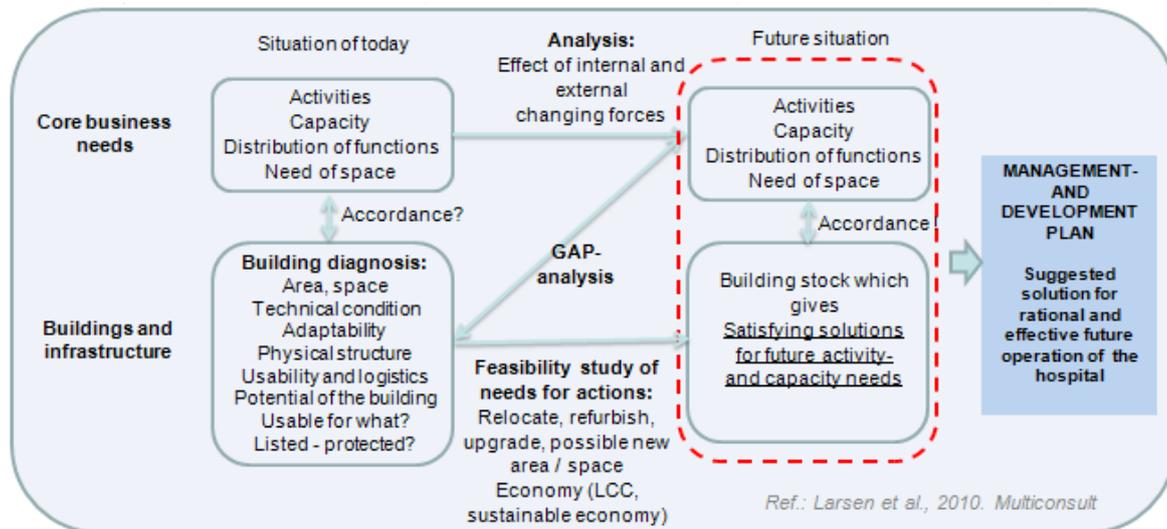


Figure 2 Holistic Analysis Model for strategic development of buildings and building portfolios (Larsen, 2011 p 195, adapted from Larsen et al., 2010 and Zwart et al., 2009)

Usability is one of several themes in the "building diagnosis". The research related to the development of usability assessment tools are presented in the following.

USABILITY – ASSESSMENT METHOD AND TOOL

Based on experience from cases, evaluation of existing methods, interviews, document analysis, workshops and literature several aspects related to buildings and equipment and which are relevant for usability were described, and finally grouped in 9 categories (Larsen, 2011):

- Activities – possibility to perform specific activities within the premises
- Capacity – sufficient capacity in relation to the activities
- Design – sufficient design (plan, room size and form, traffic area, visual contact, distances, availability etc.)
- Equipment, infrastructure and fixtures
- Indoor environment

- Condition and standard
- Logistics (internal – within a unit, and external – between units or outside of hospital)
- Adaptability and flexibility (physical, economical, organizational)
- Resource use, risk, security (the aspects above have a direct or indirect impact on this last category)

These are all relevant for the further identification of parameters that are used in the assessment tools.

Assessment tools

Two versions of assessment tools are developed:

- A matrix tool covering 8 parameters
- A more detailed questionnaire/interview guide (three A4 pages)

The detailed questionnaire has only been tested in two pilot cases (2 different units from the same hospital). The matrix tool is the one that has been implemented in practice, and is used in large scale in several real life projects in 2010-2011. The short version tool is in the form of a matrix, with 8 parameters. Each parameter is given a score from 0-3, where 0 is best and 3 worst, according to the Norwegian Standard for condition surveys (NS 3424). For each score per parameter the matrix gives a description as a guide for the scoring. The 8 parameters are (reference to the 9 main categories which are found relevant for usability is commented in brackets):

- Functions (do the premises include necessary functions – relevant for whether necessary *Activities* can be performed)
- Capacity (Adequate *Capacity* according to level of activity)
- Room sizes, shapes and design (relevant for *Design*)
- The Plan of the unit (Relevant for *Design* and internal *Logistics*)
- Communication routes (relevant for *Logistics*)
- Business related requirements for construction and technical infrastructure (relevant for *Equipment, infrastructure and fixtures*)
- Aesthetics and well-being (partly relevant for *indoor environment* and *Technical condition*)
- Distances/closeness - the units relations to other units (relevant for external *Logistics*)

These parameters deal with seven of the nine categories which are identified as relevant to usability.

The category *Adaptability* is covered by other modules in the method MultiMap and is therefore not included here. The last of the nine categories, Resource use, risk, security, will partly and/or indirectly be covered by the above-mentioned parameters. This last category is comprehensive and it has not been an ambition to cover all these aspects in an indicative assessment such as this. Assessment of Usability by the use of the matrix tool will mainly cover the eight first categories and partly the last. All in all this will give an indication on how well suited the premises are for the core business.

Assessment Methods

Two main approaches have been tested:

- Data input is provided by FM-personnel with good knowledge of the actual building. Quality Assurance is provided by personnel with insight in the health care organization in question.
- Assessment by interviews of one or several persons from each hospital unit followed by an inspection of the facilities. The assessment team is managed by a process leader. Team members are personnel with intimate understanding of the health care services and with experience from several hospitals so that they can “calibrate” the findings (both persons with clinical/medical experience, as well as hospital architects and engineers/FM-personnel has normally been part of the team).

The results have no doubt been best from the latter alternative, with a multi discipline perspective and a systematic dialogue with personnel from each unit, which contributes to acceptance and credibility of the results. The interview is very important, and often provides the most essential information. The experience and knowledge within the assessment team is also vital for effective communication with the respondents, asking the right questions, understanding the answers as basis for assessment of scores. It is also of high importance to make the respondent explain the consequences of the negative elements in the situation (i.e. costs, quality of treatment, injuries, risks, sick leave etc.) and to identify what types of approaches can solve the problem, whether they are organizational measures or simply physical/technical ones.

EXAMPLES OF PRESENTATION AND USE OF RESULTS

A basic principle with the developed methodology is the use of scores from 0 to 3, which gives a quantitative set of data. Results from the mapping can therefore be presented in a number of ways. A few examples are given here. Figure 3 is an example from the pilot

testing of the detailed questionnaire, where the respondent was the head of a Hospital Unit at a large Norwegian hospital. The dotted line illustrates how one in such a tool can define a level of acceptance, and visualize what condition is below that level. The diagram shows aggregated and weighed results for main categories based on several parameters in the questionnaire. The diagram shows that the premises works well for most needs in the case unit, except for the needs of the relatives and visitors. In this case there were no space, like a living room, where family and visitors could spend time with the patients. The only possibility was on a chair next to the patients bed, but since most rooms have two or more beds, and room sizes were limited, possibilities for social contact and support from family and other visitors during the stay was in practice very limited. Hence, the nurses will have less relief from relatives in the practical aid and care of patients, which also results in an increased work load compared to a more ideal situation. Both quality of the stay for patients, on the form of social comfort, and the effectiveness of the work processes for the nurses is affected.

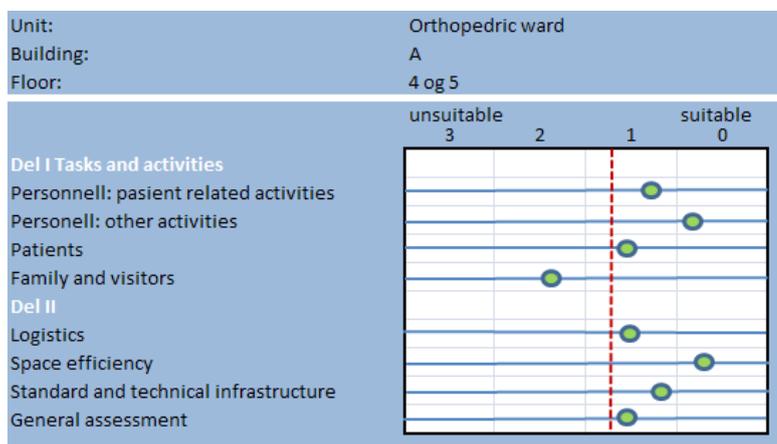


Figure 3 Example of a possible presentation of results from the detailed questionnaire – from a pilot Hospital case (Score from 0 to 3 where 0 is best) (Larsen, 2011:239).

The methodology was used as part of a feasibility study for the Hospital in Molde, Norway, in 2010-2011. Figure 4 shows how the four different alternatives were presented by the use of the Viability Model. Three alternatives were different combinations of upgrading of existing buildings combined with a new building. The upper blue circle represents today's hospital building. The other circles represent different levels of upgrading of the existing building, from minor investments (top) to massive investments (bottom circle). The different size and type of new buildings corresponding with each alternative is placed in the "best" category, in the lower left corner (good usability – good adaptability). The effect of upgrading of the older building is visualized, and illustrates that only level 3 will move the building from bad to good usability. The physical adaptability of the building is however still poor, and adaptations to future changes can be difficult and/or costly. That means that the building over time will move towards the upper right corner again. Each alternative was subject to an investment and LCC analysis. Alternative 3 had in this case approx. the same level of investments as the alternative which was a totally new hospital, and higher LCC, mainly due to more total gross area (lower space efficiency).

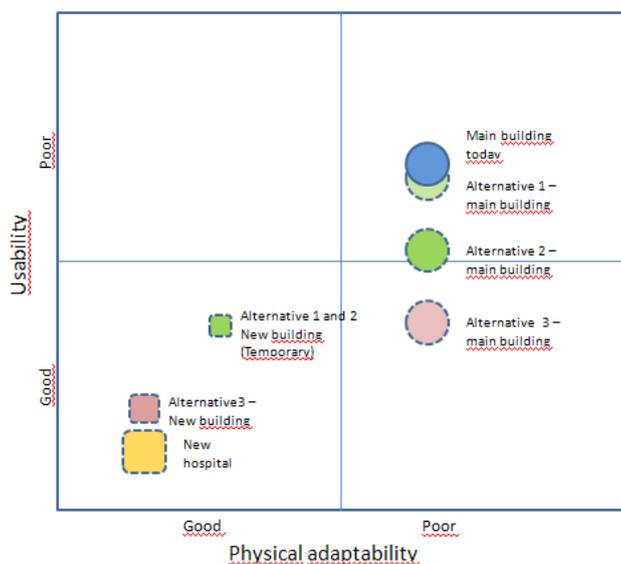


Figure 4 The Viability Model used to illustrate four different alternatives as part of a feasibility study Source: Multiconsult

Another way of presenting the results is illustrated in Figure 5. This shows a table with each unit that is assessed per row. The columns show the scores given for each of the 8 parameter in the matrix tool, and the weighed sum which is also “translated” to a color scale (traffic light principle). This is a practical tool to identify which units who has a need of improvement of their premises, and hence as input to development plans. For each unit a registration form is filled out, which gives more information to the planners or FM managers about the reasons for bad scores on single parameters.

Bruttoareal pr etasje [m2 BTA]	NY Hovedfunksjon per etasje	Funksjoner	F-paslet i enheter/etasjen	F-mmenes størrelse og utforming	F-hetens/etasjens planløsning	Kommunikasjonsveier i heten/etasjen	Enhets/etasjens virksomhetsrelaterte bygnings- og ballastjonstekniske forhold	F-estetikk og trivsel	Avstand / nærhet	Beregning funksjonell egnethet	Fargekode egnethet
300	Tekniske rom	0	0	0	0	0	0	0	0	0,0	
1200	Undersøkelse og behandling psykiatri	0	0	0	0	0	0	0	0	0,0	
1200	Undersøkelse og behandling psykiatri	1	1	2	2	2	1	1	3	1,6	
1200	Undersøkelse og behandling psykiatri	1	1	2	2	2	1	1	3	1,6	
1200	Undersøkelse og behandling psykiatri	2	2	2	2	1	2	1	1	1,6	
1060											
660	Renhold og sengehåndtering (sengevask)	3	2	3	3	3	3	3	2	2,8	
1060	Undersøkelse og behandling psykiatri	0	0	0	0	0	0	0	1	0,1	
1060	Undersøkelse og behandling psykiatri	2	2	1	1	1	1	2	2	1,5	
400	Undersøkelse og behandling psykiatri	2	2	1	1	1	1	2	2	1,5	
590	Kontor, møterom, enkle bibliotek, enkle fagarkiv etc.	2	2	2	2	3	2	1	1	1,9	
600	Undersøkelse og behandling psykiatri	1	1	2	2	3	2	1	1	1,6	
600	Undersøkelse og behandling psykiatri	1	1	2	2	3	2	1	1	1,6	
500	Undersøkelse og behandling psykiatri	2	2	3	3	3	2	2	1	2,3	
319	Kontor, møterom, enkle bibliotek, enkle fagarkiv etc.	0	0	1	1	3	1	1	1	1,0	

Figure 5 presentation of results per unit and floor by the use of the matrix tool. Weighted score illustrated by color codes to the right, where green is best, red is worst. (Source: Larssen, 2011:241)

Figure 6 shows results from assessment of a large Hospital campus in Oslo. The buildings in the upper right corner are all older buildings from the 1920 or older housing 24/7 activities such as somatic and psychiatric wards, as well as day-treatment, policlinics, laboratories and also partly technically advanced treatment. The technical condition of these buildings is also critically bad. All four buildings in the upper right corner are candidates for demolition in the suggested long-term development plan.

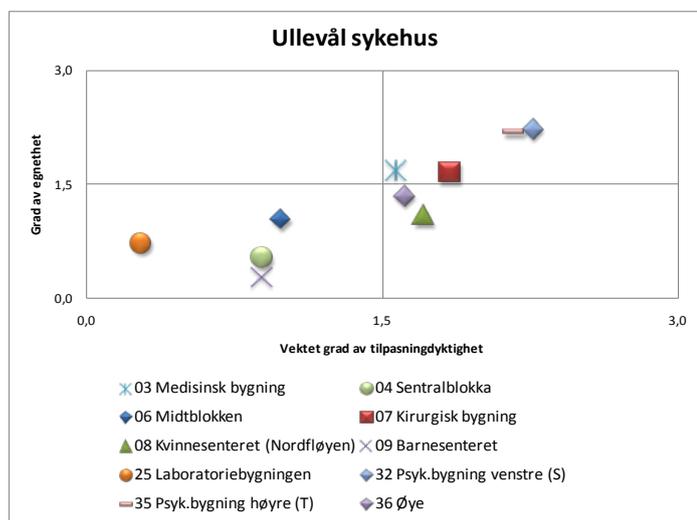
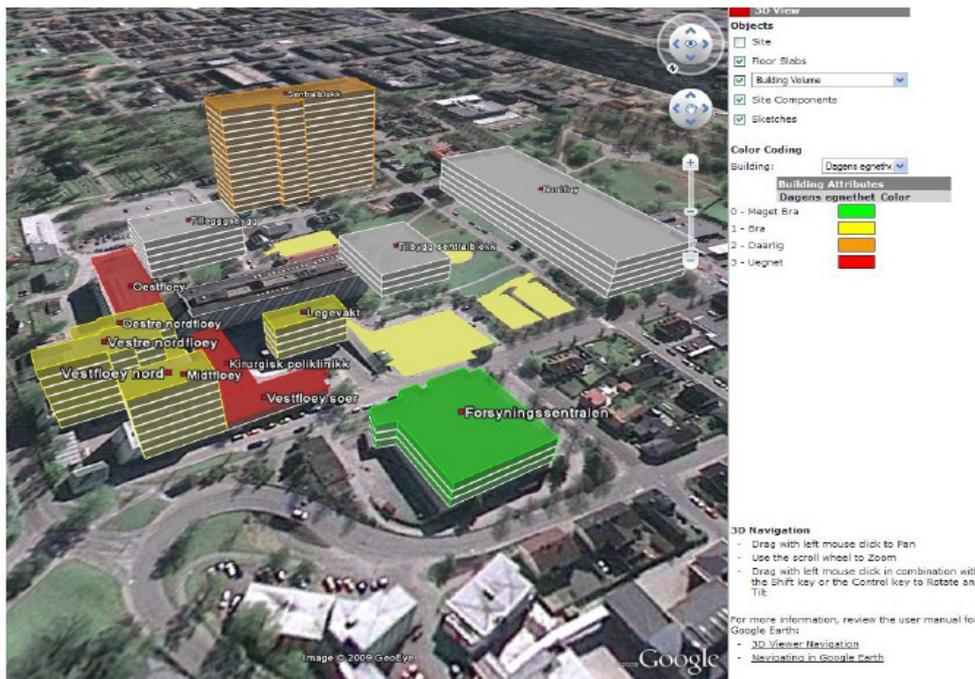


Figure 6 The Viability Model – results from assessment of buildings on a large Norwegian Hospital Campus, as part of the work on a strategic development plan for the Campus. Source: Multiconsult.

Experience from real life projects shows that one of the most powerful ways to visualize and communicate results is by the use of 3D BIM models, ref. Figure 7, and making them available for the clients on internet by the google earth platform. The client can log on and choose what region, main location, campus, single building and floor they want to see.



Figur 86 Eksempel på visualisering av resultater i BIM, her illustreres egnethet for dagens funksjon for bygningsmassen (Dataene er fiktive og kun ment for illustrasjon). Kilde: Multiconsult

Figure 7 Results of usability assessment from a larger Norwegian Hospital, part of a long term strategic development plan project. (Source: Larssen, 2011:250)

DISCUSSION

The developed tools and methodology has met the criteria's that were defined in advance. The two tools may serve as a possible step 1 (indicative) and step 2 (diagnostic) assessment. In practice however, so far only the matrix tool (step 1) has been taken into use in large scale.

Usability is defined as “Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” (ISO 9241 – 11). The practical use of the assessment method and tool has focused on single units in hospital, and does not fully cover all aspects of the overall hospital organisation. Furthermore respondents has primarily been representatives from the management of these units, not all categories of employees and not patients, visitors etc. The assessment does not cover all aspects according to the definition of Usability, but nevertheless gives an indication of the effect the facilities has on organisational performance and the persons using the facilities.

A main objective has been to provide methods and tools that can strengthen the strategic FM practice and bridge the GAP between the core business and FM. So far the results from practice has shown that the active approach to usability and the way results are communicated to decision makers in the examples shown above is effective, and is being used actively in strategic planning. The tools may also be effective for FM-personnel in their daily work, as an aid in the dialog with users, but this requires a shift in practice towards an active strategic role which is not so common today.

Validity of the Usability assessment tools are strived for through a thorough process to identify parameters. As mentioned above the tool does not cover all relevant aspects of Usability, but enough aspects to give an indication. Results will reflect the respondents and the assessment teams’ subjective understanding and interpretation. There will therefore always be some uncertainty to the results. Measures to handle and reduce these uncertainties must always be part of the assessment and analysis process. Examples of such measures are an appropriate choice of assessment team members, choice of respondents (who, how many, at what level etc), involving the organizations Safety Representatives, and supplementing data collection (i.e. key indicators such as space efficiency, productivity, costs, sick leave, etc.), study of plans etc.

A tool is just a tool, the result depends on how you chose to use it.

CONCLUSIONS

The methods and tools have been tested by case studies, and subsequently been put into practice within the scope of several projects (Among others, in connection with the examination of a future hospital structure in the Nordmøre and Romsdal Hospital Trust (2010), in the development plan work for the Vestre Viken Health Trust (2010), and in the development plan work for the Oslo University Hospital (2010-2011)).

Experience so far proves that respective methods and tools are relevant and useful for strategic area planning and for early stages of feasibility studies.

The tool for usability surveys also served to provide health authorities with a means for improved dialogue and understanding between facility managers and core business entities, by allowing the facility managers to understand the core businesses' needs better and how physical conditions work for them. The feedback given by facility managers who participated in tool testing proved that they perceive method and tool as serving this purpose well.

Suchlike tools could be useful for both, being proactive with respect to identifying needs and as aid in the documentation of the locations' and facility management's benefit value for the core business.

The approach and methodology of the viability model and the usability tools might be transferred to other types of enterprises. Furthermore the nine main groups of parameters identified as significant for usability are generic, and to a greater or lesser extent they are likely to apply to most types of enterprises. The content of the tools itself, however, is customized for hospital functions, and would have to be adapted to other types of enterprise.

FURTHER RESEARCH AND DEVELOPMENT

There is a need for further research and development related to the methods and tools, such as:

- Implementation and testing of the methodology in other sectors, and also on other types of infrastructure
- Further validation of methods and tools through real life cases
- Evaluation of existing hospitals with regard to effect for the core activity (good and less good solutions)

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EVALUATING THE IMPLEMENTATION OF FACILITIES MANAGEMENT AS A RURAL ENABLER: A MALAYSIAN CASE STUDY

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The purpose of facilities management (FM) is to provide integrated management at a strategic level to coordinate the provision of support services. The implementation of FM in South East Asia countries (such as Malaysia, Thailand and Indonesia) presents many challenges due to a lack of knowledge regarding organisational performance. Generally, FM has been espoused as a business enabler in Western countries. However, Asian countries are still struggling to implement FM as an approach for improving organisational effectiveness. The purpose of this paper is to provide preliminary findings of research regarding the capability of assimilating FM concepts at the rural level in such environments. The Homestay initiative, which addresses rural tourism in a community setting organisation, is investigated to explore the application of FM principles. These include leadership and management roles in sustaining the heritage attributes of everyday activities encountered in rural communities. The findings are based on a pilot interview of Seterpa Homestay (Kota Bharu) as the tourism destination and suggest that the community organisation practices FM principles of leadership and management. Moreover, social capital has been widely utilised in managing the Homestay tourism business. It is suggested that FM principles applied in such settings are radically different from conventional FM thinking in Western approaches. However, against a backdrop of changing practices, the challenge remains to sustain effectiveness whilst retaining cultural heritage. The research moves on to explore the Capability Maturity Model (CMM) as a tool for tracking FM capacity. This is based on the findings of the Seterpa Homestay community organisation. The present findings attempt to contextualise FM principles in rural settings providing a key business enabler. Thus, this research seeks to develop a comprehensive model of organisational capacity building in the rural context.

Keywords: community organisation, facilities management, Malaysia, social capital

INTRODUCTION

The manifestation of this paper arises from various considerations about the appropriateness of the current facility management (FM) practices when applied to the rural setting: in particular, the alignment of support services. The primary concern of the research is the evaluation of current FM development and implementation in rural South East Asia. The findings of this initial study provide an insight into the implementation of FM in the rural setting, and focusing on the principles of leadership and management approaches. In reviewing FM in the rural setting, the concept of 'community organisation' is explored and elaborated. The concept of community organisation is affiliated with power and the process of democratisation. It leads the rural community to changes that enable them to manage the facilities for a better quality of life. The process of democratisation is explored by Durkheim (1958) and Giddens (1972) in explaining the dynamic force of the community organisation's power.

In discussing the construct of community organisation, the issue of ineffective community organisation has been raised. Prior studies have shown that ineffective community organisations lead to the failure of rural development initiatives. Scholars such as Korten (1980); Ngidang (2003); and Donald et al. (2009) have discussed how ineffective community leadership distorts the community power of democracy. Putnam (1993) suggests that problematic leadership can be overcome at the community level by leveraging social capital. When managing facilities, communication flows and networks are the vital elements that bond the shared interest between the community leader and the community to achieve the rural development initiatives. Debates among scholars such as Wolcook (2001); Cote and Healy (2001); and Fukuyama (1995) view social capital as a useful mechanism to avoid the domination of a community leader's imbalance power.

The implementation of FM in South East Asia countries such as Thailand and Indonesia is still progressing, while according to Moore and Finch (2004), FM in Malaysia is still in the process of development. Moreover, Syed Mustafa and Adnan (2008); Kamaruzzaman and Ahmad Zawawi (2010) state that Malaysia still faces many challenges due to a lack of knowledge of performance guidelines in FM. Generally, FM has been successfully exploited as a business enabler in Western countries as demonstrated in high-profile

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buildings such as Australia's Sydney Opera House and the United Kingdom's Hatton World. However, an equivalent approach to the implementation of FM as a business enabler has yet to be explored in the rural settings.

This preliminary study explores the implementation of FM as a business enabler in the rural context. The rural tourism business initiative of Homestay represents a community organisation worthy of analysis in terms of applied FM principles. Such principles concern leadership and management in sustaining the heritage of the everyday routine, culture and pastime activities of rural communities. The community organisation of Seterpa Homestay (Kota Bharu) in Malaysia represents the pilot interview in this analysis.

LITERATURE REVIEW

COMMUNITY ORGANISATION

When we discuss community-based initiatives, it certainly relates to people's power and capacity that leads to changes. Thus, the power that community has tends to link to process of democracy. Democracy in this sense is viewed as the dynamic political force that influences all social spheres in the world that can be achieved and will integrate the population (Durkheim, 1958). This indicates that, the process of democracy tends to move and exercise the authority and power of the individuals as a form of institution in order to achieve the determined goals. Sociologists have tried to determine this form of authority in a modern industrial state (Giddens, 1972) and integrate it into the process of decentralisation and leadership in a democratic government at the local level in the rural development sphere.

The community organisation is regarded as the agent of change and development that promote community-based initiatives which bring benefits to the poor community in the rural development. Community organisation is not a grandiloquent feature, but it is a reality in the rural development world. This evidence can be seen in Indonesia, where the indigenous agency of the individual leadership such as 'Jumat Kliwon' in Java, 'Subak' in Bali and 'Nagari' in West Sumatra has been set up by the communities to represent their voices and interests in the rotating credit scheme (Beard, 2005). This is to overcome the poverty level of the indigenous people. The elements of trustworthy, awareness and consciousness are present in the self-help, self-sufficient and volunteerism tradition of these community organisations. The practice of community capacity and empowerment are illustrated by the social-cultural ethnic of self-help (gotong-royong in Indonesian language) in the cooperative conditions for wet rice production in Java, Indonesia (Bowen, 1986; Koentjaraningrat, 1961; Sullivan, 1992). However, several studies in South East Asia perceive community organisation as being ineffective. This is due to the existence of abusive power among the community organisation leaders in the leadership of community-based organisation (Korten, 1980; Ngidang, 2003). In such cases, community leaders or so-called 'local elites' do monopolise communities' interest in the decision-making process (Mansuri and Rao, 2004; Araujo et al., 2006; Bardhan, 2002; Donald et al., 2009). They stifle and block the community voices and preferences that distort community participation and empowerment.

In this case, the issue of leadership of leaders is perceived as the main factor of ineffective community organisation. This raises alarming questions on how to address the ineffective community organisation and what is the best solution to overcome this problem? Thus, being fully aware of this daunting problem that limits the process of democracy in the leadership of the community based organisation in managing the facilities, investing social capital is one of the solutions to this intimidating issue.

SOCIAL CAPITAL

Social capital is defined as 'the features of social organisation, such as networks, norms and trust that facilitate co-ordination and cooperation for mutual benefit' (Putnam, 1993). Therefore, we can relate to this definition that the effectiveness of the community organisation leadership is improved due to the facilitated coordinated actions that promote collective actions through the mutual interest. Civic networks enhance the effectiveness of communications and social organisation building and fostering the trust within the community (Colletta and Cullen, 2000). The effectiveness of the institutions or community organisations depends on trust, communications and flows of information (Putnam et al., 1993). However, Woolcock (2001) considers trust as an outcome of social capital, whereas Cote and Healy (2001) view it as a component of shared values. Meanwhile, Fukuyama (1995) asserts that social capital and trust integrate within an economic framework, whereby trust emerges as a key that measures social capital.

From the above definitions and explanation of social capital, we can conclude that investing social capital is useful in avoiding the domination of elite capture or abusive power of leaders. Social capital may ensure the synergy among the representatives and society to avoid the domination by particular interest groups (Warner, 1999). Hence, social capital is considered to be a useful mechanism that bonds the shared interest between the community leader and the community to achieve the rural development initiatives. At the

community level, social capital is a vital ingredient as the effort to drive and support the effectiveness of community organization. It will lead to participation and empowerment in the organising of community mutual interest. The elements of trust, norms, networks, communications and information flows drive and support the collective action which generates the community participation and empowerment that exercise the demand-laden delivery of shared objectives. This community driven initiative claims to empower the poor and marginalised community by making them take lead in the decision-making process to improve social conditions (Mc Lean et al, 2006) according to their preferences. It is a tool and mechanism that supports the local groups in delivering the local goods and services that strengthen institution building and local governance (Dongier et al., 2003). In this sense, social capital is perceived as the crucial ingredient that enables the community leaders or elites to act effectively as the agent of change in the rural community in managing the facilities in the rural areas to achieve the quality of life.

FACILITIES MANAGEMENT IN RURAL CONTEXT

Often, facilities management (FM) is associated with the old-fashioned sense of care-taking, cleaning, repairs and maintenance. Hence, FM is perceived as an integrated approach to the maintenance, improvement and adaptation of the premises of an organisation to support the primary objectives of the organisation (Barrett, 1995; Barrett and Baldry, 2003). Nevertheless, FM is not only based on managing the premises, it also encompasses the capacities of the organisation work to achieve the determined goals. This is in line with debates by Grimshaw and Keeffe (1992) who state that, FM is based on the effectiveness of an organisation to link to the physical environment within which it operates.

The concept of FM depicts the integration management on a strategic level to coordinate the provision of support services that integrates the scopes of process, services, activities and facilities (CEN EN 15221-1:2006(E) European Committee for Standardization, 2006). It covers 'multiple disciplines that assure the functionality of built environment by integrating people, place, process and technology' (IFMA, 2008). According to this definition, the concept of FM is appropriate to be applied in all contexts of management of space and other related assets management for people and process. This includes managing the facilities or FM in the rural setting especially in South East Asia. In relation to this, the main question arises; how is the development of FM in South East Asia such as Indonesia, Thailand and Malaysia? Is it progressing or regressing?

Hitherto, the implementation of FM in South East Asia in areas such as Hong Kong and Singapore has shown a clear sign of progression, while Malaysia is still in the process of developing FM in addressing the lack of understanding in implementing it (Moore and Finch, 2004). Furthermore, Malaysia is still facing many challenges in FM development due to a lack of knowledge and insufficient guidelines in FM (Syed Mustafa and Adnan, 2008; Kamaruzzaman and Ahmad Zawawi, 2010).

Generally, FM has been successfully developed and established as a business enabler in the Western countries. For example in Australia, the Sydney Opera House was recognised as an iconic 20th century architecture that contributes immensely to the nation in terms of cultural, commercial and tourism value. The maintenance, management and protection of Sydney Opera House as a performing arts centre and iconic status enables it to function as a business enterprise (Cooperative Research Centre for Construction Innovation, 2007). Moreover, Hatton Country World in Warwick, United Kingdom also is seen as an FM business enabler when it is converted from a traditional beef, sheep and arable farming into one of the country's biggest collections of rare breed animals that enables it to attract 500, 000 visitors in 1996. It has also employed 100 people to maintain and manage the farm as a rural tourism park (Alexander and McKenna, 1998). However, an approach of implementing FM as a business enabler has not been studied yet in Malaysia especial in the rural settings especially in rural tourism business.

In Malaysia, rural tourism business has becoming the priority tool of rural development orthodoxy to the nation (Liu, 2006). It has gained it prominence under the New Economic Policy since 1970 in boosting the nation economy. Moreover, rural tourism is often seen as an economic panacea for the rural communities (Marcouiller, 1997; Walmsley, 2003). Rural tourism is a multi-faceted activity that includes farm-based holidays that comprises special interest in nature holiday and eco-tourism. These include walking, climbing and riding, adventure sports and health tourism, hunting and angling, educational travel, arts and heritage tourism and ethnic tourism (Bramwell and Lane, 1994). Hence, rural tourism in Malaysia is often affiliated to 'Homestay' programmes that encompass heritage and traditional village pastimes, arts and crafts making and agricultural visits (Tourism Malaysia, 2011).

Thus, studying FM as a business enabler in Homestay organisation is yet to be explored. Exploring FM principles of leadership and management at the initial phase helps to infuse the organisation to develop the capacity for a better and effective organisation. FM Principles of leadership and management such as complementary, shared vision, integration, team buildings, trust and respect, accountability and ethical are needed to achieve the organisational capability (Anderson et al, 2006).

PILOT INTERVIEW

Pilot interview is undertaken in order to find out about the Homestay organisation. One respondent at the strategic level is selected via convenience sampling for the interview. The interview is divided into two phase, phase 1 is an interview about the Homestay organisation and phase 2 is about FM capacity.

Phase 1 – Homestay Organisation

Seterpa Homestay (Kota Bharu) is a heritage and rural tourism destination in Malaysia that has been applying the concept of Homestay. It is located 16 kilometers from the city of Kota Bharu Kelantan. Figure 1 shows the map of Kota Bharu Kelantan and Seterpa Homestay (Kota Bharu). It has been running for some time among the family members and friends who come to celebrate gatherings such as feasts, celebrations or pit stop for a day or more before continuing a journey. Currently, Seterpa Homestay is prepared to take on the challenge of offering a more systematic Homestay packages in order to promote heritage and rural tourism.

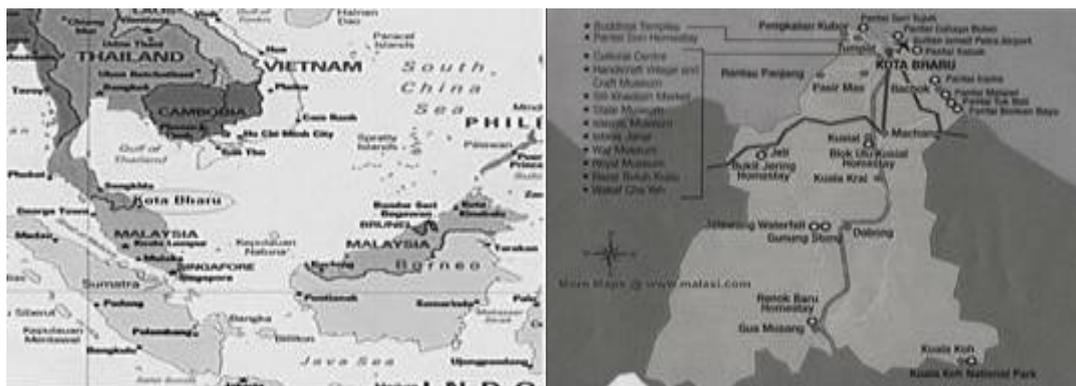


Figure 1: The map of Kota Bharu Kelantan and Seterpa Homestay (Kota Bharu)

Source: Kota Bharu Hotels (2010) and Malaysia Travel Tour Reference (2005)

Seterpa Homestay is managed by a community-based organisation and has its own committee members. This organisation consists of a chairman, vice chairman, secretary, treasurer, and seven bureaus, such as the leadership bureau; education bureau; economic bureau; cleanliness and health bureau; beautification and environment bureau; spiritual and civic bureau; and an information bureau. Each of these bureaus has their own committee members to ensure all 30 Homestay houses are clean and tidy and all three Homestay packages offered are run smoothly as scheduled. Table 1 indicates Seterpa Homestay packages offered by the community-based organisation.

Table 1: Seterpa Homestay Packages

Standard Package	1. Half Day Trip (No overnight) – MYR 60/pax ²	2. Two Days One Night – MYR160/pax	3. Three Days Two Nights – MYR 200/pax
	<ul style="list-style-type: none"> - Welcome reception & drink - Brief introduction of Seterpa Homestay - Village visit, handicraft & ancient products - Lunch (option A) or Dinner (option B) - Cultural performance, <i>Dikir Barat</i> & <i>Keratok</i> chants 	<ul style="list-style-type: none"> - Welcome reception & drink - Brief introduction of Seterpa Homestay and handover ceremony to Homestay family - Meal (breakfast/lunch/tea break/dinner) - Cottage industry visits & handicraft products - Rubber-tapping demonstrations, <i>Barik</i> painting, coconut plucking & ancient products exhibition - Cultural performance, <i>Dikir Barat</i> & <i>Keratok</i> chants 	<ul style="list-style-type: none"> - Welcome reception & drink - Brief introduction of Seterpa Homestay and handover ceremony to Homestay family - Meal (breakfast/lunch/tea break/dinner) - Cottage industry visits & handicraft products - Buffalo-plowing demonstrations, collecting snails, monkey show, <i>Barik</i> painting, coconut plucking & ancient products exhibition - Cultural performance, <i>Dikir Barat</i> & <i>Keratok</i> chants
Additional Package	<ul style="list-style-type: none"> - Fishing - Demonstration of traditional cooking 		
Special Package	<ul style="list-style-type: none"> - Demonstration of traditional wedding - Jungle trekking - Shopping spree at <i>Wakaf Che Yeh</i> market - Shopping spree at Duty Free Complex <i>Rantau Panjang</i> & <i>Pengkalan Kubor</i> - Personal portrait by renowned artist <i>Rossem</i> 		

Phase 2 – FM Capacity

This study attempts to develop a comprehensive model of organisational capacity building in the rural context. Pilot interview is

undertaken to contextualise FM principles in rural settings by providing a key business enabler. The importance of exploring the Homestay community organisation is vital at the initial stage of tracking FM capacity using Capability Maturity Model (CMM).

CMM is an organisational change model which is designed in order to improve workforce practices. CMM provides a roadmap for transforming an organisation by steadily improving its workforce practices. CMM are constructed with five levels of maturity. A maturity level is an evolution plateau at which one or more domains of the organisation's processes have been transformed to achieve a new level of organisational capacity. Thus, an organisation achieves new level of maturity when a system practices has been established or transformed to provide capacities and results the organisation did not have at the previous level. Therefore, the method of transformation is different at each level and requires capacities established at earlier levels (Curtis et al, 1995).

For the purpose of this research, an initial phase or Maturity Level 1 captures the pilot interview to contextualise FM principles. The pilot interview consists of exploration of leadership, management and social capital of the Homestay organisation. The initial stage indicates FM principles (leadership, management and social capital) instil basic discipline into workforce activities to achieve the maturity level of the organisational performance. Figure 2 illuminates the pilot interview at Level 1 of the Initial phase of CMM.

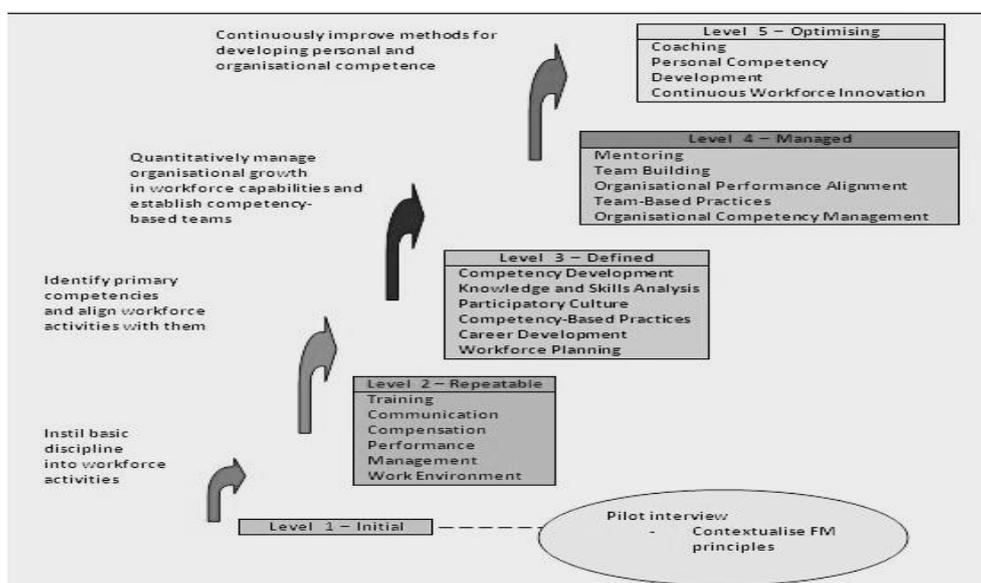


Figure 2: Pilot interview at Level 1 of the Initial phase of CMM

Source: Adapted from Curtis et al. (1995)

The pilot interview findings indicate that Homestay organisation does not imply the facility of manager's position. It is the responsibilities of facility manager that practices the monitoring of the Homestay houses and programmes (Homestay packages). According to the respondent, the organisation is established based on volunteerism and kinship. It exercises the process of democracy that leads the community to work together in running the Homestay houses and programmes. This is similar with the statement by Durkheim (1958); that democracy gives the community the power to the institution to achieve mutual interests. Moreover, democratic leadership, volunteerism and kinship are complementary elements of the facility manager's role.

According to findings, the capacity of the Homestay organisation can be seen when the community team up and work collectively after the community hold meetings. The social capital of trustworthy, communication and flows of information enhance the efficiency of the community organisation. Moreover, Colletta and Cullen (2000) perceive that social capital features facilitate and enhance the social organisation building within the organisation leadership and management. In managing Homestay business, the core element of trust and respect is vital. It influences the community to follow the leader to work closely and collectively because community's 'trustworthy' is a shared common value between the leader and the community. Moreover the community leader is working to earn trust and respect in order to run the Homestay business smoothly. According to the findings, the respondent is a 'local inhabitant' of the village, if the respondent is an 'outsider (non-inhabitant)' it is difficult to gain the trust and respect. The element of kinship holds the community to earn trust and respect towards the Homestay leader that generates the community to participate collectively in operating the Homestay business. Scholars such as Wolcook (2001); Cote and Healy (2001) and Fukuyama (1995) have also discussed the issue of trustworthy and social capital debates which is interrelated and interchangeable.

Generally, FM principles are perceived based on respondent's comments on organisational findings. The findings comprehend that social capital generates the leadership and management of the Homestay organisation. Moreover, the presence of social capital is critical in building the FM Principles in the rural settings. However, it is clear that the Seterpa Homestay organisation does not imply FM capacity organisation measurement to sustain the organisation effectiveness. In conclusion, prior studies by Syed Mustafa and Adnan (2008) and Kamaruzaman and Ahmad Zawawi (2010) are evidently true that FM in Malaysia is still facing a lot of challenges due to insufficient knowledge for organisational performance guidelines.

CONCLUSIONS

Facility management (FM) provides a key mechanism for sustaining the capacity of organisation performance. This preliminary study indicates the initial findings of the pilot interview of the Seterpa Homestay community organisation in operating the rural tourism of Homestay business at a strategic level. As a result, FM principles of leadership, management and social capital are explored based on the organisational findings.

The organisational findings show that Seterpa Homestay community organisation practises FM principles of leadership and management together with social capital in maintaining the Homestay houses and sustaining the heritage of the people and cultural activities of its programmes (Homestay packages). In this community-based organisation, the position of facility manager does not exist. However, the role of facility manager's responsibilities is exercised by the Seterpa Homestay community leader. Therefore, it deliberately shows that social capital trustworthy of Seterpa Homestay community leader is the remit of the duties of the facility manager. From the pilot interview it shows that Seterpa Homestay organisation does not enforce FM guidelines for organisational performance. Trustworthy, communication flows and networking between the community leader and the communities are believed to be leading organisational effectiveness. However, it is debateable such organisation only relies on leadership, management and social capital in order to sustain the capabilities of organisation. Therefore, it is vital to have a standard organisational change model in order to achieve the effectiveness of organisation workforce.

In the next stage of this research, the Capability Maturity Model (CMM) will be applied to evaluate Seterpa Homestay organisational performance. CMM is used to identify the stage of maturity of organisational behaviour capacity. The present evidence is strong enough for the claim that a paradigmatic transformation of the concept of FM is required. FM in the rural setting as a business enabler needs to be addressed as a significant branch of FM. What remains to be developed is a comprehensive model of organisational capacity to further evolve the FM operation in a rural setting.

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FACILITY MANAGEMENT INDUSTRY IN DEVELOPING COUNTRIES: THE CASE OF TANZANIA

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This research is aimed at identifying challenges and opportunities for development of Facilities Management (FM) industry in developing countries using Tanzania as a case study. The research is based on evidence from documentary evidence, web search, and the opinions of FM stakeholders such as practitioners, academicians, professional bodies' officials, researchers and government officials in Tanzania. Stakeholders were requested to rank the progress of the key factors essential for the development of the industry which include FM Organisation Practice, FM Supply Market, FM Education, FM Professional Bodies, FM Research and the FM Business Environment. The research also assesses the integration between the factors and their overall contributions towards the development of the FM industry within the country.

The research identified that the FM profession in Tanzania is disintegrated. There is no single unifying professional body. Service providers, suppliers, and other FM practitioners identify themselves with different profession bodies. In the case of outsourcing; the use of traditional vendor-client contracts are dominant. The profession is barely known. Generally, there is a lack of awareness of the potentials of FM as a profession. On the brighter side, the government of Tanzania has recently enacted a law that will regulate Public-Private Partnership and Private Financing Initiatives which will further create opportunities for development of FM. Despite this development, concerted efforts are required from FM stakeholders to deal with the identified challenges to enable the country to reap the benefits of FM as strategic tool in dealing with resource allocation issue. The research results can be applied in countries falling within similar economic bracket in Africa.

Keywords: developing countries, FM industry, FM development

INTRODUCTION

In 2007, the International Facilities Management Association (IFMA) published a report on the trends and development of the Facilities Management (FM) profession. The report identified a number of issues facing FM today and in the future. The epicentre of these issues is the 'expectation of doing more with less resources' as a consequence of rapid population growth and continued depletion of non-renewable resources. While the impact of population growth and resource limitation is a global phenomenon, there is no doubt that the developing countries are expected to be hit even harder due to lack of proper plans in resources allocation and rapid population increase. Population projection by the World Population Fund (2010) has shown that by 2050, the world population will be beyond 9 billion and 62% of this population will live in less developed countries (especially in Asia and Africa). These countries have been identified in the IFMA report (2007) as categorically being in a state of struggle in allocating their existing limited resources. The report concludes that these challenges related to population increase and limited resources will be of primary concern for the Facilities Management professionals.

In this paper, the FM industry is defined to mean "a sector that provides; manages and monitors optimal workplace solutions based on demand and competencies arising from a defined macro environment for the benefit of all stakeholders within a society". The definition embraces a sectorial approach which includes all of the factors and stakeholders that contribute to the formation, development and sustainability of an industry. Based on literature, Banyani and Then (2010) summarised four basic attributes of an industry to include (i) provision of products (tangible items) or services (intangibles items), (ii) generation of income and provision of employment (iii) systematic performance of the activities and prospects for continuity and (iv) tending, preserving and improving its stocks of resources. Rigorous analysis of these tenets and an in-depth review of literature such as Then and Akhlaghi (1992); Nutt and McLennan (2000); Lord et.al., (2002) and Barret and Baldry (2003) have identified essential factors for the existence and development of FM industry within a macro economy. These factors include FM Organisation Practice, FM Business Environment, FM Supply Market, FM Professional Bodies, FM Education and FM Research. These factors bear an acronym PEMPrEdR based on first letter(s) of each of the key words Practice, Environment, Market, Professional Bodies, Education and Research. In this

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research these factors are known as *feeder factors* or *feeders* and are defined as; “*Interdependent and interrelated factors essential for the existence, development and maturity of the FM industry within any national economy*”. The resulting framework from the level of development of feeder factors and integration of the feeder factors is known as “*The Integrated Feeder Factors Framework abbreviated as I3F*” as shown in Figure 1.

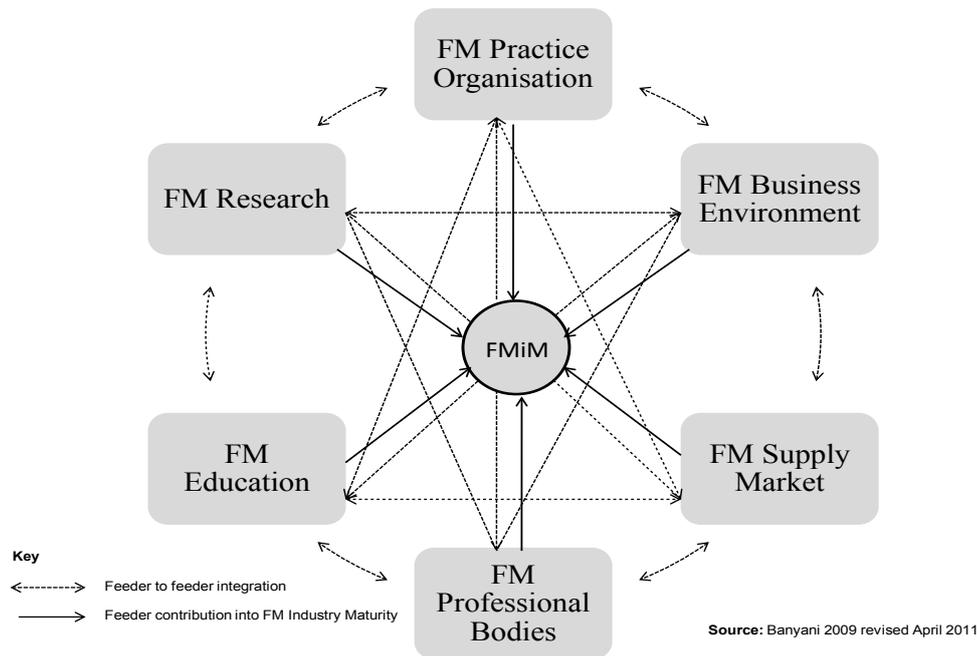


Figure 1: Integrated Feeder Factors Framework (I3F)

The underlying proposition is that the resulting overall maturity of the FM industry within a country is related to the individual development and mutual reinforcement of all the feeder factors. Individual development is based on the synthesised outcome of variables defined under each feeder and reinforcement resulting from perceived importance and value of integration (integration criteria). It is postulated that when all feeder factors are highly developed and highly integrated the FM industry will be at the Full Mature Stage (FMS). Whilst, when the feeder factors are highly underdeveloped with weak integration, then the industry will be at the Initial Formative Stage (IFS). In between these stages there are two transitional levels; Formative Transitional Stage (FTS) and Developmental Transitional Stage (DTS). The level of development and integration of these factors is a good indicator of the capabilities and preparedness of the overall industry at a macro level to meet the challenges associated with resource allocation. This paper is aimed at identifying challenges and opportunities for the development of Facilities Management (FM) industry in developing countries using the components of the proposed Integrated Feeder Factors Framework (I3F). Tanzania as one of the developing countries has been chosen as a case study.

SELECTION OF TANZANIA AS A CASE STUDY

Tanzania is the largest of the five countries forming the East African Community with a land mass measuring 945,090 square kilometers. Data from the official World Bank website (web.worldbank.org) classifies Tanzania as one of the developing countries with a GDP of USD 23b for the financial year ended in 2010. The country has an estimated population of 45 million people with a Gross Net Income (GNI) per capital of USD 530 per annum. The World Bank estimates that about 33% of the population lives below the poverty line and it has un-employment rate of 4.3%. Due to its poor infrastructure and insufficient facilities the government of Tanzania is investing heavily in the construction of road networks, bridges, health facilities, educational facilities, government buildings and market places using both internal and external funds (Budget Speech, 2011/12). There is evidence that the government has been spending around 60% of its development budget on the procurement of works (PPRA, 2010). However, public outcries due to poor planning, resource misallocation, embezzlements and corruption are vivid and rampant. Apart from the general public outcry this paper has been inspired by the following three cases:

CASE ONE:

When the Bank of Tanzania spent USD 332m on the construction of its 20-storey Twin Towers headquarters; the public went into frenzy due to the Bank's decision to continue with the project which had an initial estimate of USD 89m only. There were divided opinions on the reasons for escalation of the cost of the project, the government believed there were malpractices, the citizens attributed it to corruption and the Bank's management cited lack of expertise on the part of the responsible personnel. Construction experts in the country pointed out that the variation on the costs of twin towers were enough to construct a total of 142 schools or 580 kilometers of tarmac road (<http://www.corruptiontracker.or.tz> viewed 10th October, 2011).

CASE TWO:

The government and the National Social Security Fund (NSSF) have entered into a partnership to build a 680 metres Kigamboni bridge at a cost of USD 132m. This bridge is intended to connect the central part of the city and the Kigamboni peninsula. The striking feature of the project is the amount of capital each of the partners is expected to inject and the stake of ownership. NSSF has agreed to inject a total of USD 130m (98% of the project cost) while holding a 60% stake and the government the remaining 2% with a stake of 40%. Upon completion, users will be charged a toll during the concession period which is expected to last for 25 years. This is a very important infrastructure project since it will open up the expected "New Dar City Centre" to be built in Kigamboni to other parts of the city. On a positive note, this arrangement has direct benefits to the government, the society and the investor (NSSF). To the government this is the cheapest way to speed up its quest for better infrastructure due the amount of capital injected. To the general public, this will be the end of their long-standing dependence on unreliable ferries and to the NSSF; this is a source of income for the next 25 years. The weakness of the project is on the ratio of the stake between NSSF and the government, which is in a way not realistic and it may stand as deterrence to other investors to invest in such projects.

CASE THREE:

The government of the United Republic of Tanzania (URT) enacted the Public Private Partnership Act, No. 18 in 2010 for the purposes of regulating the relationship between the government and the private sector. The Public Private Partnership (PPP) and Private Financing Initiatives (PFI) are some of the drivers of the development of FM industry in United Kingdom and other countries (Payne, 2000). The Act provides under section 12(1) of its regulations of an appointment of a project officer, who has been entrusted with a number of functions during execution of the project. However, the Act does not provide for an appointment of the person to be involved in the management of the project during its operation phase.

The description of the above cases has led to the need for answering the question; how ready is Tanzania in dealing with issues identified in these three cases? Tanzania has been selected as a case study in order to obtain firsthand information on the development of feeder factors and their contribution to the development of the domestic FM industry. The paper uses feeder development matrices in assessing the individual feeder development and the state of the whole industry.

METHODOLOGY

The data used in this paper were obtained through questionnaires, interviews and documentary evidence. The research was conducted from May to August, 2011 mainly in Dar es Salaam city, the business and commercial hub of Tanzania. Questionnaires were used to obtain the opinion of FM stakeholders such as practitioners working for client and supplier organisations, academicians, professional bodies' officials, researchers and government officials in Tanzania regarding the level of development of the feeder factors and their attributes. Respondents were requested to rank the level of development of feeder factors and attributes based on a 9-point semantic scale. A total of 228 questionnaires were distributed to respondents from six groups representing the feeder factors. The number of distributed questionnaire for each group was; Practice (42); Environment (48); Market (43); Professional Bodies (41); Education (27) and Research (27). From the distributed questionnaires a total of 171 were fully completed and collected as follows: Practice (n=35); Environment (n=35); market (n=26); professional Bodies (n=31); Education (n=22) and Research (n=22). They represent a 75% response rate which may be attributed to the face-to-face distribution and collection of the questionnaires. Also, telephone follow up (up to five calls in some situations) were made to request and remind respondents to complete the questionnaires. Some respondents commented that the questionnaires had too many questions and consumed a lot of their time. Data were also obtained using face-to-face interviews to complement and clarify the answers which were obtained through questionnaires. This approach proved to be very useful since FM as an area of specialisation is new in Tanzania and respondents were confused with some aspects of feeder attributes. For example, it was noted that many respondents tended to confuse the single services delivery option and single source tendering option. Data were also obtained from official documents

such as the government budget for the year 2011/2012; Annual evaluation and performance reports, Government Notices, legislations, authenticated newspaper articles and official websites.

Data obtained from various sources were analysed and the results matched against the feeder factors development matrices. In the case of attitudinal data obtained from questionnaire survey; the option with the highest score (in percentage) was taken to represent the consensus of respondents relating to the issue or item under inquiry. These matrices are developed to reflect evolutionary stages of FM variables assessed under each feeder factor. There are twenty two (22) variables which are used to assess the development of FM industry within an economy. The highest number of variables is recorded in the feeder, *FM Organisation Practice* which covers issues such as positioning, range of services, mode of delivery, contract management, in-house competence and the role of FM organisation. On the other hand, the feeder Research has the least number of variables covering existence of FM research and evidence of publications. The matrices are designed with four progression levels of development ranging from Level I (the least developed) to Level IV (most developed). Mapping the data collected against each of the feeder factors development matrices enables a quick evaluation of the existing FM industry within an economy by the resulting profiles produced.

RESULTS AND DISCUSSION

This section provides the results from the research conducted in Tanzania on the development of FM industry. The shaded boxes in the matrices represent the level of development of each feeder factor for Tanzania based on the level of development of identified variables. The following subsections provide a detailed analysis and description of each of the variables and feeder factors development in Tanzania based on the gathered evidence.

FACILITIES MANAGEMENT ORGANISATION PRACTICE

Facilities Management Organisation Practice is taken in this study to represent FM organisation which is acting on behalf or serving the interest of the client organisation. Six variables have been identified to be important in assessing the level of Facilities Management Organisation Practice development within a country. These variables are positioning, range of services, mode of delivery, contract management, in-house competence and the role of FM organisation. Data were gathered using questionnaire (n=35) and documentary evidence. The analysis conducted has shown that practitioners holding positions involved in carrying out facilities management functions bear various titles such as property manager, estate manager (officers), estate management officer or corporate support services manager. The study has noted that even graduates in Facilities Management did not bear the Facilities Manager title. Data analysis revealed that about 42.2% of respondents have a background in Real Estate and Property Management; 22.9% in Facilities Management and 5.9% in Real Estate Finance and Investment. The remaining 27% was shared by Quantity Surveying (8.8%), Supplies and Procurement professionals (11.4%); Engineering (5.9%) and Accountancy (2.9%). All respondents had a formal advanced diploma education or higher. These respondents were working as managers at an operational level providing basic support services on a building and site basis, with exception of only 8.8% who had portfolio of properties in other regions in the country.

The managers had enough competence to deal with routine technical and administrative issues. Out of the list of 19 Facilities Management functions, the respondents rated security, property management, cleaning and building maintenance services to be the most common services delivered. While strategic facilities planning, health and safety, IT, voice and data management, energy management, business process outsourcing, large infrastructure project and knowledge management fared the least. The respondents also revealed that single services delivery option is the dominant mode of service delivery. While 85.7% of the respondents pointed out that traditional vendor-client prescriptive short-term contracts are common; the Public Procurement Regulatory Authority (PPRA) observed that service delivery management and contract management are not properly conducted in Tanzania (PPRA, 2010:56). Facilities management organisations in Tanzania tend to focus on ensuring the availability of services and ensuring the smooth running of the facilities and services. These organisations are not involved in strategic facilities planning which supports the observation by PPRA (2010:55) that procurement entities in Tanzania do not prepare annual procurement plan. The data gathered from Tanzania was mapped against feeder factor Facilities Management Organisation Practice development matrix and the result is shown in Figure 2. The shaded area represents the level of development of the feeder FMO Practice in Tanzania.

Figure 2 reveals that Facilities Management Organisation Practice in Tanzania has characteristics that are found within Level I and Level II in the development matrix. The dominant characteristics are those found in Level I.

VARIABLES LEVEL OF DEVELOPMENT	POSITIONING	RANGE OF SERVICES	MODE OF DELIVERY	CONTRACT MANAGEMENT	IN-HOUSE COMPETENCE	ROLE OF FM ORGANISATION
Level IV	FM Director at Board Level with national / international role	Full range of property and support services at portfolio level for multiple sites	Total / Integrated Facilities Management contract PPP/PFI contracts – design /build / operate	Strategic Alliances, long term contract of more than 10 years. PPP/PFI type of contracts can range from 25-30 years.	Strategic competences able to anticipate and meet business demand – focus on effectiveness	Ensure facilities and services are continuously aligned with business direction – focus on promoting corporate and social values like sustainability (societal view)
Level III	FM Manager reporting directly to a Board Member with regional role	Partial Full range of property and support services at portfolio level for single or multiple sites	Bundled /multiple services options	Partnerships, medium to long term (5-10 years)	Tactical skills with some strategic capabilities, able to manage and monitor services delivery to add value	Manage provision of facilities and services as a business resource – focus on value adding to shareholders (Business view)
Level II	FM Manager at operational management level	Basic property (assets) and support services on a building or site basis	Single services delivery options	Preferred Suppliers or exclusive service provider, medium term (3-5 years) contracts	Enabling competences, able to provide the required services – focus on cost efficient delivery	Ensure smooth running of facilities and services - focus on cost minimization
Level I	Technical/ administrative staff	Basic property (assets) and support services on a building by building basis	In-house/ out-tasking	Traditional vendor- client prescriptive short-term (1-2 years) contracts,	Technical and administrative competence able to respond to routine and ad hoc issues	Ensure smooth running of facilities and services - focus on availability

Figure 2: Development of Facilities Management Organisation Practice in Tanzania

FACILITIES MANAGEMENT BUSINESS ENVIRONMENT

Facilities Management Business Environment is related to variables which could drive the development of the industry outside the FM organisation influence. Four variables have been identified to be important in assessing the level of Facilities Management Business Environment development within a country. These variables are related to political environment, economical environment, social environment and technological environment. Data used in this feeder was essentially collected using documentary evidence and questionnaires (n=35).

Politically, Tanzania was a socialist country with a command economy since 1967 until 1985 when liberalization economy and privatisation was introduced. The introduction of privatisation opened doors for private sector businesses and went hand in hand with the public service reforms aimed at ensuring provision of better and efficient services to the general public. Different private enterprises were introduced providing all sorts of products including FM services. While the procurement of services in the private sector is being regulated by the forces of demand and supply; in 2005 the government on its part formed an authority to oversee the quality and efficiency of services procured by its Ministries, Department and Agencies (MDAs) and Local Government Authorities (LGAs). The authority is known as Public Procurement Regulatory Authority (PPRA). The authority is also charged with a task of ensuring that MDAs and LGAs adhere to the provisions of Public Procurement Act. The government also reformed its Department of Supplies and Services into an Executive Agency known as a Government Procurement Services Agency (GSPA), which among other objectives, has responsibilities to arrange and manage framework agreements for common use items, works and services for MDAs (GN 235:6) and provide adequate quality supplies at competitive prices to government and non-government institutions (GN 235:7).

These two bodies have a direct impact on performance and development of the FM industry in Tanzania. While the GSPA's role is

to negotiate and set standardised prices for all services and items procured by MDAs through the common use items and services (CUIS) agreements; the PPRA regulates the general procurement practice through the provisions of Public Procurement Act (2004) and its regulations. PPRA and GSPA through their regulatory mechanisms tend to encourage the growth of small size FM firms with limited capacity and innovation, thereby limiting the possibility of multiple services contracts. For example the Public Procurement Act (2004) requires the grouping of services and items into lots of similar nature and restricts more than one lot to be offered out in the same tender (TPJ, 2011). This would mean a procuring entity in need of security, catering and cleaning services has to have three tender invitations and three contracts to manage.

The study has shown that 77.1% of the respondents believed that the political environment has opened up enough to allow for the participation of the private industries but did not generate much competition. The study also identified that over 65.7% of the respondents do not have plans and programs for dealing with changes in demand of the facilities. This echoes the earlier observation by PPRA (2010:55) that around 61% of 99 procuring entities that were audited in 2008/09 had no annual procurement plans.

On the technology adoption, the study reveals that 88.4% of the respondents ranked technology as a means for simplification of their existing day-to-day functions such as word processing. This result agrees with the PPRA (2010:69) observation that many procuring entities (especially LGAs) had no IT equipment and were not connected to internet services which makes it difficult to use Procurement Management Information System (PIMS). The shaded area in Figure 3 indicates the level of development of the feeder factor FM Business Environment in Tanzania.

VARIABLES LEVEL OF DEVELOPMENT	POLITICAL ENVIRONMENT	ECONOMICAL ENVIRONMENT	SOCIAL ENVIRONMENT	TECHNOLOGICAL ENVIRONMENT
Level IV	Encourage and up-hold high level policy dialogue and consultation in response to contemporary FM issues	Demonstrable value for money	Availability of strategic long term plans to deal with a change in demand for assets and services	Transformation of the existing workplace environment by leveraging technology innovations to promote flexible workplace
Level III	Encourage longer-term contracts through transparency and trust	Adopt performance-based service contracts as basis of monitoring service delivery and encouraging innovations.	Existence of medium term plans and programs to deal with a change in demand for assets and services	Technology as knowledge management tools leading to improvement overall effectiveness of FM processes/functions
Level II	Government initiatives to enhance competitive provisions of public services	Measures taken to promote open competition for procurement of FM services	Existence of short term plans and programs to deal with a change in demand for FM assets and services	Technology as enablers in improving efficiency of existing FM processes/ functions
Level I	Recognition of the contribution of FM in efficient service delivery	Measures taken to minimise support services costs	Ad-hoc plans and programs to deal with a change in demand for FM assets and services	Simplification of the existing working condition

Figure 3: Development of Facilities Management Business Environment in Tanzania

Figure 3 reveals that Facilities Management Business Environment in Tanzania has dominant characteristics that are found within Level I in the development matrix.

FACILITIES MANAGEMENT SUPPLY MARKET

Facilities Management Supply Market is related to variables which define the ability of FM services providers and suppliers as well as the source of market data within a particular country. Three variables have been identified to be important in assessing the level of Facilities Management Supply Market development within a country. These variables are Supplier's Customer Base, Procurement Options and Access to FM Market Information. Data were gathered through questionnaire administered to service providers and suppliers (n=26) and documentary evidence. Service providers and suppliers in Tanzania tend to be limited in terms of functions and geographical areas covered. The study has revealed that local service providers operate within an area in which their headquarters is situated covering just one specific service such a security, property management, cleaning, catering etc. About 65.3% of the respondents involved in the above named functions are situated and operate within Dar es Salaam city. It has also been noted that

23% of the respondents provide services in one or two regions outside the city. The remaining 11.7% covers more than five regions. The bottom line is there is no service provider or supplier covering more than seven out of 21 regions. The list of service providers for security, catering and cleaning services for various procuring entities for all 21 regions of Tanzania Mainland released by GSPA for year the 2011/12 (www.gpsa.go.tz/ and TPJ 2011a; 2011b) support the above argument.

The list shows that in catering services a total of 533 services providers were chosen for all 21 regions and out these only 5.3% came from the respective regions. In security services, 107 services providers were chosen and only 17.7% were from other regions while out of the 123 service providers in cleaning services, only 17% were from other regions. This confirms the capabilities of many services providers and suppliers to be local in nature, only able to provide services within a certain region. On procurement options, the study established that single service contracts are dominant over other options. Service providers and suppliers tend to specialise in a specific category of services. It was noted for example that a company that is dealing in supply of furniture is not ready to compete for a tender that includes other items such as vertical blinds and carpets (TPJ 2011a:2). This is in tandem with the result from the survey which has shown that about 82% of the respondents are involved in one specific FM services only.

The study has revealed that there is no readily available integrated source of data for FM industry that can be used in estimating the volume of FM transactions or a number of people employed in it. Different FM functions are scattered in a number of sectors such as construction as one sector and a service sector covering transport, communication, hotels and restaurants, real estate and business services, public administration, education, health, trade and repairs and other social and personal services (BOT, 2010). This classification of the services industry makes it difficult to single out the contribution of FM to the economy. The shaded area in Figure 4 indicates the level of development of feeder factor FM Supply Market in Tanzania.

VARIABLES LEVEL OF DEVELOPMENT	SUPPLIERS' CUSTOMER BASE	PROCUREMENT OPTIONS AVAILABLE	ACCESS TO FM MARKET INFORMATION
Level IV	International capability	Total Facilities Management or PPP/PFI contracts (design-construct-operate)	Estimates/data from established data bank e.g. Statistics Bureaux
Level III	National capability	Total Facilities Management or Bundled services options or PPP/PFI contracts (design-construct-operate)	Estimates from a particular commissioned study
Level II	Regional capability	Single/bundled service contract option	Estimates tend to based exclusively on construction industry outputs
Level I	Essentially local provision	Single service contracts	Size of market not defined / varying estimates from different sources

Figure 4: Development of Facilities Management Supply Market in Tanzania

Figure 4 reveals that Facilities Management Supply Market in Tanzania has characteristics that are found within Level I and Level II in the development matrix. The dominant characteristics are those found in Level I.

FACILITIES MANAGEMENT PROFESSIONAL BODIES

Facilities Management Professional Bodies are organisations that are dedicated to the development and safeguarding of FM industry within a country. The study has identified four variables that can be used to assess the development and maturity of professional bodies within a country which are level of representation, membership attributes, professional training and distribution of branches (local/international). Data were gathered using information from the official professional bodies' websites, questionnaires (n=31) and interview with some existing professional bodies' leaders (n=3). It was revealed that there is not integrated FM representation in Tanzania. The existing FM professionals tend to identify themselves with the traditional FM related professions.

The study has shown that around 86% of the respondents prefer to be associated with their traditional professionals. It was noted that real estate related professionals identified themselves with the National Council of Professional Surveyors (NCPS) and Tanzania Institute of Valuers and Estate Agency (TIVEA). Procurement and Supplies Professionals tended to be associated with the Procurement and Supplies Professionals and Technicians Board (PSPTB); Contractors are aligned with the Contractors Registration

Board (CRB); Engineers with the Engineers Registration Board (ERB) and Architects and Quantity Surveyors with Architects and Quantity Surveyors Registration Board (AQRB). Interview with leaders of the two of the registration boards indicated that FM is not known to be a profession that can be accommodated within their boards. These organisations provide professional and continuous education to their members. It has been revealed that apart from CRB which has branches in Mwanza city, Mbeya city, and Arusha city other traditional FM related professional Bodies operate from their headquarters in Dar es Salaam City alone. Also it was noted that NCPS, TIVEA and PSPTB have no official web-site. The shaded area in Figure 5 indicates the level of development of feeder factor FM Professional Bodies in Tanzania.

VARIABLES LEVEL OF DEVELOPMENT	REPRESENTATION BY PROFESSIONAL BODIES	MEMBERSHIP ATTRIBUTES	PROFESSIONAL TRAINING	LOCAL AND INTERNATIONAL BRANCHES
Level IV	Existence of multiple Professional Bodies representing FM professional interests	National and International distribution of members	Formal accreditation of FM courses with full responsibility and provision of continuing professional education at national and international level	Distribution of branches at national level and chapters at an international level e.g. IFMA
Level III	Existing of one or more dedicated FM profession body with other traditional FM- related disciplines embracing FM within their discipline.	Widening acceptance of FM professionalism, attracting membership from traditional disciplines	Accreditation of FM education and provision of CPD training	Promotion of FM professional discipline within a country
Level II	Emergence of FM professionals. Recognition by existing professions bodies representing FM-related traditional disciplines	Practitioners operating under different traditional professional bodies	Existence of formal FM training organised by traditional FM related institutions.	Local branches representing traditional disciplines
Level I	No dedicated FM Professional representation.	Technicians operating under different traditional professional bodies	Available training at vocational/trades level, based on traditional disciplines	No formal professional FM representation

Figure 5: Development of Facilities Management Professional Bodies in Tanzania

Figure 5 reveals that Facilities Management professional Bodies in Tanzania have characteristics that are found within level I and level II in the development matrix. The dominant characteristics are those found in level I.

FACILITIES MANAGEMENT EDUCATION

Facilities Management Education is taken to mean the courses that embrace FM competence areas prescribed by FM professional bodies. The study has identified three areas to be important in assessing the level of development of FM education within a country covering number of courses, content of the courses and level of the courses. Data were gathered using interview (n=2), questionnaire (n=22) and from official websites of the organisations offering FM courses. The study has revealed that from 2005, there were two Facilities Management courses offered in Tanzania on top of vocational education offered by Vocational Educational Training Authority (VETA) and technical courses offered by various technical colleges such as Mbeya Institute of Technology (MIT), Dar es Salaam Institute of Technology (DIT) and Arusha Institute of Technology (AIT). Also there were FM related courses offered by the University of Dar es Salaam (UDSM) and Ardhi University (ARU). In 2005, the department of Civil Engineering of Dar es Salaam Institute of Technology started to host a Masters Degree course in Facilities Management offered by Leeds Metropolitan University. The course was offered on-line and students had an opportunity to meet with lecturers within determined schedules. According to DIT officials, the course is no longer running after only two batches of admissions of 25 and 12 students respectively. In 2006 the ARU started offering a Bachelor of Science in Property and Facilities Management course. The course is still running but with inconsistent admissions; it was revealed that in 2006/7 a total of 11 students were admitted; in 2007/8 the number increased to 26; in 2008/9 it dropped significantly to 7; and increased to 13 in 2009/10 and 23 in the following year. The university is expected to enroll a total of 20 students in 2011/12. Under the current situation, this is the only FM course being offered in Tanzania.

The Bachelor Degree in Facilities Management offered by the Ardhi University is a four-year course which is divided in eight semesters.

In the first three semesters students in this and other degree programs within the School of Real Estate Studies (SRES) are required to attend common foundation courses. Some of the subjects covered under foundation courses include development perspectives, communications skills, Mathematics, Introduction to ICT, Principles of Economics, Principles of Management, Elements of Law, Environmental Studies, Land economics and Architectural Studies. Starting in the second semester of year II students begin to concentrate in their specialisation; subject covered are shown in column 1 to 4 of Table 1 below. These subjects are compared with the broad competence areas defined by IFMA in 2011 (column 5) to evaluate their overall compliance as FM courses.

Table 1: Specialisation subjects in BSc. Property and FM Course at Ardhi Univeristy

YEAR II SEMESTER I	YEAR III SEMESTER I	YEAR III SEMESTER II	YEAR IV SEMESTER	COMPETENCE AREAS DEFINED BY IFMA
Construction	Building Pathology	Maintenance management	Computer Applications	Communication
Building Materials	Contract management	Space Management	Building Surveying	Emergency Preparedness and Business Continuity
Planning Law	Maintenance technology	Facilities Management I	Business Planning and Entrepreneurships	Environmental Stewardship and Sustainability
Construction economics	Land lord and tenant Law	Condition Surveys	Facilities Management II	Finance and Business
Property Development	Technical Report Writing	Applied Property Management	Applied research	Human Factors
Principles of Construction Management	Estate Management	Infrastructure and building services	Semester project II	Leadership and Strategy
Rehabilitation Planning	Semester Project	Industrial Training	Business Ethics	Operations and Maintenance
Industrial Training				Project Management
				Quality
				Real Estate and Property Management
				Technology

The comparison reveals that the subjects covered in the BSc. Property and Facilities Management have bias in real estate and technical aspects. There are fewer courses which provide elementary knowledge in finance and business, project management, human factors, leadership and strategy or emergency preparedness and business continuity. The research has indicated that about 89% of the respondents considered the FM course content to be relevant to their day-to-day activities. This result may be influenced by the nature of the FM activities that are taking place in Tanzania and the current business environment. The shaded area in Figure 6 indicates the level of development of feeder factor FM Education in Tanzania.

Figure 6 reveals that Facilities Management Education in Tanzania has characteristics that are found within Level I, Level II and Level III of the development matrix. The dominant characteristics are those found in Level I and Level II.

VARIABLES LEVEL OF DEVELOPMENT	NUMBER OF COURSES	CONTENTS OF THE COURSES	LEVEL OF COURSES
Level IV	Availability of multitude of institutions offering specific FM courses at postgraduate and undergraduate levels. Clear evidence of specialised offerings by commercial trainers.	In addition to formal offerings by tertiary and professional sectors, the availability of specialised commercial courses on specific, topical aspects of FM practice.	Full range of postgraduate courses in FM specific courses (i.e. Postgraduate Diploma, Masters degree and PhD) by the tertiary sector. Professional courses linked to professional accreditations.
Level III	Availability of courses by tertiary institutions and training by professional bodies in clearly defined FM competencies with an emphasis on integration and management aspects	FM courses with clearly defined specialisation tailored along defined competences adopted by FM professional bodies covering both technical and management aspects.	Tertiary institutions offering diploma and undergraduate courses in FM. Also professional courses linked to professional accreditations.
Level II	Availability of formal training courses by tertiary institutions in specific FM-related areas.	FM related courses such as quantity surveying, architecture, building services engineering, etc.	Tertiary and Higher Education Institutions offering technical courses at diploma and degree levels in FM-related areas, but not integrated.
Level I	Availability of vocational institutions offering courses related to FM trades	FM courses with emphasis in specific trades such as; surveying, electrical, mechanical, plumbing, hotel catering, etc.	Tertiary Institutions offering certificate level training.

Figure 6: Development of Facilities Management Education in Tanzania

FACILITIES MANAGEMENT RESEARCH

Facilities Management Research is related to research and publications in areas falling within FM competencies, FM market data and statistics. The study has identified two areas to be important in assessing the level of development of FM research within a country; the existence of research and evidence of research publications. Data were gathered using questionnaire (n=22) and searches were conducted in official websites of the organisations offering FM courses or research institutions in Tanzania. The result has indicated that currently there is no clearly identifiable FM research base in Tanzania either in academic institutions or research centres other than a few undergraduate theses written by students at the end of their studies. These studies are not published and are not rigorous enough to serve as an evidence of academic research. In the same breadth, the study has revealed the lack of evidence of published FM works from Tanzania at both local and international journals.

In the questionnaire, respondents were requested to evaluate the degree of the availability of research works in 19 FM functions. Out of the list, 68.4% the respondents rated property management, building services and operations and maintenance and repair, to be the most common research areas conducted in Tanzania. However, strategy facilities planning, security, catering, office services, cleaning, health and safety, IT, voice and data management, energy management, business process outsourcing, large infrastructure project and knowledge management were rated the least in evaluation by 76.8% of the respondents. Other functions such as construction project management, human resources management, procurement had an average rating by 65.3% of the respondents. The shaded area in Figure 7 indicates the level of development of feeder factor FM Research in Tanzania.

Figure 7 reveals that Facilities Management Research in Tanzania has characteristics that are found within Level I in the development matrix.

VARIABLES LEVEL OF DEVELOPMENT	EXISTENCE OF RESEARCH	EVIDENCE OF PUBLICATIONS
Level IV	Existence of undergraduate and postgraduate courses, research centres dedicated to FM-related research. Formal accreditations offered by national and international professional institutions with research capabilities.	Clear evidence of formal publications in the form of magazines, journals, specific issues in FM by academic institutions, professional bodies and commercial consultancies.
Level III	Clear evidence of formal FM training by professional institutions and educational courses by academic institutions, giving rise some research in FM related issues like required competences, role of FM, procurement of FM services, etc.	Evidence of publications on FM related issues in trades and professional magazines and appearance of formal FM journals.
Level II	Some evidence of research by academic and professional institutions and research consultancies in RE/FM-related issues. FM receiving growing attention as a separate integrated discipline.	Some evidence of formal publication of FM-related research from academic/professional institutions and commercial research organisations. Emergence of some market statistics on FM-related activities.
Level I	No clearly identifiable FM-related research from academic institutions and commercial organisations. FM not recognised as a separate discipline.	No evidence of formal publication of FM-related research from academic institutions and commercial organisations. No formal national statistics on FM as an economic activity.

Figure 7: Development of Facilities Management Research in Tanzania

FEEDER FACTORS INTEGRATION

The study used questionnaire to gather information on the degree of integration between various feeder factors in Tanzania (n=178). While respondents had rated the integration between feeders to be higher than the minimum level, the follow up face-to-face interviews and documentary evidence revealed the opposite. For example, about 64% of the respondents had an opinion that the integration between professional bodies and other feeders was high while the fact of the matter is there is no devoted FM Professional Body in Tanzania. It could be that respondents gave their opinion based on the relationship between other feeders and the existing traditional FM related professional bodies which was not the essence of the questionnaire. During the face-to-face interviews it was revealed that the integration between the feeders is at a minimum. The research has established that the use of questionnaire in evaluating the level of integration between feeders is inappropriate and could provide misleading results. It has been resolved that interviews with key stakeholders within the industry are more relevant.

FACILITY MANAGEMENT INDUSTRY DEVELOPMENT IN TANZANIA: THE PRESENT STATUS

From the results of mapping the gathered data on the development matrices (Figure 2 through to Figure 7), this paper has shown the current profiles of feeder factors development in Tanzania. Three categories of profiles have been identified. The first category has one feeder namely FM Education. This is the highest developed feeder in Tanzania. It has been shown in Figure 6 that FM Education has characteristics that are found in Levels I, II and III of the feeder factors development matrix. The dominant characteristics are those found in Levels I and II. The second category has three feeder factors FM Organisation Practice, FM Supply Market and FM Professional Bodies. It has been shown in Figure 2, Figure 4 and Figure 5 that these feeder factors exhibit characteristics that are found in Level I and Level II of the feeder factors development matrices. It has been further observed that the dominant characteristics within these feeders are those found in Level I. Facilities Management Business Environment and FM Research are found within the last category. These two, have all characteristics of only Level I as shown in Figure 3 and Figure 7 respectively. Generally, the profiles of feeder factors development in Tanzania have indicated that the FM industry is in Level I of development with some signs of transition into Level II. Also, the integration level between the feeders is at the minimum. Given the profiles of feeder factors development and level of integration it can be argued that the Facilities Management industry development in Tanzania is within the Initial Formative Stage (IFS).

CONCLUSIONS

The study has shown that FM industry in Tanzania is within the Initial Formative Stage (IFS) of its Development (Maturity). The discussion above has highlighted a number of challenges associated with the development of FM industry. Some of the prominent challenges include:

- (1) Lack of identity, participants within the industry tend to be associated with their traditional professions and even graduates in FM (very few in number) find it difficult to identify themselves as Facilities Managers;
- (2) The existing legislations such as Public Procurement Act (2004) tend to inhibit innovations on the part of FM suppliers and services providers;
- (3) FM services suppliers and providers have limited knowledge and capabilities to cater for a wider market and functions;
- (4) The government failure to recognise and include FM as important stakeholders in the PPP Act (2010) is an indicator that the life cycle management concept for infrastructure and other facilities was not considered;
- (5) Lack of Marketing of FM as an integrated industry;
- (6) Lack of a dedicated professional body to represent the FM industry interest limits the speed of recognition and development of the profession;
- (7) Incompatibility of the FM education curriculum in Tanzania with competencies defined by established FM Bodies;
- (8) Lack of local research and publications forces lecturers to entirely depend on external/imported knowledge which may not be a reflection of the local conditions;
- (9) Lack of FM transaction data.

On the other hand, the FM industry in Tanzania has potential of growing faster due to the following opportunities:

- (1) The enactment of the PPP Act (2010) provides FM practitioners with opportunity to participate in the management of large facilities/infrastructure;
- (2) There exist a potential for Ardhi University to upgrade its BSc. Property and Facilities to meet International FM competencies;
- (3) Due to the existing pool of FM-related functions other universities could consider establishing more courses;
- (4) The existing traditional professional bodies could consider embracing FM as one of their core competence areas.

By way of conclusion, due to the level of FM industry development in Tanzania which has been identified to be at the Initial Formative Stage (IFS), it can be pointed out that the industry is not very competent to effectively deal with the three cases identified as inspiration for carrying out the study. In order to create an environment that could deal with the identified issues in the three cases, the FM industry should first take care of the challenges highlighted above.

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THE ARCHITECTURE OF HEALTHCARE SERVICES PROVISION: A FACILITIES MANAGEMENT PERSPECTIVE

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Contemporary trends in healthcare services provision tends towards increased provision of healthcare services through community based healthcare centres. This concept of healthcare provision hypothesizes that the main source of healthcare services will be a network of community based clinics where most of the primary and the ordinary care be provided. This concept implies that a network of community clinics equipped with state-of-the-art means for distance care be established with a wide geographical dispersion. The paper examines the implications of this architecture of healthcare service provision on the resources and the performance of the built environment through the Israeli healthcare system. The paper reflects the results of research of healthcare Facilities Management in the past 10 years. Comparison of the performance and maintenance of hospital facilities with community clinics reveals that the cost-effectiveness and performance of clinics facilities provides high potential for combination of improved healthcare facilities services and economic facilities management.

Keywords: facility management, healthcare, key performance indicators, decentralization

INTRODUCTION

Countries all over the world are witnessing similar trends in healthcare services provision. Triggered by natural population growth, the ageing of the population, and the consumer revolution, an increase in the demand for healthcare in public hospitals has been observed (Hosking and Jarvis, 2003). Consequently, the total number of in- and out-patient admissions per 1,000 persons has increased as well (American Hospital Association, 2010). In order to deal effectively with the growth of in-patient admissions, and as a result of their limited resources, hospitals have tended to reduce patients' average length of stay. This trend is evidenced in separate reports produced in Germany (Federal Statistical Office Germany, 2003) and the U.K. (Hensher and Edwards, 1999). In the U.S., a 14.2% increase in the number of in-patient admissions has been witnessed in community hospitals between 1994 and 2004, together with a decrease of 16.4% in the average length of stay. At the same time, an increase of almost 50% has been observed in the number of out-patient admissions in the exact same hospitals, and a significant increase of about 170% in the number of out-patient admissions over a period of 20 years (1984-2004) (American Hospital Association, 2010). These changes have led to a demand for investigating the structure of healthcare systems and Facility Management (FM) decision-making processes in the industry. Melin and Granath (2004), for instance, conducted a study in Sweden on the effect of "Horizontal Integrated Care" (HIC, which deals with ways that care is delivered to patients) on healthcare facility management and the implications of HIC, "local hospital", and "close care" on the built environment.

When examining facility management in the healthcare sector, scarcity of resources is noted. This might adversely affect the non-core activities of healthcare providers, and primarily facility management aspects, such as maintenance activities and operations. The American Hospital Association states in its 2003 Annual Report that "Hospitals have been under financial pressure in the last five years, both from public and private payers. Since 1999, up to one third of hospitals have had negative total margins" (American Hospital Association, 2010). A similar state of affairs is presented in the 2003 Annual Report of the British Ministry of Finance, which states that: "Over the past 30 years the U.K. has consistently invested a smaller share of its national income in healthcare than comparator countries. Historical underinvestment has resulted in poorer health outcomes than the EU average" (British Ministry of Finance, 2003).

In response to a steady demand to provide healthcare in distant peripheral regions, the Israeli healthcare system developed a network of clinics organized in a hierarchical scheme. This network is composed of three levels of clinics (Figure 1): community, regional and hospital-based. Community clinics are located in any city, town or village, and are approximately 500-2,500 sq-m in size (mean size

of 1,200 sq-m). In the entire country, there exist 800 community clinics that provide primary care to an average of 8,000 insurance subscribers per clinic. Forty regional clinics support the community clinics, providing secondary care such as MRI, X-Ray, medical consultancy and regional laboratories that supply diagnostic services to both the community and the regional clinics. This network acts as a screening net that provides primary care to all participants in the Israeli system prior to admission into a peripheral or regional hospital. Hospitals are classified into three categories of infrastructure and medical care: peripheral hospitals (less than 400 patient beds), regional hospitals (401-800 patient beds) and strategic hospitals that provide unique specified care and are equipped with built and human medical infrastructure (801-1,500 patient beds).

As one can tell from the service structure mentioned above, healthcare services provided through the community-based healthcare sector have expanded. Acute-care hospitals have witnessed an increased number of in-patient admissions, but at the same time, a decrease in the average length of stay. One of the possibilities for sealing this gap is to develop a hierarchical network of community clinics aiming to provide most of the primary and part of the secondary care. Although the use of community clinics is increasingly common worldwide, the quality of care they provide is a subject of continuing debate (Fox et al., 2007; Scott et al., 2004). The quality and effectiveness of medical services was widely investigated and discussed in the medical research arena in the past decade. Hutchinson et al. (2003) compared delivery of care to various patients through walk in clinics with usual care through emergency department and family practices. The overall quality of care in clinics was found to be equal to emergency departments and higher than family practices.

The present study investigates FM characteristics of built facilities for healthcare. Key Performance Indicators (KPI's) are defined for hospital and clinic facilities, and the KPI's are analyzed from samples of 12 acute-care hospitals, and 42 community clinics. The paper discusses the implications of the performance, maintenance and Benefit-to-Cost Ratio between allocation of resources in the development of built facilities for healthcare and the performance provided.

ALTERNATIVE ARCHITECTURES OF HEALTHCARE PROVISION

Provision of healthcare services traditionally occurs through a network of hospitals, both regional and principal facilities. This concept is implemented in most countries in Western Europe; it requires a large network of hospitals that necessitates substantial capital investment and appropriate resources for maintenance and management of these facilities.

An alternative architecture and infrastructure for the provision of primary and part of secondary healthcare, is the provision of infrastructure for healthcare in a unique manner: built facilities for ordinary primary close care located in the community and equipped with the infrastructures for primary care. These clinics are supported by regional facilities that provide laboratory radiology and diagnostic services. A patient may access a regional clinic only after a visit and a transfer order from a community clinic to a regional clinic. Healthcare in peripheral and regional hospitals is provided to patients following primary care and diagnostics in regional clinics; this excludes emergency circumstances in which patients are allowed to contact hospitals in emergency departments in acute care hospitals.

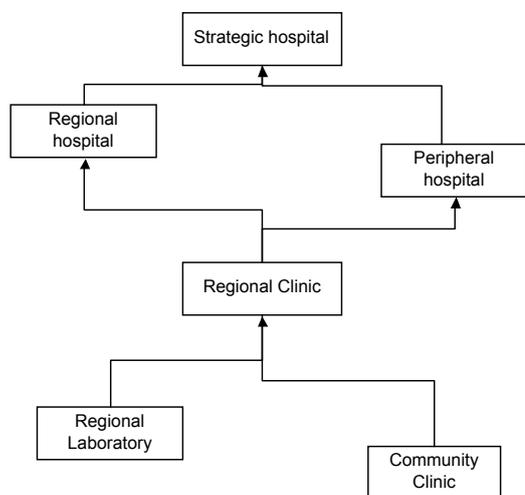


Figure 1: Architecture of healthcare facilities

KEY PERFORMANCE INDICATORS IN HOSPITAL AND CLINIC FACILITIES

The research employed eight Key Performance Indicators for monitoring the performance and maintenance of hospital and clinic facilities; the KPIs fell into three categories: Asset Development, Maintenance Management, and Performance Management. The following paragraphs delineate the KPIs for hospital and clinic facilities used in this study to create a comprehensive maintenance toolkit:

ASSET DEVELOPMENT

This category of KPIs quantifies the service conditions' effects on the facility and predicts the resources required to maintain the facility at its designated performance.

Age Coefficient

The age coefficient is defined as a coefficient for the adjustment of maintenance needs to actual service life of the facility along the Designed Life Cycle (DLC) of the facility. A Designed Life Cycle of 50 years was assumed for clinic facilities and 75 years for hospital facilities.

Occupancy/Density Coefficient

The research hypothesis is that density (in clinics) and occupancy (in hospitals) conditions affect the deterioration pattern of the building components and systems. The coefficient was developed through analysis of the life cycle of building components under intensive and under moderate service conditions. In clinic facilities, the density coefficient was based on an analysis of building components life cycle under intensive vs. normal service conditions.

In moderate density conditions (less than or equal to 80% of standard density) the density coefficient equals 0.97, expressing only minor savings in the maintenance activities, due to compulsory preventive policy. Between 80% and 100% relative density, the increase in maintenance activities is moderately linear with a slope of 0.001625. Between 100% and 154% relative density, there is a greater impact of patient density on maintenance expenditure, the slope of the graph increases to 0.00578, and the density coefficient in high density conditions remains constant at a level of 1.31. In hospital facilities the occupancy coefficient is defined between the range of 80% and 133% of the standard occupancy (10 patient beds per 1,000 sq-m); at low occupancy the resources required are 0.95, while at the high levels of occupancy the coefficient is 1.22 (Shohet et al., 2003).

Facility Coefficient

The Age and Occupancy/Density Coefficients are integrated into a third KPI, Facility Coefficient, that expresses the maintenance resources required for implementing preventive and breakdown maintenance based on the facility's level of occupancy, age, type of environment, and the complexity of the buildings in terms of the components included in them. The Facility Coefficient is computed through an assessment of four variables: age of the building, its service conditions (occupancy/density), category of environment (marine or inland), and type of building. Typical deterioration patterns obtained from empirical research are translated into maintenance activities that are expressed in this financial coefficient as a means to adjust the maintenance resources to prevailing conditions (Lavy and Shohet, 2007).

MAINTENANCE MANAGEMENT

This category of KPIs provides insight into the organizational procurement and cost control of maintenance services delivery; three KPIs were developed under this category: Annual Maintenance Expenditure (AME), Maintenance Sources Ratio (MSR), and Managerial Span of Control (MSC).

Annual Maintenance Expenditure (AME)

This KPI reflects the scope of expenditure per sq-m built (excluding cleaning, energy, and security expenditures). From an organizational viewpoint, this parameter determines the annual expenditure on maintenance of a clinic/hospital; it further provides a means to assess the overall expenditure on built assets with reference to the organization's turnover. From a managerial-professional viewpoint, however, the expenses must be analyzed in relation to the facility's characteristics and with respect to the output (the physical performance). This examination is attained in the framework of the Maintenance Efficiency Indicator (MEI), as described below.

Maintenance Sources Ratio (MSR)

This KPI reflects the ratio between external maintenance resources and the total sum of resources, and expresses the extent of

outsourcing (in %) out of the total labour resources allocated for maintenance of the facility. A combination of 60% outsourcing with 40% internal labour may represent a solid balance in healthcare facilities under standard service conditions and located in a large urban area.

Managerial Span of Control (MSC)

This KPI expresses the ratio between the number of managers and the respective number of personnel directly subordinated by them: while a wide span of control may save overhead expenses, it sometimes creates difficulties in control. On the other hand, a narrow span of control may save the amount of day-to-day coordination, and leave time for the manager to deal with planning; however, overhead expenses are usually high. Different than hospitals, in which this indicator is straightforwardly defined, for clinic facilities, geographical dispersion and the size of facilities imply that their management is conducted in a hierarchical manner as follows: several facilities located in a close regional area are managed under the direction of a regional facility manager. The number of clinic facilities subordinated to the supervision of a regional FM is defined as the Managerial Span of Control. At small spans of MSC ($MSC < 6$), the managerial overhead costs per clinic rise as some of the managerial resources may be redundant, larger spans of MSC (i.e. $MSC > 8$) reduce the costs of managerial overhead, though the effectiveness of supervision may be diminished.

PERFORMANCE MANAGEMENT

The performance section of KPIs covers built facilities' physical performance as well as the efficiency with which the allocated resources for maintenance are utilized

Building Performance Indicator (BPI)

This KPI enables the evaluation of the overall state of a clinic or of a hospital building, according to the physical performance of its components and systems. The indicator is expressed as a value, with ranges between 0 and 100 points, that expresses the building state, including the performance of its various systems (P_n). P_n is graded according to performance scales between 0 and 100 points, where $P_n < 60$ indicates poor/dangerous performance condition, $60 < P_n \leq 70$ indicates deteriorating performance condition, $70 < P_n \leq 80$ indicates marginal (70) or satisfactory (80) condition, and $P_n > 80$ indicates good condition. The actual score for each system (P_n) is composed of three aspects of facility maintenance: (1) actual condition of the system (C_n); (2) failures affecting the service provided by the components of the system (F_n); and (3) actual preventive activities carried out on the system to maintain an acceptable service level (PM_n) (Israel Standards Institution, 2002). The evaluation of the performance score considers the following aspects: (1) structural suitability of the building to the intended service loads and appropriate load factors; (2) suitability of the existing spaces within the building to the building's actual usage; (3) adequacy of finishing materials and fixtures (e.g. doors, windows, claddings, etc.); and (4) suitability of end-fixtures to their intended use (e.g. electricity, HVAC, elevators, fire protection, and low-voltage electrical systems). These factors induce and consider the user satisfaction as well through the performance survey. This parameter enables us (1) to evaluate the overall state of a facility; (2) to evaluate the state of the facility's systems; (3) to benchmark the asset's performance in relation to other facilities (inter-organizational benchmarking); and (4) to benchmark the clinic's or hospital's systems in order to compare the efficiency of the various maintenance crews (intra-organizational benchmarking).

Maintenance Efficiency Indicator (MEI)

This indicator examines the allocation of resources for maintenance with reference to the facility's performance (which is in fact the service provided to the healthcare organization by the FM department). The MEI is calculated by equation [1]:

$$[1] \quad MEI = \frac{AME}{FAC(y)} * \frac{1}{BPI} * i_c$$

Where, AME = the actual Annual Maintenance Expenditure, FAC(y) is the Facility Coefficient for year y, BPI is the monitored Building Performance Indicator, and i_c is the construction prices index. MEI expresses the expenditure on maintenance per hospital/clinic performance unit, adjusted to prevailing conditions using the Facility Coefficient (FAC(y)). MEI may be analyzed in the two dimensional system of BPI (dependent variable) and the Normalized Annual Maintenance Expenditure (NAME) (independent variable) as expressed in equation [2]:

$$[2] \quad NAME = \frac{AME}{FAC_y}$$

NAME expresses the Annual Maintenance Expenditure neutralized from the effects of age (ACy), the facility's occupancy/density (OC or DC), and environmental conditions through the Facility coefficient. The (NAME) gives a clear and transparent perspective to the Annual Maintenance Expenditure, where the MEI can be easily interpreted. For a clinic facility maintained at the desired performance level, we assume a BPI of 100. The average Annual Maintenance Expenditure (AME) per sq-m was analyzed to be 2.50% of the reinstatement value of a clinic facility which was calculated to be \$1,180 per sq-m built. A clinic facility with an Age Coefficient of 1.00 (the standard), and a Density Coefficient of 1.00 and a consequent facility coefficient of 1.00 would yield an MEI value of 0.30. The upper and lower boundaries of the desirable range were deduced from the standard deviation of the MEI for the clinic sample population. The MEI values are thus interpreted according to the following categories:

- $MEI < 0.20$ indicates high efficiency with which the resources are utilized, or scarcity of resources for maintenance, or both;
- $0.40 \leq MEI \leq 0.20$ reflects a normative range of maintenance efficiency, in which the lower limit indicates good efficiency while the upper limit indicates low efficiency and/or slack of resources; and
- $MEI > 0.40$ indicates a high level of resources relative to the actual performance. Such high indicator values may express high maintenance expenditures, low physical performance, or a combination of these two extreme situations.

In a similar manner, ranges for the MEI in hospital facilities were deduced. Three ranges for MEI were established for hospital facilities in Israel:

- $MEI < 0.37$ expressing high maintenance resource utilization efficiency, and/or lack of resources;
- $0.52 \leq MEI \leq 0.37$ indicating normative use of maintenance resources; and
- $MEI > 0.52$ indicating high inputs in comparison with the actual performance, and/or surplus of resources.

The upper and lower boundaries of the MEI for hospital facilities were deduced similarly from the standard deviations of the hospital sample population.

PROFILE OF CLINIC FACILITIES

Table 1 depicts the profile of the clinic facilities sample and the hospital facilities sample. The clinic sample encompasses 42 data-points, the mean floor area of the clinics is 1,154 sq-m with an average age of 7.9 years. The average built floor area of clinic facility per insuree is 0.15 sq-m. The respective mean Age Coefficient for the population is 0.75. The annual number of visitors per sq-m, representing the density of the clinics, is 258.0, where an annual number of 175 is defined as standard density. In light of the latter finding, we deduce that the clinic facilities sample represents a facilities population under intensive service conditions. The mean Annual Maintenance Expenditure for the maintenance of the clinic sample population is \$24.2 per sq-m, constituting an annual expenditure of 2.05% of the re-instatement value of the clinics (\$1,180 per sq-m). The analytical expectancy of the Annual Maintenance Expenditure in % of Reinstatement Value for clinics facilities is 2.5%. In light of the young age of the clinic sample (7.9 years), this level of expenditure is high and may be explained by the intensive service conditions of the clinic facilities as discussed above. The Maintenance Sources Ratio (MSR) expresses the mixture of outsourcing as opposed to in-house maintenance service provision. The MSR shows that 60% of the services are contracted out. This allocation of resources is rationalized by the intensive service conditions that require high availability of maintenance crews for urgent service, which is supplied by in-house maintenance crews. Managerial Span of Control for the clinics' regional Facility Manager is 7.2 compared with a normative span of 6. This span of control is explained by the relatively small sizes of the facilities. The high rate of the Building Performance Indicator's mean value (95.5) indicates high performance of the clinic facilities sample. The relatively small S.D. of this parameter (2.9) indicates its significance. The last parameter, Maintenance Efficiency Indicator (MEI), expresses the efficiency with which the maintenance resources are utilized. The mean MEI falls within the predicted analytical value (0.30), and the variance in this parameter expresses significant variability in this efficiency. This level of efficiency was established following a two-year corrective and preventive maintenance policy that used the BPI as a key measure for maintenance policy setting. Figure 2 depicts the distribution of the clinic facilities sample in a two dimensional setting where the independent variable is the Normalized Annual Maintenance Expenditure (NAME) and the dependent variable is BPI. The three lines represent equivalent levels of efficiency where 0.30 is the normative, and the other two express the margins of standard-normative region of efficiency, 0.40 represents the highest margin of the normative efficiency range of maintenance, i.e. values above this bound represent high expenditure, indicating low efficiency and slack of resources. The 0.20 margin expresses efficient execution of maintenance; however facilities with MEI lower than 0.20 are facilities with lack of resources.

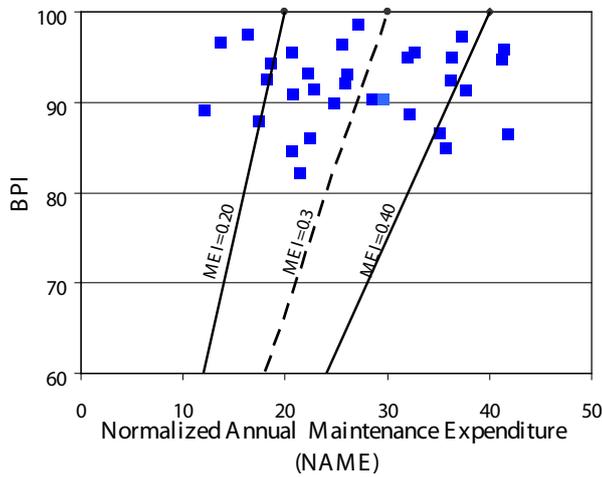


Figure 2: Building Performance Indicator as against Normalized Annual Maintenance Expenditure of the clinics sample.

Table 1: Comparative profile of hospital and clinic facility sample

Parameter	Clinics	Hospitals
	Mean (S.D.)	Mean (S.D.)
Sample size	42	12
Built Floor Area [sq-m]	1,154 (1,148)	76,410 (65,130)
Built Floor Area per insuree [sq-m]	0.15	0.30
Age [years]	7.9 (6.1)	27.3 (19.1)
Age Coefficient	0.75 (0.23)	1.27 (0.07)
Annual Density/Occupancy (%)	147 (71)	89 (19)
Density Coefficient	1.16 (0.15)	0.97 (0.07)
Reinstatement Value [\$/sq.-m.]	1,180	1,678
Annual Maintenance Expenditure (AME) [\$/sq-m]	24.2 (13.7)	37.2 (5.3)
Analytical AME in % of Reinstatement Value	2.50	3.23
Maintenance Sources Ratio (MSR)	60.0% Outsourced	36.7% Outsourced
Managerial Span of Control (MSC)	6.1 (1.9)	3.5 (2.2)
BPI	95.5 (2.9)	76.6 (5.9)
MEI	0.30 (0.16)	0.43 (0.05)

PROFILE OF HOSPITAL FACILITIES

The Israeli health sector encompasses a total number of 42,119 patient beds (Central Bureau of Statistics in Israel, 2009), where 50% of them are designated for long-term care, and 35% for acute-care. Furthermore, 70% of the total patient beds in Israel are publicly owned, whereas only 30% are private. In the acute-care sector, the share of the publicly-owned beds is even higher and accounts for more than 96% of the total patient beds. Previous research (Shohet and Lavy, 2004) studied the profile of hospital facilities in Israel. Based on a survey of 12 large acute-care facilities, which have a total floor area of more than 1,000,000 sq-m, it was found that the average size of a hospital is 76,410 sq-m of floor area per campus, distributed among almost 50 buildings. In addition, these twelve acute-care facilities were found to offer healthcare services through 8,031 patient beds, which means an average of 669 patient beds per healthcare facility; and an average of 8.9 patient beds per 1,000 sq-m of floor area (with a standard deviation of 1.9 beds). The Reinstatement Value of a Hospital Facility is 1,670 \$/sq.m. Figure 3 depicts the performance of hospital facilities sample with respect to the normative range of MEI and the according to the BPI indicator. Hospital facilities are found in marginal level of performance as most of the data points are below BPI=80, and many of them are below the marginal BPI=70 margin.

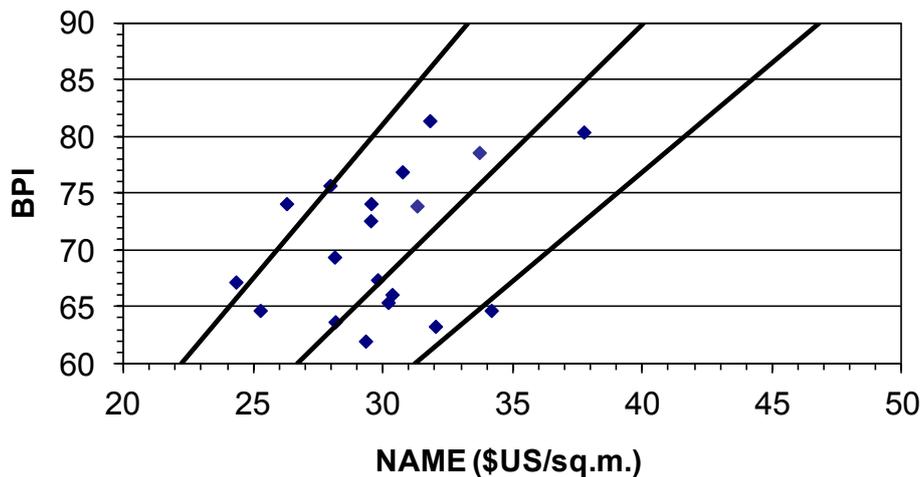


Figure 3: Building Performance Indicator (BPI) vs. Normalized Annual Maintenance Expenditure (NAME) in hospital buildings

CONCLUSIONS

Comparative review of hospital and clinic facilities reveals considerable differences between the facilities in terms of FM parameters: while hospital facilities necessitate the allocation of double the amount of resources for maintenance—the computed annual expenditure for hospitals required to accomplish full performance is \$54 (3.23% of the Reinstatement Value) compared with \$29 (2.5% of Reinstatement Value) in clinics—accomplishing high performance for hospital built-facilities is complex, as demonstrated in the 12 data-point hospital sample. The BPI for clinics (95.5) indicates accomplishment of the performance goals of the maintenance policy in clinics, compared with marginal performance accomplished in hospitals (76.6). Furthermore, the built-floor area per insuree in clinic facilities in Israel (0.15 sq-m) falls far below the respective parameter for acute-care hospitals (0.30 sq-m); thus, the actual expenditure per insuree in a hospital facility is nearly four times higher than in clinic facilities.

Community clinics are much more accessible than peripheral or regional hospitals in terms of geographical dispersion. Accomplishment of close care is realized to a greater extent and the cost of facilities per insuree is approximately 75% lower than in regional hospitals. From a life cycle perspective, the maintenance of hospital facilities implies two critical life-supporting systems (electricity and medical gas), and two more electro-mechanical systems that support healthcare and hygiene (communication and low voltage, and water supply and sanitary system). Hospital facilities are also sensitive to extreme events due to failures in critical electro-mechanical systems such as power supply and medical gas supply.

The above comparative view of Key Performance Indicators reveals that delivery of part of the healthcare services through clinics entails multiple advantages from the FM point of view:

- Capital cost invested per patient is considerably less.
- The provision of high performance facilities for medical staff and for patients is realized with considerably fewer maintenance resources.
- The employment of clinic facilities for primary care, instead of peripheral and regional hospital facilities, enables the potential for flexible infrastructure and for close healthcare. Furthermore, clinics can be maintained at a high performance level with fewer resources needed for labour and materials.

This conclusion leads us to a vision that the future hospital will be composed of the core of medical acute care; this core hospital will be connected to a network of community and regional clinics that will provide primary care and serve as close care providers and as a screening net for patients for the core hospital. This vision implies that the importance of future community clinics will be magnified and the services provided in these clinics expanded.

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OUTSOURCING VS. INSOURCING FACILITY MANAGEMENT SERVICES: THE PRACTICE IN UGANDA

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One of the theories of the development of Facility Management is that it was aided by the increase in the practice of outsourcing services identified as Facility Management services. This study is aimed at analysing the current practice of procurement of Facility Management services in Uganda, from which the growth of Facility Management in Uganda can be projected. A survey questionnaire was used for both the interviews that were carried out, and for self-administered surveys. It was discovered that although some organisations insource a number of Facility Management services, even more do outsource. The most popularly outsourced services currently are security and catering. The most common driver for outsourcing was the necessity to gain quality services from another organisation's expertise, followed by cost savings. For the organisations that are procuring their services in-house, the most common reason was the desire to control the service in terms of quality and response time. The implications of these results were discussed, and one of the conclusions made is that the Facility Management industry in Uganda definitely exists, though it is not officially recognised yet. It is a field that is steadily growing with the growth of the economy.

Keywords: facility management, insourcing, outsourcing

INTRODUCTION

Although FM, in comparison to the other management disciplines, is relatively young (Yiu 2008), it has developed as a profession in a number of countries, including the United Kingdom (UK) and other countries in Europe, the United States of America (USA) (Price 2001) and Asia among others. In Africa, it has grown largely in two countries. Firstly in Nigeria (Adewunmi, Ajayi and Ogunba 2009), the development of which is made evident by the introduction of a Nigeria branch of the International Facility Management Association in 1997 (IFMA Nigeria 2011); secondly in South Africa (South African Facilities Management Association 2011). In Uganda in particular, FM does not exist officially as a profession. However, the services considered as a part of a Facility Manager's role in an organisation are definitely present, as in all other countries.

FM development over the years has been said to grow based on practice (Kincaid 1994; Alexander 2003). There are a few theories relating to the development of FM. According to Maas and Pleunn (2001), FM was introduced in 1975 in the USA and grew through the 1980's, eventually spreading to Europe and around the world in the 1990s (Cigolini 2009). Lord et al. (2002) maintain that the term FM originated about the late 1960s to describe the practice of banks then increasingly outsourcing the processing of credit card transactions to specialist providers. FM is closely linked to outsourcing, and it could be argued that the increased requirement for outsourcing services has largely contributed to the growth of the profession. Usher (2003) states that the concept of outsourcing has been in existence longer than that of FM; though in a completely different form than it exists today. The government policies on market-testing, compulsory tendering and PFI aided the increase in the use of out-sourcing over the years (Lord et al. 2002).

Uganda is a developing economy. In the olden days, many Small and Medium sized Enterprises (SME's) used to rely on family to provide labour, and other services for their businesses. Currently, there is a change in that practice of organisations, in the sourcing of services. Pere (2011), speaking on the industrial practice in Uganda today, puts it this way:

"Gone are the days when it was of necessity to be in touch with relatives and friends with the aim of using them for cheap labour."

It is possible that a growing practice of outsourcing FM services in Uganda would encourage development of FM as a profession in the country. This research was therefore designed to analyse and establish the current practice of FM service procurement in Uganda, and to determine what the drivers for their procurement techniques are.

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PURPOSE/SIGNIFICANCE OF THE STUDY

Not only can this study be of interest in the academic sphere to analyse the growth of FM in Uganda, but, to the professional looking to start the practice in Uganda, this study could be used as a basis for his organisation to position itself in the market. Uganda has economic practices and issues specific to its own modern society, context and culture, among other things, as do most developing countries. This study therefore acts as a guide to understanding the industry so that one is able to strategically position oneself as a provider of FM services to Ugandan businesses.

PROCUREMENT METHOD SELECTION

According to a report by the Butler Group, in Global Knowledge (2006), about 40% of organisations were likely to outsource different facets of their infrastructure within the two following years. Services categorised under FM include, but are not limited to catering, security, cleaning, and information and communication technology. A great deal of work has previously been done on the pros and cons of outsourcing.

Usher (2003) suggests that there are ten themes against which the pros and cons of outsourcing or insourcing can be evaluated, being gauged for an organisation depending on what the client wants. They are cost, quality, risks and liability, specialisation and diversity, responsibilities and accountabilities, flexibility, innovation, investment, information and customer orientation (ibid). The pros of outsourcing emerge where the client demands more value for less with the elimination of risk, while the cons come with the suppliers' desire to deliver the minimum requirements from the client in order to generate maximum profit while safeguarding the retention of the contract and inheriting the least risk possible (ibid).

Some of the literature suggests that the requirement for businesses to gain profit through provision of a high service quality has driven the need for outsourcing parts of the business that are not considered a part of the core business function (Cigolini et al. 2009; Cotts et al. 2010; Lord et al. 2002; Kakabadse and Kakabadse 2002). For companies that prefer a small employee size, outsourcing is a very good way to obtain services (Cotts et al. 2010). It is also stated that a contracted workforce is believed to be more flexible and can therefore adjust better to fluctuations in the workplace (Cigolini et al. 2009).

By far, the most common reason given for outsourcing services is the belief that it brings cost savings to the customer firm, and enables the company to concentrate on its core business (Becker 1990; Cotts et al. 2010; Cigolini et al. 2009; Kakabadse and Kakabadse 2002; Lord et al. 2002; IFMA 2006; Aidan and Globerman 1999). Research carried out by Kakabadse and Kakabadse (2002) shows that a large percentage (59%) of the respondents outsourced their services to achieve a reduction in costs, which came second only to aiming to achieve best practice. However, most of these writers argue that much as that is the belief of many firms, this is not always the case. Cotts et al. (2010) argue that they have not experienced reduced costs due to outsourcing, and therefore that should not be the sole reason for it.

The major reason that firms have given for a preference for in-house services is the fact that they maintain their control over the service once it is procured in-house, in terms of costs, quality and response time (Becker 1990; IFMA 2006; Cotts et al. 2010; Vining and Globerman 1999). There is sometimes the fear that the employees of the supplier firm will not be as loyal to management (Cotts et al. 2010).

Atkin and Brooks (2009) state that the choice between whether to outsource or retain services in-house requires a lot of consideration, and a consideration of many factors affecting the business should be made. The decision has to be as objective and rational as possible (ibid), and should be made depending on what works best for the organisation to meet its objectives.

Wiggins (2010) suggests that this decision will usually depend on the location, type of buildings, type and volume of work and the organisations current workforce. The idea here is that the selection of method for procurement will depend on the organisation's corporate objectives, the implications and risks of the procurement method, and the related contractual issues. According to Schlereth (2009), it is more effective for larger organisations to procure their services in-house.

Barrett and Baldry (2003) state that the potential to contract out relates to the optimum balance between the retained in-house FM services, and those contracted out. At the end of the day, whether the company decides to outsource or insource FM services, it needs to be an informed decision, rather than random. Both methods of procurement have their pros and cons, but the organisation needs to objectively decide which method reaps the best value for the company in the long term (ibid).

METHODOLOGY

Data was sourced from different commercial organisations in Kampala, Uganda using research questionnaires. A total of 41 questionnaires were received back out of the 60 that were distributed, which comes to a 68.33% return. The respondents comprised firms from different sectors, with the highest percentage (61%) being private sector commercial organisations. 73% of the respondent firms were small/ medium scale Enterprises, while the 27% were large-scale enterprises. This categorisation was done based on the number of employees that the organisation has.

Since the scope of FM services is wide, this study covered only the support service delivery section of FM, rather than its entire scope.

RESULTS

78% of the firms approached outsource at least one facility management service, while the 22% procure all their services in-house.

SERVICES OUTSOURCED

The distribution of the services outsourced is shown in Figure 1 below. This list is not conclusive of the large range of FM services, but it covers a number of services covered by the facility manager's role under strategic sourcing of support services suggested by Yiu (2008). The results for this question are presented in consideration of the 32 respondents who said they did outsource FM services.

As shown in the graph, 65.6% of the respondents outsource catering and security services, which have the highest frequency. This result was not completely unforeseen, as it is also evidenced by the large number of security companies that are active in Uganda, including *G4S*, *APS*, *Securiko*, *Alarm Guards*, *Askar Security Systems*, *SGA*, among others. These security companies are employed not only for commercial organisations, but also in a number of residences, to provide a large range of security service options to their clients. Catering companies have also been quite popular, and are increasing by the day.

The second most commonly outsourced service is cleaning, followed by information technology and communication, then building operation and management, moving and asset management, transport, and finally, others. None of the respondents outsource human resource management services or mail and reprographics.

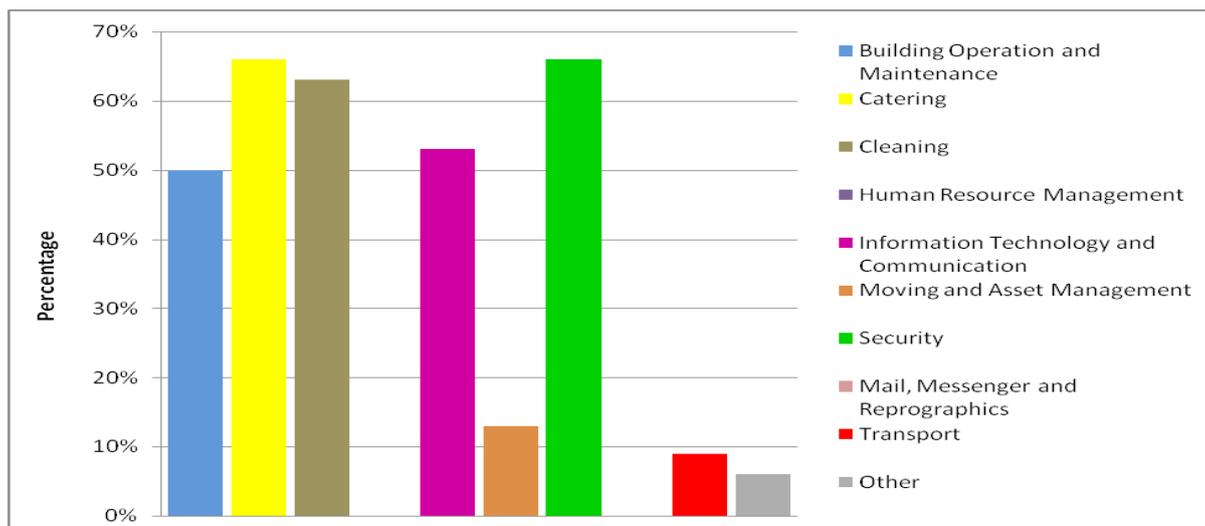


Figure 1: Outsourced Services

DRIVE FOR OUTSOURCING FACILITY MANAGEMENT SERVICES

The highest number of respondents (85%) said that their intention is to gain quality services from the expertise of the firm from which they are purchasing the service (See Figure 2).

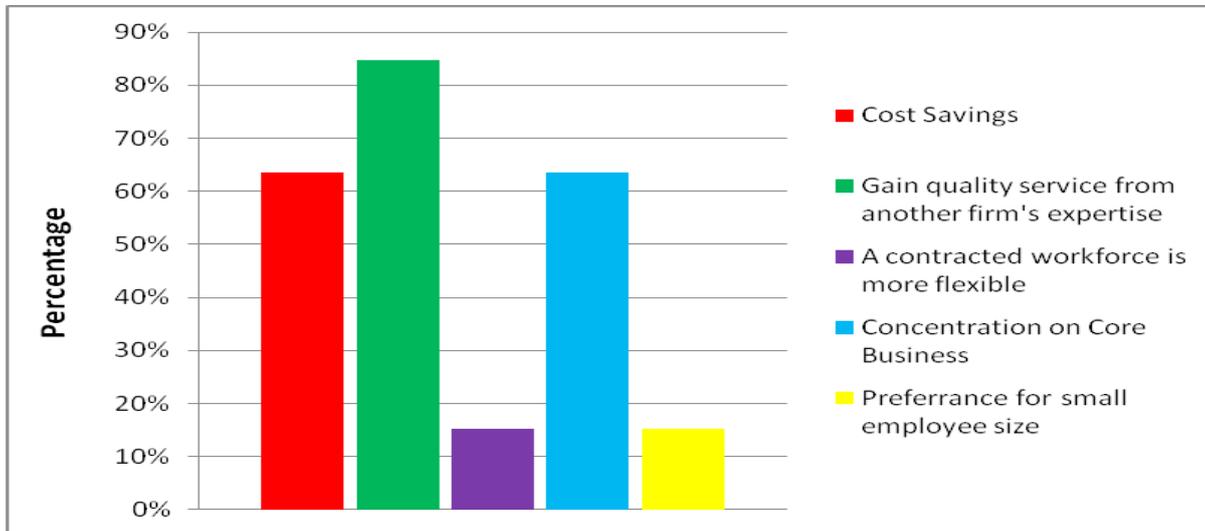


Figure 2: Drive for outsourcing facility management services

Cost savings came in second as the next most popular reason for outsourcing. An equal number of respondents (64%) said that they outsource to gain cost savings and to concentrate on the core business of the organisation.

The least percentage (15%) was from those that said their reason for outsourcing was due to their preference of a small employee size, and an equal number said that they outsourced because they believed that a contracted workforce was more flexible than an in-house one.

DRIVE FOR PROCURING FACILITY MANAGEMENT SERVICES IN-HOUSE

This question was posed to both the firms that had earlier responded that they do not outsource any FM services at all, and those that outsource some and still procure the rest in-house.

The most popular reason for insourcing services (83%) was to enable the organisation retain control on the quality of the service (See Figure 3). This high percentage shows how highly placed service quality is for any organisation. A high percentage seeks to retain control over the service in terms of response time. There is a big difference between the percentage of those that outsource to manage service quality, and those that outsource for cost savings (41%).

This difference could indicate that a number of organisations may agree with the fact that insourcing may not bring in cost savings, but it is chosen as a better option for a number of other reasons. This is in line with the suggestion by Becker (1990) and Nelson (2004).

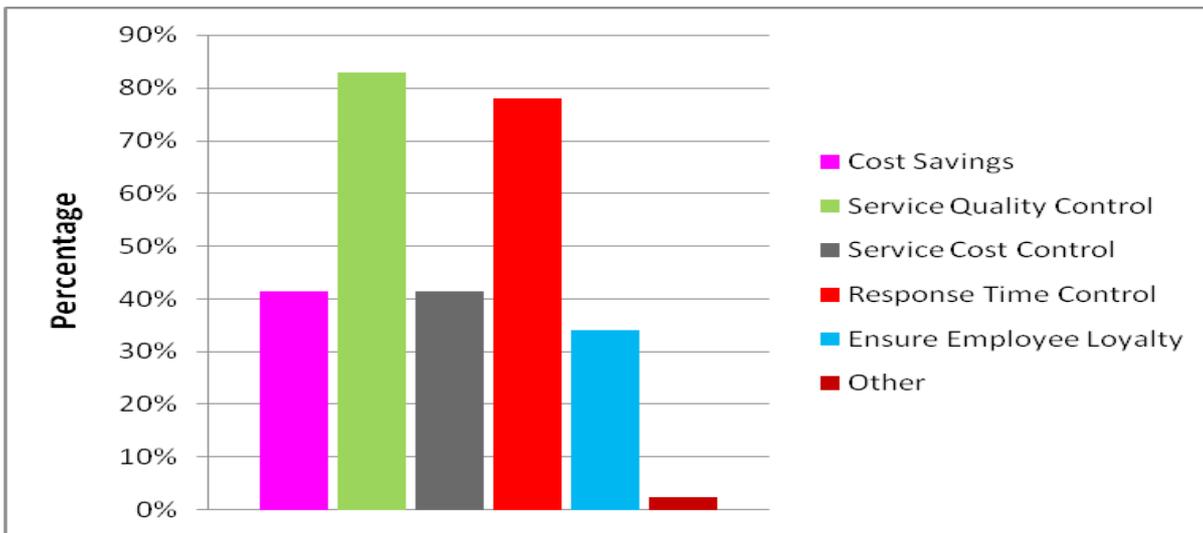


Figure 3: Drive for insourcing facility management services

RELATIONSHIP BETWEEN ORGANISATION SIZE AND PROCUREMENT PRACTICE

Regarding the relation between the size of the organisation and its procurement practice, the 9 firms that responded that they do not outsource any services were studied. Of these, 11% were large scale organisations, and 89% were small and medium scale organisations.

This statistic, when compared to the sourcing practices shows that of the 29 small-scale industries that participated, 28% procure all their services in-house, while 72% procure some services from external providers. Of the large-scale industries, 8% use insourcing for their services, while 92% use outsourcing. A big percentage of large-scale organisations in Uganda outsource one or more services, and none of these reported dissatisfaction with their service procurement.

A larger number of small-scale organisations than the large scale ones procure their services in-house, and a percentage of these stated that they would rather source them out in order to get better quality services. There is therefore no absolute relationship between the size of the organisation in Uganda and its sourcing practice.

PREFERRED OUTSOURCED SERVICE PROVIDERS

The respondents who outsource services were asked which type of service providers they preferred to use. The results are shown in Figure 4 below.

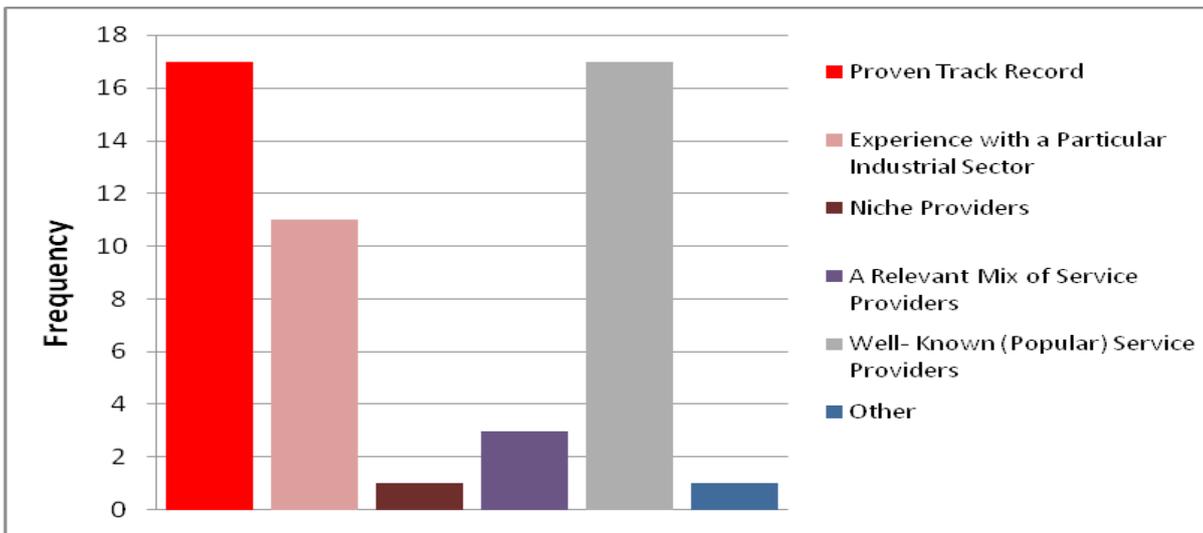


Figure 4: Preferred service providers

The highest percentage of the respondents (53%) said they prefer to use service providers who can demonstrate a proven track record, and an equally high percentage said they prefer to contract well-known service providers. The second highest percentage (34%) said they prefer those that have experience with a particular industrial sector. Some large-scale businesses contract corporate service providers. Those that responded that they prefer to use a relevant mix of service providers were 9%, and those that prefer to use niche providers were 3%.

SATISFACTION LEVELS

In response to the level of satisfaction of the organisations with their current procurement methods, 18% of the respondents said they were very satisfied, 68% said they were satisfied, 12% were neutral, 2% were dissatisfied, and 0% were very dissatisfied (See Table 1). One respondent said the level of satisfaction definitely varies among different service providers, but overall, they are satisfied with the service provision.

Table 1: Level of service satisfaction

	PERCENTAGE (%)
Very Dissatisfied	0
Dissatisfied	2
Neutral	12
Satisfied	68
Very Satisfied	18

The 2% that responded that they were dissatisfied outsource. Of those who responded that their level of satisfaction was neutral, 75% outsource and 25% in-source. From the 68% that are satisfied, 86% outsource and 14% insource. Of the very satisfied percentage, 71% outsource and 29% insource. The majority of both those that insource and those that outsource are within the satisfied and very satisfied category, while the larger percentage of those that are neutral and those that are dissatisfied procure their services externally. This question was linked to the earlier one about the reasons for the organisation's method of procurement, and to that of the fears they have for outsourcing, and it is probable that the reasons for the dissatisfaction of the organisations are in line with those explained above.

CONCLUSION

Global Knowledge (2006) stated that in reality, there are only a few businesses that do not outsource at least one service. Comparing to what was discovered in the findings, it can be said that the statement holds true for Uganda too. There is still a percentage of the organisations that still insource their FM services, but the larger percentage of them outsource at least one service. In Uganda, while a number of large-scale industries insource their services, it seems to be a practice more common with small/medium scale industries. The results from the distribution show that there is no particular tendency to relation between the size of the organisation and its sourcing practice.

The need to receive quality services is a factor that kept recurring through this research. As with those that outsource their services, the organisations that procure their FM services in-house are concerned about quality. Many of the quoted authors emphasise the need for organisations to control their services in terms of cost, quality and response times, and this was agreed by the organisations in Uganda which prefer to insource. Cost issues with outsourcing, though less popular than quality is one of the reasons why some organisations choose to retain their services in-house, showing that a number of organisations actually believe, along with Cotts et al. (2010), Cigolini (2009) and Vining and Globerman (1999) that in some cases there is either barely any difference between the two options' costs, or that actually, outsourcing is the more expensive option.

A lot of the issues that have been reflected in this research can be dealt with through efficient contract management. If the companies draw up strict, well- specified contracts that include detailed specification on the key performance indicators required of the supplier firms, and closely monitor the supplier firm's performance (Incognito, 2001), then many of the glitches can be solved.

It is in areas of assurance of quality, response time, cost and client confidentiality and trust that many organisations seem to be struggling. It is necessary for any supplier organisation to consider the cultural aspects of the business community because, in addition to those mentioned above, the understanding and integration of the cultural aspects will play a big role in determining its success.

Although FM is not recognised at present in Uganda as much as it is in some African nations, traces of its practice are clearly evident. Therefore, if the theory that the growth of FM as a profession is aided by the increase in the practice of outsourcing holds, then it can be said that in Uganda, FM is soon to develop as a recognised profession separate from property management, and this development is one that will be worthwhile to witness. This growth will also yield many opportunities for study of the industry.

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THE ADAPTATION OF ENVIRONMENTAL SUSTAINABLE FACILITIES MANAGEMENT PRACTICES IN BARBADOS - A SMALL ISLAND DEVELOPING STATE

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In Latin America and the Caribbean, the population is rising and the regions' energy use is expected to rise significantly by the year 2025. Barbados has a high dependency on fossil fuel, where it is currently importing 9,000bbl. per day, together with the locally produced 1,000bbl. daily. The Caribbean has also been identified as a "tourism vulnerability hotspot", where a suite of climate-related factors combine to place the Caribbean as a tourism destination at risk. Impacts of climate change on the natural environment are of particular concern, as these are a critical resource to the tourism product. With the high costs of the importation of fossil fuel and increased global pressure towards global sustainable development, the islands' businesses have been adapting to the change. This paper explores the implementation of environmental sustainability practices in Barbados. It is based on a survey carried out on a sample of six (6) different business sectors on the island. A qualitative research approach, using some quantitative techniques, is applied to assess: (a) What are the key sustainable practices in organisations; (b) What are the main drivers for pursuing sustainable practices in organisations and in Barbados; (c) What successes have been experienced; (d) What the interviewees consider to be the main barriers or management challenges to the current sustainable initiative; and (d) How such barriers can be reduced or overcome. The study finds that although Barbados is considered to be a Small Island Developing State (SIDS), and is in the embryonic stage, with respect to sustainable development, businesses in the country have begun to implement sustainable practices. Despite being faced with particular management challenges, their overall environmental quality is relatively good. This research is recommended for an international standard of operations.

Keywords: Barbados, behaviour, development, environmental, facilities management, organisation, sustainable practices

INTRODUCTION

RESEARCH BACKGROUND TO STUDY

The built environment is responsible for nearly half of the UK's carbon emissions, half of the water consumption, about one third of landfill waste, and one quarter of all raw materials used in the economy (BIFM, 2009). With the pressing sustainability agenda, the impact of the built environment, including the contribution the construction industry makes, is colossal and needs to be addressed across all industries. In developing countries, the construction industry accounts for around 40% of all material resource consumption and about 40% of all waste and greenhouse gas generation (Prasaid, 2004). The built environment, and in particular the existing building stock, can consume as much as 45% of generated energy to power, while only 5% is consumed during the construction phase (Elmualim, 2009).

The benefits of sustainability are well established in the UK, in addition to the increased realisation of the contribution that the Facilities Management (FM) Professionals need to play in delivering sustainability, and they are increasingly becoming recognised. With regard to the enforcement of legislation, as well as the environmental importance of the Built Environment, Shahbazpour and Seidel (2006) points out that sustainability has been emerging as a new means to achieve differentiation in today's competitive market. Environmental awareness has become an increasing concern in all walks of life in most parts of the world, and the area of Facilities Management has been no exception.

Barbados is the most easterly of the tropical Caribbean island chain (see Figure 1). It's population of 267,000 reside in an area of only 431 km², making it one of the ten (10) most densely populated countries in the world. In the past, sugar cane production was central to the economy, but since the 1980s, there has been a significant shift to the service sector, notably tourism. However, large-scale tourism development dates back from the late 1950s and early 1960s. By its independence from Britain in 1966, the number of tourists staying overnight was 79,104, and thereafter the numbers have reflected a boom-bust pattern (Dann and Potter 1997, pp.207-

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9). By 2001, there were 507,078 tourists and also 527,597 cruise passenger visitors (Barbados Ministry of Tourism, 2002). Therefore, the national economy relies significantly on tourism. Its contribution to real GDP has been around 13-15% throughout the 1990s (Barbados Ministry of Physical Development and Environment 2001, p. 19). In 2001, tourism provided about 52.6% of the country's foreign exchange earnings, as well as direct and indirect employment for 10.6% of the workforce (Barbados Ministry of Tourism, 2002). In that same year (i.e., 2001), the largest tourist source market was the UK (with 42.9%).

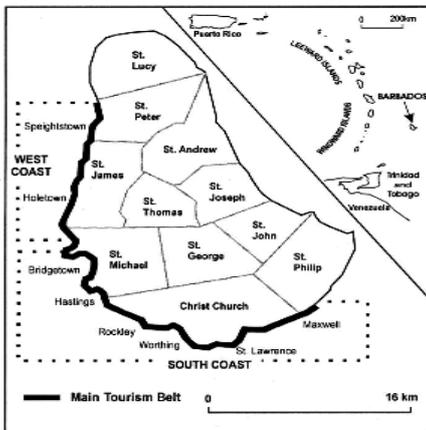


Figure 1: Features and Location of Barbados - Source: BTA

Barbados' overreliance on imported fossil fuels has become one of the island's major environmental concerns. However, despite being in the embryonic stage of implementing sustainable practices in all businesses, it is still regarded as a leader in the region on green issues. Solar water heaters are now a widely used renewable energy technology in Barbados, with installations in nearly half of the island's dwelling units.

LITERATURE REVIEW

KEY SUSTAINABILITY ISSUES TO ADAPTING SUSTAINABLE PRACTICES IN BARBADOS

Climate Change

Barbados is a middle-income Small Island Developing State (SIDS), with a fragile natural resource base and open economy, characterised by a narrow range of exports and a heavy dependence on imported goods (UNDR). Barbados' main foreign exchange earning sectors are tourism, sugar, manufacturing, banking and financial services. However, the country faces several challenges which are unique to SIDS and the Caribbean region. Its small economic size, high degree of economic openness, and limited resources base makes it extremely vulnerable to external shocks, and impedes its capacity to respond and adjust to them (UNDR). This lack of resilience is further compounded by the negative aspects of globalisation.

Barbados' limited land size of 166 square miles, the natural resource base and fragile marine eco-system leaves the island susceptible to several environmental threats, such as: invasive species, flooding, soil erosion, coral reef degradation, climate change and natural disasters (Mimura, 2007; Nicholls, 2007; and Simpson, 2009). Therefore, threats to Barbados' environment have the potential to seriously damage the tourism-based economy (McCarthy, 2001).

The Caribbean has been identified as a "tourism vulnerability hotspot", where a suite of climate-related factors combine to place the Caribbean as a tourism destination at risk (Simpson, 2008). Impacts of climate change on the natural and human environment are of particular concern, as these are a critical resource in the particular tourism product. Considering the fact that Barbados' economic security is tied to its tourism performance, this would be of great unease. As a member of SIDS, tourism is estimated to be the single largest economic sector in the regions, with a GDP of 14% in 2004 (Simpson, Gossling and Scott, 2008). The Caribbean tourism industry recognises that tourists have become increasingly sophisticated in their choice of tourism destinations, and a major factor in the choice set of tourists is the environmental quality of their preferred destination (Fitzgerald, 2003). Barbados, being a member of SIDS, is not a major contributor to global warming and climate change, but is likely to be significantly impacted if adaptation measures are not implemented.

Energy

“*The sun will shine when the oil runs out.*” (Professor Oliver Headley).

The primary incentive of organisations in following sustainable and green-building practices is the reduction in energy consumption and the subsequent reduction in the reliance on fossil fuel to produce that energy (Hodges, 2005). In Latin America and the Caribbean, the population is rising and the region's energy use will also rise by 60-85% by the year 2025 (Olade, 1996). Barbados has a very high dependency on fossil fuels. Approximately 90% of the electricity produced in Barbados is generated from fuel oil (Sustainable Energy Framework Barbados, 2010). Since Barbados' oil demand exceeds its production capacity, the country has to import 9,000bbl. per day, that together with the locally produced 1,000bbl. daily, and it is mainly used for power generation (50%) and transport (33%) - (Sustainable Energy Framework Barbados, 2010). With the current high price of oil, the government of Barbados is committed to introducing cleaning energy and energy conservation as a means to reduce the dependency on expensive fossil fuel. In addition, awareness of sustainable development issues throughout the region is also a major factor in support of energy conservation practices, and is the driving force for energy policy-making decisions (Haraksing, 2001). Energy efficiency programs are urgently needed in the region in order to reduce wastage due to ignorance or malpractice (Haraksing, 2001). Therefore, energy-efficiency policies must embrace economic, political, cultural and domestic activities.

Research carried out during the mid 90s by the renowned Solar Scientist, Professor Oliver Headley (1997), showed how the energy needs of Barbados can be met by renewable energy systems, and he outlined very clearly the effective use of the solar-powered water heating systems. Over 23,000 out of 70,000 households, during the time of the study, had water heaters installed. Moreover, the solar water heater industry of Barbados is the best known example of the exploitation of renewable energy technology in the Caribbean (Headly, 1997; and Haraksingh, 2001). The success of the solar water heaters, as he (Professor Headley) goes further in his paper to express, should be repeated in other sunny Third World countries in order to reduce the dependency on imports of fossil fuel.

Sustainable Practice of Waste Management in the UK:

- *Strategic Focus* - Sustainability derives its greatest power, and affects organisations, when it is deeply embraced as a set of core values that genially integrate economic prosperity, environmental stewardship and social responsibility (Pitt, 2005). Recycling initiatives must therefore become a part of the corporate strategy.
- *Development* - Often, the issue of staff not knowing what is expected of them is viewed as a problem. Developing a process entails those services that comprise in the recycling or waste management processes and their quality of execution, which is associated with program outcomes. This takes account of the recycling infrastructure, in relation to its physical environment. It has been argued that the convenient recycling facilities layout and infrastructure are vital for recycling success (Marans and Lee, 1993; Margai, 1997; Perri and Barton, 2001; Envirowise, 2002; McDonald and Oates, 2003; and Pitt, 2005). For example, clear and easily recognisable signage is essential in terms of the correct system use and low contamination rates. Each system should be colour-coded and signed. Signage should be placed on bins and in the waste areas. The importance in managing waste data relative to Performance Indicators has been highlighted (Envirowise, 2002).
- *Organisation and Culture Factor* - Strong support of Senior Management or Board Members is vital when managing the recycling programme (Barr, 2005). In addition, the key role of the FM, as the executer at the management level, has also been identified in other studies (Atkin and Brooks, 2009) as the person responsible in the areas of materials handling, transportation, and procurement, as well as with waste contractors, employees, and the general public.
- *Culture and Organisational Behaviour* - A positive culture and climate is vital to successful recycling initiatives. This should involve recycling education, as well as departmental awareness campaigns. Hence, a series of information sheets should be developed and issued to staff on a regular and on-going basis. These communications will introduce staff and students to the systems in place, explain the concepts of recycling, avoidance and contamination, and promote good practice stories about how waste can be avoided or reduced.

The main driver of the successful implementation and management of this type of initiative is the behaviour of individuals, resulting in the actions of individuals (Tudor, 2007). A major factor that has been advanced as a reason for the limited uptake of sustainable waste management policies is the behaviour of individuals involved in the execution of the function (Barret, 2005). Behaviour, which is referred to as “observable acts of the subject” (Fishbein and Ajzen, 1975), is an action. A study conducted by Tudor, in 2007 and 2008, which tested the theory of planned behaviour in waste management within the UK health care sector, demonstrated that the key factors that linked intended behaviour to actions, were the beliefs about the priority of waste management as an issue, the benefits of recycling, as well as whether staff were concerned with recycling. The results also indicated the usefulness of the theory of planned behaviour. In practice, if the perception is that there is some tangible benefit to staff in engaging in the action, then they

are more likely to change their intended behaviour into action. Strategically, the focus should seek to have in place policies strongly linked to raising the significance and profile of sustainable waste management, ensuring that the people who deliver day-to-day service within the operations know the purpose or reasoning behind what they are doing, and are therefore able to carry out their duties effectively, knowing the benefits.

RESEARCH METHODOLOGY

The research methodology is designed to obtain qualitative data about the extent of which sustainable business practices have been implemented within six (6) different business sectors in Barbados to:

- (1) Ascertain whether those involved in the management of practices have an understanding of sustainability; and
- (2) To have some idea of how far Barbados is at in terms of the development of the sustainability agenda.

In order to investigate this, case studies of six (6) very different types of organisations and sectors were conducted (Figure 2).

The question posed about the UK study in relation to the management challenges have been researched using secondary sources. Articles, journals and books have provided useful information in order to understand the similar challenges and methods for the best practice in implementing waste management in the UK. In-depth research for literature, relating specifically to Barbados on the research question, was virtually non-existent.

ORGANISATION	SECTOR
Hilton International	Tourism
The University of the West Indies	HEI
Barbados Sanitation Services Authority	Quasi -Governmental
Studio Blue Architects	Private Sector
The British High Commission	Government
Nation Publishing House	Media House

Figure 2 Organisations in case studies

FINDINGS AND DISCUSSION

FINDINGS PRESENTED

Main Drivers to Adapting Sustainable Practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Climate Change	4	18.2	18.2	18.2
	Consumer Demand	4	18.2	18.2	36.4
	Employee Engagement	1	4.5	4.5	40.9
	Fuel Cost	6	27.3	27.3	68.2
	Legislative	2	9.1	9.1	77.3
	Political Pressure	2	9.1	9.1	86.4
	Stakeholder Influence	2	9.1	9.1	95.5
	Tourism	1	4.5	4.5	100.0
	Total	22	100.0	100.0	

Figure 3. Main Drivers towards Adapting Sustainable Practices in Organisations

Key Drivers towards Sustainability In Barbados

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Climate Change	6	24.0	24.0	24.0
	Consumer Demand	2	8.0	8.0	32.0
	Employee Engagement	1	4.0	4.0	36.0
	Fuel Cost	6	24.0	24.0	60.0
	Legislative	1	4.0	4.0	64.0
	Political Pressure	3	12.0	12.0	76.0
	Stakeholder Influence	1	4.0	4.0	80.0
	Tourism	5	20.0	20.0	100.0
	Total	25	100.0	100.0	

Figure 4. Key Drivers towards Sustainability in Barbados

Sustainable Practices in Organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Carbon Foot-Printing	4	12.1	12.1	12.1
	Community Engagement	3	9.1	9.1	21.2
	Energy Management	6	18.2	18.2	39.4
	Ethical Purchasing	4	12.1	12.1	51.5
	Flexible Working	1	3.0	3.0	54.5
	Health and Safety	2	6.1	6.1	60.6
	Recycling	6	18.2	18.2	78.8
	Sustainable Travel	2	6.1	6.1	84.8
	Water Usage	5	15.2	15.2	100.0
	Total	33	100.0	100.0	

Figure 5. Sustainable Practices in Organisations

Opinion on Effectiveness of Managing Sustainability Practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	4	66.7	66.7	66.7
	Very Good	2	33.3	33.3	100.0
	Total	6	100.0	100.0	

Barriers to Effective Management of Sustainable Practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Behavioural Change	5	20.8	20.8	20.8
	Building Constraints	1	4.2	4.2	25.0
	Customer Constraints	1	4.2	4.2	29.2
	Financial Constraints	2	8.3	8.3	37.5
	Lack of Awareness	4	16.7	16.7	54.2
	Lack of Knowledge	1	4.2	4.2	58.3
	Lack of Senior Management Commitment	1	4.2	4.2	62.5
	Lack of Staff	1	4.2	4.2	66.7
	Lack of Tools	2	8.3	8.3	75.0
	Lack of Training	3	12.5	12.5	87.5
	Organisational Engagement	1	4.2	4.2	91.7
	Time Constraints	1	4.2	4.2	95.8
	Time Restraints	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Figure 6. Opinion on Effectiveness of Managing Sustainability Practices

DISCUSSION

MAIN DRIVERS

In the final analysis of the study questionnaire, results show that the key drivers to sustainable practices in organisations are influenced by a high influx of fuel costs, followed very closely by climate change and consumer demand. This concurs with Hodge (2005) in his research, and in further review of the literature within this study, that the incentive of organisations in following sustainable and green-building practices is related to the reduction of energy consumption, and the subsequent reliance on fossil fuel in order to produce that energy.

Long-term changes in climate are high on the global environmental agenda - not because of their potential impact on economic activity, but as a result of the damaging effects on the island's coastal arena. Environmental groups and most governments are concerned about warnings from the scientific community, and businesses are taking notice, especially those in the tourism industry. Consumers are undoubtedly making decisions based on the environmental impact that they contribute. Therefore, the choices and operations of service providers need to reflect that. Views from the questionnaire, as it relates to drivers toward sustainable practices, highlight the awareness that is being made in this particular area. Twenty percent (20%) of those persons who were asked the question felt that consumer demand was a contributing factor towards implementing sustainable practices in organisations. Research of Fitzgerald (2003), although linked more closely to the tourism sector, confirms the importance of choice-set based on the environmental quality of the preferred destination. The service industry in Barbados, on the whole, has become more aware of the importance of sustainable practices, and sees it as a crucial factor. However, views on drivers towards sustainability, as a nation, reveal two (2) leading areas - climate change and fuel costs, as the main equal (see Figure 4).

RECYCLING

Sustainable practices adopted by organisations usually focus on energy efficiency. However, a more common initiative is recycling. Both energy efficiency and recycling show results of an 18% frequency (see Figure 5). In the study, 66.7% of the organisations had some type of recycling procedure in-house. However, for at least 33% (see Figure 6), this did not form part of any policy and raised a number of management issues faced with the execution of this initiative. For example, the issue of garbage having to be separated from the recyclables, misunderstanding of collection days, and no concrete timetable for when this should take place. Establishing a recycling policy, as suggested by Folz (1991), Pitt (2005) and Ekere (2009), helps to achieve recycling goals, and also helps with other means of waste reduction.

MAIN BARRIERS TO EFFECTIVENESS OF SUSTAINABLE PRACTICES

"Sustainability derives its greatest power" (Pitt, 2005).

For behaviour and culture change, institutional change would have to play an important role in changing attitudes, either through changes in legislation or new organisational arrangements, which prioritise the management of practices. Respondents were asked what they felt were the main barriers towards effective management of sustainable practices, and what actions could be taken. The discussion and questionnaire revealed clearly that the behaviour of individuals and the lack of awareness were the main causes (see Figure 6). Respondents suggested that despite having an energy management programme with some willing participants, some attitudes and behavioural change prevented the effectiveness. The majority of interviewees considered the 'organisation's culture' to be another important barrier to undertaking environmental initiatives. It was claimed that a general lack of interest towards environmental improvements predominated their organisation. The Staff was described as careless; whilst some were considered uninterested and too busy with their own work to participate in a greening process. Cultural and awareness barriers are definitely inter-linked. Someone who is biased against, or at least not interested in, environmental issues will most likely also not be aware of many benefits of environmental improvement measures.

It is believed that the lack of awareness was as a result of inadequate training mechanisms within organisations, and it is recommended that training of all staff should be conducted, rather than only top or middle management, as in most cases. The lack of environmental awareness was considered significant because people did not know how to act sustainably. In other words, investing in waste and energy reducing devices has no meaning unless people know how and why it should be carried out. Decision-makers must be familiar with the benefits of greening in order to establish environmental policies and to invest in green devices, and managers must also realise the necessity of being 'green' role models to their staff. Furthermore, staff must be made aware of how their habits and choices influence the business' own environmental 'footprint' before a change towards environmentally sustainable behaviour can be expected to take place. For encouragement, people should also be informed of achievements, savings, and successes that have taken place in a greening process.

This research has shown that policies linked to raising the significance and profile of sustainable practices, ensure that the people who deliver day-to-day service within the operations know the purpose or reasoning behind what they are doing, and are therefore able to carry out their duties effectively, knowing the benefits. The results from the case studies, where significant improvements were noticed, were of those that have in place a robust environmental management system, two (2) of which fall under the Future Centre Trust's "Green Business".

CONCLUSION

This study has attempted to perform an overall evaluation of how far a sample of businesses in Barbados has reached with respect to sustainable practices within the areas of solid waste, water usage, carbon reduction and energy management. The study has also determined what these organisations consider to be the most important barriers to further greening, and suggested measures on how such barriers can be reduced, or possibly overcome.

The Caribbean is quickly awakening, and although Barbados is considered a SIDS, they have begun to implement greening in organisations. Despite the fact that it is still very much at the embryonic stage in some cases, the overall performance of the sample studied proved to be relatively good, considering the results from those that applied energy saving measures, and those that were able to provide measurement data proved that success had been noticed. It was clear that the driving force behind sustainable practices, especially energy efficiency, were related to cost, rather than to environmental stewardship. The most important drivers to greening initiatives were found to be:

- Financial - The reduction or saving in utility costs;
- Climate Change - Environmental impact on the island's coast and terrain;
- Consumer Pressure - Demand from the consumer to give an environmentally-friendly product.

The reduction of costs in utility billing was considered the most significant driver to sustainable practices. Although climate change and consumer pressure were also highlighted, the influence was mainly due to the nature of the service industry and expectations from the customer. Main barriers to overcome in the management of greening initiatives were very clearly seen as:

- Behaviour and Culture - Lack of willing participation and non-environmental attitude;
- Lack of Awareness - Lack of education/training in environmental issues;
- Financial Constraints - The lack of financial resources.

It is believed that the most important measures for reducing or overcoming the established barriers to green initiatives in Barbados' businesses is to raise awareness in the entire organisation. Implementing a standard of operations and ensuring that sustainability forms part of the overall business strategy will give staff better understanding of the purpose and keep them informed of the benefits. Waste reduction, particularly recycling and energy efficiency practices, were the two (2) major initiatives that businesses in the study were found to be involved in, where the biggest opportunity for creating environmental change naturally fell in the domain of Facilities Management.

Undertaking greening initiatives nationally, since it can be beneficial to the environment, were considered essential from a Caribbean island's prospective. However, at the macro level of business, it was not. The issue of climate change and the reduction of importation of fossil fuel are very high on the Barbados Government's agenda. It is apparent that the drive towards the direction of a green economy is some evidence that progress is being made in the pursuit of fulfilment of the sustainability agenda. The possible change in legislation, allowing businesses to benefit financially from "going green", will steer more businesses in the direction of implementing a sustainable business practice. Renewable energy solutions are developing rapidly as fossil fuel alternatives are desperately being sought and the sunny tropics provide an ideal climate for solar energy. However, more needs to be done so that businesses, and individuals alike, will understand that greening has numerous advantages, and should thereby start to vigorously pursue environmental initiatives in businesses and organisations. As a small island state, and one that is regarded as considerably more developed than a number of the other Eastern islands, Barbados' huge influence, research resources, and their sustainability efforts (both large and small), could most likely in time extend far beyond the island's beautiful white sandy beaches.

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SESSION 10 ORGANISATIONAL STRATEGY & BUSINESS PERFORMANCE

A BUSINESS MODEL FOR COOPERATIVE LIFE CYCLE SERVICE PROVISION

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The construction industry is dominated by short-term yield considerations. Usually the offer with the lowest initial investment cost is awarded the contract without taking the life cycle costs into consideration. The individual processes are highly fragmented with many stakeholders and interfaces. A more holistic sustainable building optimization across all trades and stages of the building's life cycle is needed. Therefore the concept of eco-efficiency is introduced. The new cooperative business model for life cycle service provision follows the objective of delivering sustainable holistic eco-efficiency maximization. The requirements and know-how of later stages in the building's life cycle, like production and operation, have to be considered in the early design stages. Through an interdisciplinary cooperation across trades the knowledge of all project participants can be combined in a synergetic way. A focal enterprise, which acts as system leader, can develop sustainably optimized buildings in cooperation with various specialist contractors, the system suppliers.

Keywords: business model, cooperation, life cycle orientation, networks, sustainable building

INTRODUCTION

The leading paradigm of modern society is economic growth. A steady economic expansion is necessary to sustain a certain level of societal welfare in developed countries. For emergent countries economic growth is even more important as a means of reaching a standard of living comparable to industrial nations. Over the last 100 years economic growth has been accompanied by extensive resource consumption, emissions and waste generation resulting in an increasing resource scarcity and pollution. Controversial to the main objective of economic expansion, societal welfare, the exploitation of natural resources beyond nature's bearing capacity induces a steady decline in quality of life.

THE CONCEPT OF ECO-EFFICIENCY

Therefore a more sustainable development through the decoupling of economic growth and resource consumption is necessary (Weizsäcker et al. 1997). The Brundtland Report of the World Commission on Environment and Development (1987) defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

In order to accomplish a successful implementation of sustainable development Schmid (2000) developed three basic strategies:

- Sufficiency demands a change in life style and consumption habits leading to a reduced demand for material commodities.
- Efficiency deals with an increase in resource productivity, closed loops of material flow and cascading use of resources. According to Weizsäcker et al. (1997) an improvement of input-output-ratios in production by a factor of four to ten is possible through the optimization of products and the value creation process.
- Consistency targets the re-integration of anthropogenic material and energy flows into the natural cycle.

The business model follows the strategy of efficiency as it aims to restructure the building production process and to re-design buildings to make them more sustainable. Schmid (2000) identified four basic principles for developing measures that ensure sustainable development in business enterprises:

- Principle of responsibility,
- Principle of cooperation,
- Closed-loop principle, and
- Principle of function-orientation.

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These principles are used as leading paradigm for the development of the business model. For the assessment of ecological measures in a technological system Schaltegger and Sturm (1990) identify effectiveness as the appropriate success criterion. Effectiveness describes the degree of target achievement of corporate actions. While in a market they introduce efficiency as the proper criterion for success because of the scarcity of most input resources. Efficiency as the ratio of output to input is the number one criterion to secure a company's existence. With the objective of combining environmental improvements with economic benefits Schmidheiny (1992) introduced the concept of eco-efficiency. Accordingly the concept of eco-efficiency focuses on two of the three pillars of sustainability. The concept was further developed by the World Business Council for Sustainable Development (WBCSD 2000) defining it as "creating more value with less impact or doing more with less". The Organisation for Economic Co-operation and Development (OECD 1998) describes eco-efficiency as "the efficiency with which ecological resources are used to meet human needs." The WBCSD has identified three broad objectives in increasing eco-efficiency:

- Reducing the consumption of resources,
- Reducing the impact on nature, and
- Increasing product or service value.

Moreover the concept of eco-efficiency is increasingly considered as an opportunity for innovation by companies instead of posing a threat to them. In general a paradigm shift from cleaning-up activities towards integrated preventive measures is taking place (Bleischwitz 2004). Companies are encouraged to develop creative strategies of precautionary management with a focus on environmental and sustainability matters throughout the whole life cycle.

ECO-EFFICIENCY IN THE BUILDING INDUSTRY

The building industry as a major consumer of natural resources with an enormous impact for the environment needs to adapt to the changing environmental conditions. A building impacts its environment throughout the whole life cycle. The construction activities for producing a building alter the environment significantly. In the academic literature several aspects of environmental impacts of construction activities have been described. Gangolells et al. (2009) identified the following aspects of environmental impacts during the construction process guided by the European Eco-Management and Audit Scheme (EMAS):

- Emissions to air (greenhouse gas emissions, volatile organic compounds and chlorofluorocarbons),
- Releases to water (execution of foundations and retaining walls, cleaning process of machinery and tools, sanitary water),
- Waste generation (inert waste, non-special waste, special waste),
- Use and contamination of land (land occupancy, dumping from use and maintenance of construction machinery, use of concrete release and surface cleaning agents, dumping of other liquid waste),
- Use of natural resources and raw materials (water, energy, raw materials),
- Local issues (noise, vibration, odour, dust, visual appearance, etc.),
- Transport issues,
- Environmental accidents, and
- Effects on biodiversity.

When evaluating the environmental influences of construction activities it is important to extend the scope of consideration and include grey energy necessary for the production of building material as well as emissions and waste caused by the production including the extraction of raw materials (Pacheco Torgal and Jalali 2011). In addition the effects of maintenance activities have to be considered. The building also impacts the environment significantly during the operation phase. Malmqvist and Glaumann (2009) analyse the environmental impact relating to energy use in connection with the quality of the indoor environment. During the operation phase use of electricity and energy for heating, cooling, and hot water constitute an environmental impact. It is vital to evaluate the environmental impacts of a building over the whole life cycle including impacts caused through the production and disposal of building materials.

OBJECTIVES OF THE NEW COOPERATIVE BUSINESS MODEL

The new cooperative business model is developed to increase eco-efficiency in the construction business. Eco-efficiency is a measure of economic performance divided by the environmental impact added (Schaltegger and Burritt 2000):

$$\text{eco-efficiency} = \frac{\text{economic performance}}{\text{environmental impact added}}$$

Potential for eco-efficiency increases can be identified in two sub categories, product eco-efficiency and production eco-efficiency.

Product eco-efficiency

The product eco-efficiency is concerned with the customer's perspective. The economic performance from the customer's point of view is the customer value attributed to the building or infrastructure. The environmental impact added through the building has to be considered over the building's life cycle covering design, production including the grey energy used for the production of the building material, utilization phase (e.g. energy consumption, type of energy (renewable or not), emissions and waste generated through the building) and disposal. Therefore product eco-efficiency is defined by:

$$\text{product eco - efficiency} = \frac{\text{customer value}}{\text{environmental impact added}}$$

The business model for cooperative life cycle service offers increases the slope of the linear relationship between customer value and environmental impact added. With the new service offer more value can be offered causing less environmental impact (see Figure 1).

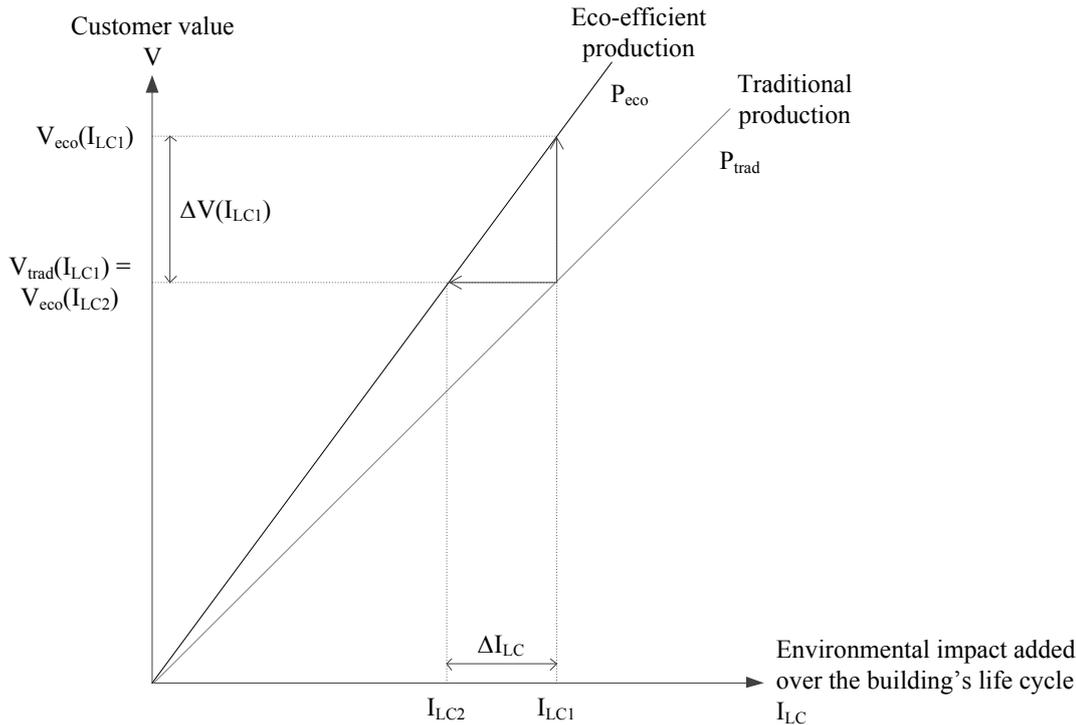


Figure 1: Effects of eco-efficient production on customer value and environmental impact added compared to traditional production

Production eco-efficiency

The second aspect that offers potential for eco-efficiency increases is the so called production eco-efficiency. From the contractor's perspective economic performance is measured by revenue. The environmental impact added again has to be evaluated over the buildings life cycle. Therefore production eco-efficiency is defined by:

$$\text{production eco - efficiency} = \frac{\text{revenue}}{\text{environmental impact added}}$$

In traditional production a specific level of revenue causes a certain degree of environmental impact added. By the means of sustainable production more revenue can be generated with a certain level of environmental impact. And vice versa eco-efficient production enables construction companies to achieve the same revenue causing less environmental impact through efficient use of resources as input factors, less waste generation and the creation of a holistically optimized building (see Figure 2).

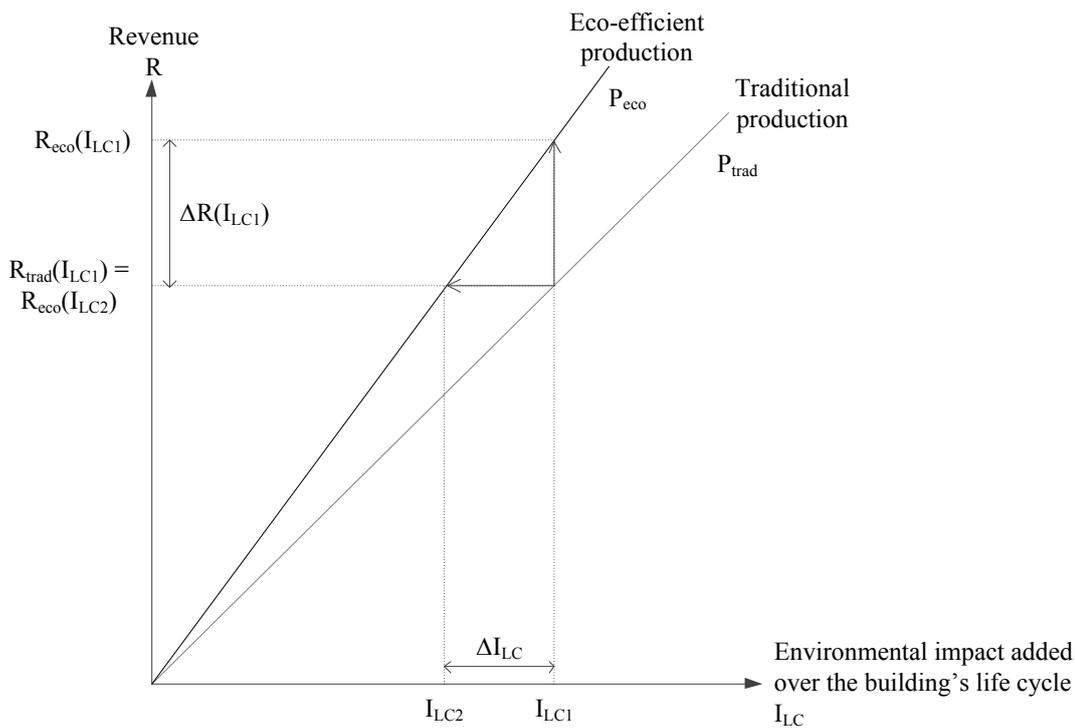


Figure 2: Effects of eco-efficient production on revenue and environmental impact added compared to traditional production

RESEARCH METHODOLOGY

The development of the business model can be allocated in the hermeneutic science program with the objective of shaping the socio-technical world (Girmscheid 2007). According to the constructivist research approach the model is developed logically-deductively using target-means-relations. The formal scientific framework is provided by systems theory (Bertalanffy 1969) and the internal structuration follows structuration theory (Giddens 1986) and principal-agent-theory (Jensen and Meckling 1976). To improve the scientific quality of the model the results of an empirical analysis (Lunze 2010) are included. This empirical study was conducted with the aim of identifying success factors for cooperation using semi-structured problem-centered interviews in trades where cooperative project delivery is practiced successfully. In a cross-case these success factors were evaluated for their applicability in the construction industry.

THE NEW COOPERATIVE BUSINESS MODEL

The new cooperative business model increases eco-efficiency by reducing environmental impact over a building's life cycle and increasing customer value and revenue for the companies involved.

FIELDS OF ACTION

Four fields of action to increase eco-efficiency can be identified (WBCSD 2000):

- Re-think markets,
- Re-design products,
- Re-engineer processes, and
- Re-valorise by-products.

The cooperative business model for the construction industry focuses on the first three fields and structures the organization and processes according to the principles of sustainability identified by Schmid (2000).

Re-think markets

First of all the reasons for people building houses should be considered. What are the customers' needs? Which are their objectives

and expectations? Only when the customers' requirements are understood, they can be fulfilled (Girmscheid 2010b). People build houses and buy heating systems, because they want rooms with comfortable climatic conditions to live in. Traditional types of project delivery only consider the production of the building. There are no guarantees covering the satisfaction of the client's needs. Construction companies should offer function-oriented-systems instead of product-oriented-systems as nowadays. More service orientation by the contractors throughout the life cycle of the building contributes threefold to the objective of increasing eco-efficiency. First more service orientation increases customer value. Second more service orientation increases the construction company's revenue as they expand their business segment into areas they have not served before. Third this increase in revenue and customer value is not accompanied by an increase in resource consumption or environmental impact added.

Re-design products

At the level of product design the new service offer is characterized by its sustainability in three dimensions:

- Use of sustainable, renewable or renewed building material according to the closed-loop principle of sustainable development,
- Energetic optimization causing reduced energy consumption and CO₂-emissions as well as increased utilization and generation of regenerative energy sources, and
- Flexibility of utilization and alteration according to the principle of function-orientation.

Girmscheid and Lunze (2009) developed a life cycle construction kit for energetically optimized buildings consisting of modules and subsystems which are integrated specifically for each project to generate a sustainable, holistically optimized building. The following subsystems and modules were identified:

- Passive energy building subsystem including the modules
 - o Facade, and
 - o Component activation
- HVAC heating and cooling subsystem including the modules
 - o Fossil energy utilization,
 - o Thermal solar power utilization,
 - o Geothermal energy systems, and
 - o Biomass
- Electrical power subsystem including the modules
 - o Combined heat and power system – Polygeneration,
 - o Photovoltaic solar power utilization,
 - o Lighting, and
 - o Building management and automation
- Water supply and disposal subsystem including the modules
 - o Drinking water utilization,
 - o Rainwater/Gray water utilization, and
 - o Technical systems for saving water
- Interior finish subsystem including the modules
 - o Flexible wall and flooring systems
 - o Flexible building technology, and
 - o Floor and interior wall coverings
- Work and utilization infrastructure subsystem including the modules
 - o Computer system, and
 - o Telecommunications system.

Re-engineer processes

In order to optimize a building's design, production and operation process holistically and increase the efficiency of the whole project delivery process cooperative process modularisation using the life cycle construction kit developed by Girmscheid and Lunze (2010) is implemented in the new business model. By creating process modules which are put together in cooperation the two-dimensional interdependencies between the different modules can be taken into account.

First the various modules are chronologically interdependent. Nowadays project execution is performed sequentially and is highly fragmented with many interfaces. The requirements and experience of later stages of a building's life cycle, like production and use, are hardly ever considered at the design stage.

Second the different modules are technically interdependent, which is not being considered in the current construction management methods. In a building project for example the architect designs the facade and specifies the requirements, which are then passed on to the HVAC-contractor who optimizes the indoor climate. No cooperative interaction which potentially generates synergies is taking place.

Through the project specific integration of the different modules according to the principle of cooperation the know-how of different project stages and of various trades can be brought together leading to sustainably optimized buildings, which generate a surplus-value for the customer and the companies involved.

Cost and function guarantees can serve as an instrument for securing the performance of such a holistically optimized building. This enhances customer value by generating certainty about the reduction of operation costs, which leads to a reduction in resource consumption and emissions and therefore a lower environmental impact.

FORMATION OF THE COOPERATION

The cooperation is led by the focal enterprise, the system leader. This new business entity can be founded as a strategic business unit in a general contractor. The focal enterprise is responsible for the acquisition of new contracts and the selection of the specialist contractors, the system suppliers (for example heating, cooling, ventilation, plumbing, electrical installation, facility management, etc.). For the selection of appropriate suppliers the focal enterprise generates a competence profile which lists all the competences required for the processing of a specific project. The focal enterprise has a pool of potential partners to choose from. To keep competition up inside the cooperation a multiple sourcing strategy is chosen. This means that at least two contractors of the same trade are invited to develop an offer for a specific contract and the company making the better offer will then be assigned to participate in the cooperation network and improve the concept further in coordination with the other project participants.

MANAGEMENT OF THE COOPERATION

The focal enterprise is also responsible for the coordination of the system suppliers and the management of the network. Lunze (2010) identified the following types of success factors which are vital for the functioning of cooperation networks across different industries:

- Cooperation constitutive success factors,
- Market-related success factors,
- Hierarchy-related success factors,
- Process- or product-related success factors, and
- Leadership related success factors.

These success factors take effect on various levels of the cooperation. In order to create a clearly structured model these levels have to be examined separately (Sydow and Windeler 2000).

Level of institution context

The cooperation is embedded in its institutional context shaped by economy, ecology, society, and technology. On this level the cooperation is influenced by five forces (Porter 1985): rivalry, threat of new entrants, supplier power, threat of substitutes, and buyer power. The output on this level is customer value. According to eco-efficiency the customer value has to be high and accompanied by a low environmental impact added.

Level of the inter-organisational network

On the level of the inter-organisational network the elements of observation are the companies involved in the network and their interactions. To ensure market conformity of prices and services within the cooperation mandatory rules of cooperation must be institutionalized. The intent is to build a foundation of trust so that extensive contractual arrangements become obsolete. The energy spent for contract management can then be invested into value-creating operations. Trust cannot be enforced but encouraged through appropriate incentive mechanisms and inter-organizational transparency. With structuration theory (Giddens 1986) and principal-agent-theory (Jensen and Meckling 1976) an appropriate organizational structure and process organisation can be determined to avoid opportunism to a large extent.

Level of the single enterprise

On the next level the organisation and processes in the enterprises involved have to be structured. These are the units of observation on

the level of the single enterprise. It has to be taken into account that the companies participate in the cooperation besides continuing their normal business as well. Negative interferences between these two business fields have to be obviated.

Level of the individual

Last but not least the interactions of the individuals involved in the cooperation have to be examined. A culture of trust and commitment can only originate, if the individuals interacting with each other are willing to cooperate.

EXAMPLE OF APPLICATION OF THE BUSINESS MODEL

The guaranteed delivery of a comfortable room climate to the customer in addition to the construction of the building is one example of an eco-efficient service offer. The business model enables different specialist contractors to form a cooperation to undertake the construction of the building and supplement it with a guarantee covering generation and use of energy during the utilization phase. As the responsibility for the whole process from design to operation is concentrated in the hands of the cooperation, the companies involved have an incentive to create a building with a highly efficient energy supply. Through energy contracting using renewable sources of energy and through the integral optimization of the interdependent elements, like building envelope, heating, cooling, lightning, and solar energy generation, in the design phase an enormous potential for efficiency improvement can be seized and benefits for all parties involved can be generated.

The customer receives a surplus value because he isn't exposed to exceeding costs in the utilization phase. He benefits of a higher degree of cost certainty and lower costs independent of oil price increases. The companies involved in the cooperation can create a new field of business as service provider covering the whole life cycle of a building. In doing so they pursue a differentiation strategy and they are able to generate surplus revenue over a longer period of time.

These financial benefits are accompanied by ecological benefits. Through the use of geothermal energy, thermo active building systems, the installation of a photovoltaic system mounted on the building's envelope, and other measures the consumption of fossil fuels is reduced and therefore less CO₂ is emitted. Additionally the energy supply systems are not oversized but instead reasonably dimensioned and through the professional maintenance of the facilities their operating life can be extended.

CONCLUSIONS

The next steps in the further development of the business model are the structuration of the organisation and processes so that the empirically investigated success factors are assured. The model's reliability and practical applicability will be assessed in a practical test with the companies involved in the research project.

The business model makes a valuable contribution to the sustainable design of business processes in the construction industry by showing ways of creating holistically optimized eco-efficient buildings with a lower environmental impact and an increased value for the customers and the companies involved. It provides the companies facing the challenge of our future a concept for seizing the challenges as chances to become more sustainable and efficient, both ecologically and economically.

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UNDERSTANDING THE LONG TERM SUCCESS OF UK CONSTRUCTION FIRMS: THE EXTENT AND ROLE OF 'HIDDEN' CORPORATE SOCIAL RESPONSIBILITY

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The construction sector is often described as lagging behind other major industries. At first this appears fair when considering the concept of corporate social responsibility (CSR). It is argued that CSR is ill-defined, with firms struggling to make sense of and engage with it. Literature suggests that the short-termism view of construction firms renders the long-term, triple-bottom-line principle of CSR untenable. This seems to be borne out by literature indicating that construction firms typically adopt a compliance-based approach to CSR instead of discretionary CSR which is regarded as adding most value to firms and benefiting the broadest group of stakeholders. However, this research conducted in the UK using a regional construction firm offers a counter argument whereby discretionary CSR approaches are well embedded and enacted within the firms' business operations even though they are not formally articulated as CSR strategies and thus remain 'hidden'. This raises questions in the current CSR debate. First, is 'hidden' CSR relevant to the long term success of construction firms? and to what extent do these firms need to reinvent themselves to formally take advantage of the CSR agenda?

Keywords: corporate social responsibility (CSR), strategy, stakeholders, sustained success, case study

INTRODUCTION

UK firms are encouraged to adopt innovative practices (cf. Mason et al., 2009; Reid and Peter, 2008). Numerous reports have been commissioned over the years aimed at ensuring the long term success of the UK construction sector through the adoption and diffusion of new practices (or innovations as is sometimes known), typically from other sectors such as manufacturing (e.g. Latham, 1994; Egan, 1998). Such recommendations are well debated in the literature (cf. Green and May, 2003, Koskela et al., 2002 and Abrahamson, 1991).

The concept of Corporate Social Responsibility (CSR) within the construction management literature is relatively new, emerging from the broader sustainability agenda, yet it is aimed at improving the construction processes in the broadest terms. Interest emerged through the works of the likes of Myers (2005) and Jones *et al.*, (2006) amongst others. As such, the concept of CSR and how it is understood within a construction context is still in its infancy. The concept of CSR and its outcomes remain ill-defined yet appear to focus on issues ranging from; moral obligations, ethical considerations, corporate governance, reputation, image, and relationships with numerous stakeholders (cf. Glass and Simmonds, 2007; Petrovic-Lazarevic, 2008). Whilst drawing on the issues described above, this research aims to understand if the CSR themes are being enacted within UK construction contractors that have enjoyed long term success. If so, it is hoped the findings begin to shed some light upon how and also the reasoning and drivers for such practices. Such an aim is deeply embedded in the previous literature regarding improvement and change agendas for the UK construction sector. CSR is increasingly viewed as a management concept which the construction sector must engage with. Initial recommendations suggest that the fragmented and diverse structure of the construction sector is problematic for CSR adoption (Myers, 2005). Past literature relating to other 'must have' management concepts such as Lean Production, Supply Chain Management or Business Process Reengineering have generated a healthy debate regarding their suitability for an industry as fragmented and diverse as construction (Green and May, 2003; Green *et al.*, 2005; Fernie *et al.*, 2001; Koskela and Ballard., 2006). Whilst mindful of such debates this research does not blindly follow the proponents of CSR and the various frameworks proposed. Instead, the authors seek further understanding and empirical evidence of what CSR means and the practices undertaken by UK construction contractors that have a sustained track record of success.

The paper is structured as follows: the broad literature relating to how firms, and then construction firms, are able to sustain their businesses and thus remain competitive is critiqued. This is done whilst being mindful of the exogenous and endogenous factors and

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the interplay between them. This results in the research aligning itself broadly with the notion of firm capabilities, embeddedness and localised learning. These are themes demonstrated as key to the long term success of UK construction contractors (Green *et al.*, 2008; Kao *et al.*, 2009). The antecedents of CSR are presented together with the key themes. These are balanced against the main criticisms of a concept which is still in its infancy. This is followed by describing the results from an in-depth case study. A discussion of the case-study firm's evolution, describing its success and highlighting the extent and role played by themes derived from the current CSR literature is then presented. Conclusions regarding the resonance between the concept of CSR from the literature and the empirical data are offered.

LONG TERM SUCCESS OF CONSTRUCTION FIRMS

Understanding the long term success of firms has been a central theme within management literature and is often viewed through terms like competitive advantage. Such literature is theoretically fragmented, typically focussing upon either the exogenous forces (cf. Porter, 1980 and Chandler, 2005) or the endogenous forces within the firm (cf. Barney, 1991, Teece *et al.*, 1997). There is little need to rehearse the arguments surrounding the relevance of such theoretical approaches as they are now well trodden within the construction management literature (cf. Green *et al.* 2008). Some appear aligned with the exogenous factors as determining the successful nature of construction firms (e.g. Betts and Ofori, 1992; Öz, 2001). Whilst others focus more upon the endogenous issue of what a firm *has* such as De Haan *et al.* (2002) and Phua (2006) typically embracing the resource-based view (RBV) to understand the long term success of firms (cf. Barney, 1991). The key argument of RBV is that a firm's long term success rests on its unique resources which cannot easily be replicated by others. Still aligned with the endogenous stance, others have focussed not on what a firm *has*, but rather on what a firm actually *does* thus emphasising actions and processes and becoming more aligned with the capabilities literature (cf. Teece *et al.*, 1997) and strategy as practice literature (cf. Jazabowski, 2005). Authors such as Teece *et al.*, (1997) argue that a firm's success depends upon its ability to reconfigure its operating routines in response to changing environments. Previous empirical research sought to evaluate the explanatory usefulness of the capabilities and strategy as practice views in the construction context (cf. Green *et al.*, 2008 and Larsen *et al.*, 2007). However, the capabilities literature is also heavily criticised (cf. Arend and Bromiley, 2009). More recent research highlights the significance of the localised learning and embeddedness literature for making sense of the long term success of UK regional construction contractors (Kao *et al.*, 2009). UK regional contractors adopting this approach are *doing* something that enables this to happen. Taking such work as a point of departure, we can begin to consider other concepts, theoretical lenses or innovative practice that may help us understand exactly what firms are *doing* to achieve this localised learning and embeddedness approach for long term success. One innovative emerging concept to appear in the construction management literature is CSR. Firms using innovative practices have been the focus of debate regarding the benefits of early adoption. Such innovation adoption attempts to keep the firm ahead of its competitors but also distinguish it from them as well. The sustainability agenda and the concept of CSR that was borne out of it is a case in point. Firms seeking to appear innovative, offering something extra, or simply distinguishing themselves from their competitors have the option to promote themselves in this fashion and structure their firm as such. The following section introduces and discusses the development of CSR, different frameworks for understanding it and begins to recognise links with enacting a localised learning and embeddedness approach discussed.

CSR LANDSCAPE WITHIN THE CONSTRUCTION SECTOR

Research regarding the concept of CSR within the construction management literature is still relatively scarce, thus offering justification for this exploratory contribution. When reviewing the literature the ambiguity surrounding what CSR means to different parties becomes apparent. Myers (2005) first highlighted the relationship between CSR with the broader sustainability agenda and in doing so pointed to the fragmented and diverse structure of construction sector as barriers to embracing CSR themes. He further concluded that that few companies have changed their approach to business. However, it is not clear if firms' current approach to business have elements of CSR which are 'hidden', in the sense that while firms do not necessarily have a formalised or strategic approach to CSR, elements of CSR are nevertheless embedded in their business activities. Such a notion raises the question of how well CSR, in its current guises, actually 'fits' the UK construction sector and its structural make up. Perhaps a more meaningful contribution can be sought by understanding how CSR manifests itself so that it makes sense to an industry like construction which is structurally fragmented and diverse. Glass and Simmonds's research (2007) is an example in point of the ambiguity within the literature, whereby they focused upon the term 'considerate construction'. This UK based scheme called 'considerate contractors' is gaining momentum, yet based more upon causing the least disruption to third parties during the construction process. For Glass and Simmonds (2007), considerate construction appears to address a range of issues from ethics, community relations right through to

CSR. There is evidence that CSR has spread to a number of construction sectors across the world, including Australia (cf. Loosemore and Phua, 2010). Petrovic-Lazarevic (2008) defined CSR within that context as moral obligation to be a good citizen, achieving sustainability, image of the firm, improving relationships with employees and unions, suppliers, and other community representatives.

A number of studies have offered prescriptive guidelines of what firms wishing to engage with CSR should be doing and these include; having a corporate governance structure, improving sustainability, improving relationships with suppliers, a strong commitment to local community and its protection and engagement, and improving occupational health and safety measures (Petrovic-Lazarevic, 2008). This prescribed list of themes appears logical and perhaps what many conscientious firms would already be doing. However, the issue is perhaps how well the firms articulate these practices and seek to exploit them across the CSR agenda within the UK construction sector. We now begin to see the various emerging themes which make up our evolving understanding of what *doing* CSR means. CSR initiatives in the construction sector are primarily viewed from a profit-making case rather than from the perspectives of those they are intended to benefit, and hence giving rise to contradictions between widely supposedly espoused social values and the enterprise cultures that still dominate the industry (Green, 2009). Against this backdrop, the very meaning of CSR is clearly open to interpretation. This has in some ways led to two conceptual developments in the CSR literature about whether CSR is best approached from a compliance-based or discretionary perspective (Carroll, 1991). Carroll (1991) argues that at the most fundamental level firms should fulfil their economic responsibility to its shareholders followed by a duty to act within the legal framework drawn up by the government and judiciary, as well as ethical responsibility. Firms however, can exercise their discretionary responsibility that go further than basic requirements of shareholders, laws and ethics. It is at the discretionary level that CSR is deemed to have the most potential to add value to a company, and it is where proponents would argue it has the greatest long-term positive impact. At this level, CSR clearly involves a lot more than simply complying with legislations or adopting the latest national or international standards, although in many firms, including those in construction this is as far as it goes (Saha and Darnton, 2005; Petrovic-Lazarevic, 2008; Louisot, 2009).

In practice, the line between compliance-based and discretionary CSR is less clear because it is not uncommon for CSR to encompass a range of economic, legal, ethical and discretionary actions that enable a firm to effectively manage the impact of its business decisions on people, the environment and the economy. This is a challenge which will require a response at many levels. At a firm level, this requires commitment to social, economic and ecological objectives (the so-called triple bottom line) and an understanding of the strategic relationships between them (Oury, 2007). However, because the relationships between the social, economic and environmental impacts of construction activities are complex, project-based with numerous stakeholders ensures they remain poorly understood. This is one of the main reasons for the lack of formalised CSR approach within the industry. Because of the ill-defined causal relationships one of the biggest challenges for the construction sector is to justify the relevance of CSR concepts to the small and medium sized enterprises (SMEs) which dominate the sector. The nature and scale of CSR activities are likely to be very different for SMEs compared multinational companies. For example, SMEs as part of the supply chain or subsidiary of larger companies are likely to be more insulated from regulatory changes, particularly in the international realm. Complying with CSR may not only involve potentially high compliance costs but problems in attaining what may be unachievable targets without the assistance of the larger partners. Conversely, Draper (2000) argued that because SME employee and community relationships are likely to be more intimate than in larger companies and because the impact of any SME activities is likely to be more direct on these communities, this makes SMEs a good environment for CSR to flourish. Encouraging SMEs to take CSR seriously is fraught with practical challenges which are exacerbated by the lack of examples of good practice that such firms can draw from.

METHODOLOGICAL JUSTIFICATION

The research employed a case study approach (cf. Eisenhardt, 1989) in order to understand the long term success of UK construction contractors. The approach sought to occupy the middle ground between inductive and deductive case-study research, whereby emergent findings are interrogated against a succession of theoretical models derived from the literature (cf. Orton, 1997). The approach is aligned with *iterative grounded theory* championed by Orton (1997) and has been exploited within the construction management literature by Kao *et al.*, (2009) and Green *et al.*, (2010). Central to this approach is the iteration between emergent findings and different branches of literature which can help make sense of the data. This iterative process would continue for as long as the insights were sufficient to justify the resources expended. As such the researcher's knowledge of the literature regarding success of firms shaped the research design and interview template. Yet, the emergent stories mobilised by the participants led the researchers to re-visit branch of literature that would help them understand the data. It was this iterative process that led to the need to understand the CSR as many of the stories described appeared to resonate with CSR. Thus, the importance of CSR was not

predetermined but emerged as the research unfolded. In this sense, the role of CSR in ensuring a firm stayed in business was hidden, and it was only through the methodology adopted that its relevance became apparent.

RESEARCH DESIGN

The case study was developed from a series of semi-structured interviews with key senior managers/directors who were involved in the firm's long term success. Further interviews followed by pursuing a snowballing method as themes emerged and actors were identified. The interviewees were questioned about the firm's evolution over time, perceived unique resources and capabilities, their immediate business networks, and future plans. Particular interest was given to the activities and practices adopted in the firm's local setting. The case study sought data beyond interviews in the form of archival data sources, such as company reports held at Companies House in London and also publicly available construction sector statistics. This offered rigour, whereby stories could be corroborated against archival sources. The interviews were recorded and then transcribed. The data was coded using NVivo 7 computer software to aid the analysis process. The software enabled the data to be repeatedly interrogated as themes emerged. It was during this phase that the analysis template initially based on the themes surrounding capabilities, localised learning and embeddedness was revised as the theme of CSR emerged.

ENACTING 'HIDDEN' CSR FOR LONG TERM SUCCESS

In the first instance it is important to describe the case study firm, known for publication purposes as Elise Construction (Elise). Elise began life in 1970 in the south of UK. Initially operating as a civil engineering contractor working for local water companies, they eventually diversified into other market sectors. At the time of the research Elise operated from nine different locations in the south of the UK and was engaged in numerous market sectors including; building, civil engineering, railway maintenance, and property development. The firm has an annual turnover in excess of £250 million and employs around 1000 staff. At the time of publication the firm has itself now become a subsidiary of a much larger international construction plc. Future research may be possible to understand how this takeover impacts the firm's enactment of CSR. Until becoming a subsidiary Elise thrived in its own right, with three decades of growth. The interviewees attributed success to their long-term investments in building a network of well-located, embedded and established regional offices. Elise sees its regional setup to be pivotal to its' long term success. By the mid-1990s Elise had established five regional offices. The development of successive regional offices was described to be a creeping process, showing prudence and care for both employees but also their business partners and clients. According to the chief executive (CE), a regional office would take approximately 15 years to grow and establish its own team, suppliers and client base. The CE explained that the slow and stable progress allowed each regional office to gel as a team and to grow its substantial knowledge about local markets, clients, supply chain and the type of projects often required within the local market. This story resonates strongly with CSR themes such as having a strong commitment to local community, engaging with the local community, and even protecting the local community (cf. Petrovic-Lazarevic, 2008) and also issues surrounding ethics and broader community relations deemed relevant by Glass and Simmonds (2007). However, the CE at no time referred to this tactic as an approach associated with or influenced by CSR.

The concept of 'organic growth' was used to describe the progressive development of each regional office. Elise had rejected the idea of purchasing construction firms as a means of moving into new regions. The interviewees consistently emphasised the importance of localised staff and their personalised networks of contacts. The purpose of setting up a regional office was considered to demonstrate a presence and an ongoing commitment to local clients, supply chain and employees. It was suggested that local clients preferred to work with contractors on their projects that had a long-standing presence in the region. Interviewees described how they had developed a number of regional offices in this organic fashion, not by buying other firms but by growing their own teams and recruiting local professionals already embedded in the local market.

The secret to the success of this was described as becoming embedded in and sensitive to the local construction market, and the network of actors that made up that market. In order to enact such an embedded approach to business ensured that Elise behaved in a particular manner. It is important to state that Elise viewed their long term success not in isolation of other firms, but rather in a network of players within the local market they operated in (cf. Kao *et al.*, 2010). In order to enact such a localised approach for such long periods of time Elise had to have been doing something right, which other players within those localised markets were happy to be part of. Elise could not upset, disrupt or simply ignore its local network of specialists it worked with; it could not take advantage of them, act irresponsibly toward them or exploit the informal rules and regulations of the local market setting. To do so would 'cut

off' the very capabilities required to operate locally within a particular market network. This is a form of CSR, especially when viewed against the themes outlined by Petrovic-Lazarevic (2008) including improving relationships with suppliers and developing a strong commitment to local community. Thus Elise did not pro-actively engage in defining CSR or seek to implement the concept of CSR, yet their localised and embedded approach to the long term success of the firm resonates strongly with discretionary CSR themes. In many ways, Elise's 'hidden' enactment of CSR made their localised business strategy a success.

A further strength of Elise's regional setup and a particular challenge for many construction contractors was staff travel and project location. Due to the regional set up staff were often located much closer to the projects they worked on thus enabling staff to 'achieve a sensible home life'. It was found that the majority of regional directors and managers had been working and living in their respective local areas for a significant part of their careers. This demonstrated a long term commitment to staff which was sustainable and ethical whereby staff did not feel taken advantage of, but considered and valued. This illustrates CSR associated with the moral obligation to be a good citizen and the relationship with employees (cf. Petrovic-Lazarevic, 2008) and aligns itself more with the idea of discretionary CSR. Remaining with Elise's business strategy of operating in local markets where each regional office held autonomy another interesting story emerges from the data. Many of the interviewees viewed the success of their regional office dependant upon the opportunities developed from senior managers' networks of contacts with local clients and supply chain. Thus, being embedded in the local network of firms helped secure future work. Such an approach is only possible if the firm is operating in a CSR fashion. If Elise were difficult to work for or with, behaved irresponsibly or took advantage of others within this closely knit local network then such opportunities may disappear. Directors' were active within trade associations and chambers of commerce and sought to 'give something back' to their local industry and communities. Thus, enacting degree of compliance-based and discretionary CSR 'oiled the wheels' when seeking local business opportunities.

Before drawing this discussion to a close it is important to note that the archival desk study undertaken of Elise during the interview stages revealed no mention at all of CSR in their formal documentation. However, at the time of writing and following the acquisition by a large construction plc, CSR now appears within Elise's documentation and web presence. It remains unclear at present if any of the processes have changed, or if they have simply now been documented. The history of Elise tells a number of stories related to CSR; however the interviewees' vision of the future also reflects such themes. Elise currently puts a strong emphasis on the importance of 'controlled growth' as a means of ensuring that 'the firm won't go bust'. The firm seeks to manage risk sensibly, with group directors focussed upon limiting the value of projects each regional office can bid for to avoid possible problems. Regional director described a need to protect the overall firm, its long standing reputation but also the jobs and livelihood of the 1000 staff it employed. Caution was expressed regarding expansion that might be short lived yet may jeopardise these important aspects. This sense of duty by the directors can be aligned with themes associated with CSR, whereby the interests and welfare of the staff, the supply chain and clients come before increasing short term profit.

CONCLUDING THOUGHTS

The research set out to understand if CSR themes are being enacted within UK construction contractors, and if so begin to shed some light upon how and also the reasoning and drivers for such practices. Whilst CSR within the construction management literature is still in an embryonic stage there is strong data to suggest that the practices of CSR are being enacted by firms in the UK. Analysis of the data presents an argument that Elise engaged in a number of activities which can be described as CSR practices. However, during all of the interviews undertaken no one referred to CSR, or saw their actions as something to be promoted as CSR. It is concluded that Elise was enacting 'hidden' CSR practices. The findings suggest regional construction contracting firms in the UK are already engaged in CSR practices, both compliance-based and importantly discretionary. It is proposed that such firms perhaps need support in recognising or articulating these practices to greater positive effect and to a much wider audience. Elise's whole approach to business echo's numerous of themes within the CSR literature, and in fact CSR actually helps the firm enact its desired approach to business. As such, it is argued that there is a symbiotic relationship between the long term success of the firm and the enactment of CSR themes.

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A REVIEW OF SMALL CONTRACTOR SUSTAINABLE GROWTH: IMPLICATION FOR ENTREPRENEURIAL LEADERSHIP APPROACH

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Small contractors remain unsustainable despite the initiatives to enhance their development. This paper attempts to identify the gap between entrepreneurial leadership approach and sustainable growth of small contractors. This study focuses only on the literature and identifies the relationship between the sustainable growth and entrepreneurial leadership. In detail, the review provides the information about the challenges faced by the small contractors to retain their growth. The literature showed that there is a relationship between the entrepreneurial leadership and the growth of small contractors. Findings further indicated that innovation was essential for growth of an organisation. The study also revealed that there exist a positive relationship between innovation and transformational leadership. Further, the past research showed that other factors such as calculated risk taking and pro-activeness apart from the innovation of an entrepreneur will enable the small business to be sustainable in the market. The findings uncovered the advantages of transformation leadership style and entrepreneurial capability to sustain the growth of small contractors.

Keywords: innovation, transformational leadership, sustainable growth, small contractors, entrepreneurial leadership

INTRODUCTION

The construction industry has been known for its substantial role in creating employment while contributing to economic growth, especially in developing countries. Within this context, there has been a steadily growing recognition that the contribution of construction industry is attributed to small and medium contractors (Agumba, 2005; Lazarus, 2007; Ndlovu and Thwala, 2008; Kheni, 2008; Ladzani, 2009), as these contractors perform a greater amount of construction work which somehow generate employment opportunities and lead to economic growth. Small and medium contractor often tend to emerge through sub-contracting on large construction projects, given their specialist nature of services (Dlungwana and Rwelamila, 2003). This interaction between small and medium contractor with their larger counterparts could create opportunities. In order to create a competitive advantage against their fellow competitors, there is a necessity for the small contractors to build a healthy relationship with the large firm by providing innovative quality outputs. Snyman (2003) pointed out competitive advantage as an essential factor to the success of the business. Leadership is reported to have an influence on competitive advantage of an enterprise (Ratnaningsih *et al.*, 2010). Scheepers *et al.*, (2008) added that “enterprises with well-developed entrepreneurial capabilities are able to sustain growth and innovation, which are critical competitive advantages in the 21st century”. Further, a study on the Chief Executive Officer (CEO) / owners, found that their leadership characteristics are important factor for the success of construction companies (Arslan and Krivrak, 2008). Hence, it can be concluded that the small contractor who possess entrepreneurial capabilities with effective leadership in place could grow in a sustainable manner. However, Steward *et al.*, (2003) revealed that the small and medium contractors face numerous barriers which hinder their sustainable growth and development. Martin (2010) also believes that the growth of small and medium contractors in developing countries like South Africa somehow appeared to be hindered. Consequently, Construction Industry Development Board (CIDB) (2009) highlights the *need to unlock growth constraints, to develop sustainable contracting capacity and to elevate enterprise development*. This study presents a review of literature on barriers that are faced by small contractors in pursuit of their growth. In addition to this, the study is also focusing on the entrepreneurial leadership approach to address some of these barriers to sustaining the growth of small contractors.

DEFINITION OF SME IN CONSTRUCTION INDUSTRY

The definition of Small and Medium Enterprises (SMEs) cannot be easily settled (Yang, 2010). A citation of Netswera (2001: 31) by Ladzani (2007) indicates that, a small business is characterised with a number of 5 to 50 employees, a total capital assets of R2 million and a turnover of less than R6 million in South Africa. In China, small business is distinctively categorised with less than 300 employees, sales

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volume of R3 million RMB and total assets of R4 million RMB (Yang, 2010). In other countries like Denmark, France and Norway, however, there is no legal definition or what-so-ever related to SMMEs (OECD, 2004).

In the construction industry, small contractors employ about 1-599 employees with a turnover of R0-3 RMB per annum and medium contractor employs 600-2999 employees with a turnover of R3-30 RMB in China (Yang, 2010). In South Africa, small contractors employ about 6-60 employees with a turnover of R6 million per annum while medium contractor employs 61-200 employees with a turnover of R0-26 million (Republic of South Africa, 2003). These definitions might be common but they vary in terms of social, economic and cultural dimensions of the country. However, this research will focus on analysing small contractors.

NATURE OF SMALL CONTRACTORS AND CHALLENGES

The construction industry particularly in developing countries is characterised with very small to medium enterprises operating in the informal and formal sector of economy. Small contractors often rely on outsourcing skilled personnel to accomplish their job tasks when they won a contract (Phaladi and Thwala, 2008). The environment at which they operate presents volatilities due to turbulence of construction market and this could require a great deal of flexibility and responsiveness. If managed and led effectively, small contractors might become sustainable by reaping opportunities within the construction industry. However, Jacquet (2002) argued that the construction industry is faced with a challenge to develop and grow small contractor enterprise into a sustainable medium construction enterprise.

Empirical study shows that, among others, small contractors were unable to build and maintain good relationships with suppliers (Phaladi and Thwala, 2008). However, good leadership is about building and maintaining good relationships with others. Kotter (1999) further viewed leadership with a responsibility to set *direction* and develop *vision* for the future – *align* people to accomplish the objectives of such a vision, *communicate* new direction and critically evaluate the delegation process. Egbeonu (2008) suggested that those contractors who do some works and delegate some to workers are most likely to be successful. Delegation might lead to growth as it enables the owner to look for more opportunities. However, small contractors were found with lack of vision, managerial skills (leadership), business and entrepreneurial skills and the ability to delegate responsibilities to workers (Phaladi and Thwala, 2008). Delegation is a critical element for leaders and entrepreneurs to grow their enterprises. Hence, leaders and entrepreneurs are vital for the growth of an enterprise since they provide the vision and imagination necessary to carry out opportunistic expansion (Entrialgo *et al.*, 2001). Joseph Schumpeter defined entrepreneur as “*an innovator who implements change in an economy by introducing new goods or new methods of production*”. The United Nations Centre for Human Settlements (1996) suggested that a contractor should innovate by combining a variety of resources in an environment fraught with uncertainty and expand their operations to various geographical and business areas.

THE JOURNEY OF LEADERSHIP RESEARCH

Leadership research has grown thereby capturing interest to various researchers from various disciplines. Arrington (2010) adopted a definition from Northouse (2007: 3) to define leadership as “*a process whereby an individual influences a group of individuals to achieve a common goal*”. Puccio *et al.*, (2007) defined leadership as “*the process of positively influencing people, context, and outcomes through a deliberate creative approach that is applied to open-ended, novel, and ambiguous problems – both opportunities and predicament*”. These definitions and other previous authors have been used to define leadership with a common understanding that it is a process of influencing others. Ground breaking leadership research has been concerned with who the leader was, what the leader did and environment in which leadership takes place (Rauch, 2007). These factors can be tracked back from leadership traits, leadership behaviour and situational leadership research which have been conducted for over a century (Niemam and Bennet, 2006). Rauch (2007) cited Bird (1940) that, earliest studies on leadership have focused on studying leadership from an individual due to the perceptions that the secret to unlock leadership was to investigate an individual leader’s characteristics (traits) based on their talent.

Leadership traits in previous studies have been defined as the personality characteristics that leaders were born with (Elearn, 2007). Some of these traits have been identified as motivation, intelligence, integrity, self-confidence, knowledge, drive, vision (Kirkpatrick and Locke, 1991; Niemam and Bennet, 2006; Elearn, 2007). However, it was argued that leadership traits can be learned (Elearn, 2007), and Kirkpatrick and Locke (1991:49) further argued that; *traits alone are not sufficient for successful business leadership—they are only a precondition*. Hence, the behavioural approach to leadership was introduced.

TRANSFORMATIONAL AND TRANSACTIONAL LEADERSHIP BEHAVIOR

Leadership behaviours were identified to be employee-centred and task-oriented or job-centred (Schuster-Cotterell, 2003). While *people-centred* leadership is identified as that leadership which is concerned with the people who are involved in the operational process, *task-oriented leadership* was referred to as that leadership with a strong focus on production during the operational process (Niemam and Bennet, 2006). It was reported by Marturano and Gosling (2008) that, Fiedler matched these leadership styles and concluded that a task-oriented leadership style is more effective in situations wherein the leader has very much or very little influence; a people-oriented leader is more effective in situations only moderately favourable to influence. These leadership behaviours were lately referred to as *transformational leadership* and *transactional leadership* behaviours (Burns, 1978; Bass, 1990, 1998; Bennis and Nanus, 1985).

Transformational leadership behaviour: (*people-centred*) is more concerned with employee relation through motivational and inspirational efforts, which leads to the growth and development of followers (Einstein and Humphreys, 2001). Bass (1985) identified four components of transformational leadership such as, *idealized influence*, *inspirational motivation*, *intellectual stimulation*, and *individualized consideration*. **Idealized influence** practice of leadership great persistence and determination in the pursuit of objectives, highly admired, respected, trusted, sacrifice self-gain for the gain of others and consider subordinates' needs over their own needs and share successes and risks with subordinates (Limsila and Ogunlana, 2008). **Inspirational motivation** involves the ability of leaders to motivate and inspire followers and colleagues to go beyond the limits in service delivery by building confidence. **Individualised consideration** deals with follower development where needs of employees are put first. **Intellectual stimulation** involves encouragement of creativity and new ideas towards problem solving which normally leads to innovation (Limsila and Ogunlana, 2008). Transformational leadership was found to respond under uncertain environmental conditions (Beugre' *et al.*, 2006), positively affects market orientation while market orientation positively affect innovation (Menguc *et al.*, 2007) and that the relationship exist between transformational leadership and organisational innovation (Jung *et al.*, 2003). Innovation according to previous studies in entrepreneurship is one of the factors that contribute to new venture creation off which this might lead to growth in medium contractors. Empirical study in Thai construction projects found that transformational leadership was one effective leadership style that is likely to generate higher leadership outcomes than the transactional style and the *laissez-faire* style (Limsila and Ogunlana, 2008).

Transactional leadership behaviour: *occurs when one person takes an initiative in making contact with others for the purpose of an exchange of something valuable*" (Kurrhnet and Lewis, 1987). This leadership approach set goals with clear clarity for outcomes and feedback and the reward upon the successful completion of the desired outcomes. Despite its reward system, this leadership approach, however, has penalties where mistakes occur or targets are not met. Thus, Simić (1998) argued that in recent times a new style of transformational leadership is needed unlike the old style of transactional leadership. Bernhard and Driscoll (2011) found that transformational and transactional leadership styles have a significant positive relationship with feelings of psychological ownership for both the organization and the job. Despite the operationalization of leadership behaviours and traits having attempted to be suited in all situations, it was argued that there is no one perfect leadership approach that fits all situations (Niemam and Bennet, 2006). Hence, situational leadership was introduces which encompasses both the leadership behaviours and traits in a certain situation.

While situational leadership style is closely related to contingency leadership, contingency leadership theory attempts to match the best leadership style or method to the appropriate situation (Hall, 2007). However, circumstances changes and they do not stay fixed for long (Marturano and Gosling, 2008). According to Marturano and Gosling (2008:25), *contingency theorists contend that there is no one best way of leading, that a leadership style that is effective in some situations may not be successful in others*. This means there might be a need to change a leadership style in a particular situation or change the situation to suit a particular leadership style. Tulacz (2007) indicated that small construction business firms struggle to find individuals with leadership qualities to operate construction organizations. Thus it is important to understand what leadership behaviour needed in organisations such as small contractors to introduce new product and expand grow its business.

ENTREPRENEURIAL LEADERSHIP AND SUSTAINABLE GROWTH OF SMALL CONTRACTOR

In the newly developed document which focus on future of construction industry in South Africa, titled "*The Future of Construction in South Africa to 2015*", published on the 26 April 2011, it is reported that, "*With the government aiming to increase investment in*

infrastructure projects, the market is expected to grow steadily from 2011. Company expects the country's construction industry to grow at a CAGR of 4.22% during the forecast period to reach US\$15.5 billion in 2015". This might generate great opportunities for new entry and growth to existing construction firms. The will to participate in emerging markets and pursue new opportunities is associated with entrepreneurial orientation of an enterprise (Covin and Slevin, 1989 and Lumpkin and Dess, 1995). Moreno and Casillas (2008) found that entrepreneurial orientation dimensions with an influence on growth of an enterprise. As found by Covin and Slevin (1989), entrepreneurial oriented enterprise possess a great deal of *innovation, pro-activeness, and risk taking* and they tend to contribute to performance of an enterprise. According to Gambatese and Hallowel (2011), Slaughter (1998:1) defined innovation as the 'actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change'. Innovation is essential for new venture creation or expansion of business services and therefore involves great risk taking. Gupta *et al.*, (2002) suggested that proactive behaviour may enhance competitiveness. Empirically, it was found that performance of firm was enhanced through pro-activeness and innovation (Yang, 2008). Within the construction industry, however, Sexton *et al.*, (2006) reported that small contractors do not possess knowledge and resources needed to develop innovation. Consequently, Dlungwana *et al.*, (2008) suggested that construction firms need to acquire knowledge and innovative technologies in order to become sustainable and competitive. It was also suggested small construction firms could acquire knowledge and innovation through inter-organisational network (Sexton *et al.*, 2006). Henrich *et al.*, (2006) have a different view that innovation initiatives in construction are usually triggered by new materials and/or equipment launched into the market. Hence, it becomes evident that innovation is a required core capability for a small contractor to sustain growth and stay in the market. However, Gupta *et al.*, (2002) reported that entrepreneurial oriented organisations are faced with challenges to build capacity that is capable to continuously discover and exploit new competitive opportunities. Brown (1994) perceived a challenge for organizations to foster a culture of innovation that cultivates growth and/or corporate sustainability. Bekker (2004) cites Visser and Sunter (2002:57) that "sustainability" means, the ability of something living (functioning) to survive over the long-term. As for Jonash (2005), industry leaders accumulated long term sustainable growth and innovation through strategic organic growth and accelerated innovation by building reputation of compelling and differentiated services to their customers and robust networks with partners who can excel by delivering superior value across the extended enterprise. The other organisation grew by developing new quantitative measures which changed their behaviour and culture towards the sustainable growth and innovative practises (ibid). Hence, innovation culture within an enterprise might be fostered through a certain leadership approach.

The construction firms appear to be in a competition with "competitors" within the construction business environment, where survival depends on the management's ability to adjust and develop organization in ever changing external conditions (Wandahl and Ussing, 2010). This environment might require a flexible enterprise that is able adapt to changes by this dynamic market in order to stay competitive. Transformational leadership create a culture that cultivates change and decentralized environment where followers are involved in decision making and this may lead to follower voicing their ideal new business venture opinions. Previous studies have found association between transformational leadership and innovation (Jung, *et al.*, 2003; Menguc, *et al.*, 2007 and Matzler, *et al.*, 2008) whereas transaction leadership behaviour was negatively associated with innovation (Liu *et al.*, 2011). While Swiercz and Lydon (2002) opined that in order for a firm to continue to grow and achieve long-term success, they might need to utilise new leadership competencies, empirical study indicates that both transformational leadership and innovation were found to have an influence on growth and profitability of small and medium enterprises (Matzler *et al.*, 2008). In the US construction industry, empirical study shows transformational leadership was positively related to the success and profit of small contractors (Valdiserri, 2010). During the growth process, the leader works to preserve the entrepreneurial spirit that successful worked earlier through inspiring followers to fulfil company vision (Swiercz and Lydon, 2002). However, within the context of South African construction industry, this remains unpacked or unrevealed.

According to Tarabishy (2008) transformational leadership tend to emerge from an entrepreneurially oriented enterprises in a dynamic market which can be defined *entrepreneurial leadership*. Remer (2009) cited Kotelnikov (2005) that entrepreneurial leaders tend to take initiative and act as if they are playing a critical role in the organization and energize their people, demonstrate entrepreneurial creativity, search continuously for new opportunities and pursue them, take risk, venture into new areas and provide strategic direction and inspiration to their people". Entrepreneurial leadership plays a critical role in venture creation (Swiercz and Lydon, 2002). Unfortunately, this remains systematically unpacked and undocumented in the construction industry. In fact it is recognised that little attention has been given to investigate leadership on growth of organisation from the start-up of the business to its maturity (Swiercz and Lydon, 2002). The need for research to focuses on leadership of construction SMEs (Ofori, 2011).

SUMMARY OF CONCLUSIONS

The literature indicates that entrepreneurial oriented firms tend to utilised proactive behavior while taking risks to implement innovative practises in their firms. Innovation plays a major role in growth and profitability of small and medium enterprises. Despite the networking being recognised as the possibility to accumulate innovation through interactive learning between parties involved in construction industry, small construction firms were recognised to lack knowledge and resources that could lead to innovative practice. These factors might contribute to barrier or growth constraints in small contractors. Transformational leadership is found to have major influence to the innovation of an enterprise given the decentralised environment it create and culture of employee engagement it instils in the organisation. In construction industry transformational leadership has been found to have an influence on profitability and success in small contractors. Transformational leadership have played a critical role in growth and profitability of small and medium enterprises. However, it remains unknown as to whether transformational leadership have an influence on growth of small contractors in the construction industry. Transformational leadership and entrepreneurial orientation form a construct of an entrepreneurial leadership, which possess a common attributes of innovation that leads to sustainable growth. As such, sustainability of growth is archived through continuous innovative practise in an enterprise either through product or processes. There might be no systematically documented academic work that illustrate or demonstrate the influence that entrepreneurial leadership has on sustainable growth of small contractors in the construction industry. Hence this might contribute immensely not only to knowledge but to sustainable practise for small contractors and more understanding of entrepreneurial leadership in the construction industry.

Future study might focus on investigating how what leadership style do owners of small contractors possess to generate innovation in their companies. Building an entrepreneurial leadership in small contractors, it might be interesting to explore how small contractor leaders create an entrepreneurial enterprise.

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EFFECTIVE CORPORATE GOVERNANCE: THE ROLES OF CORPORATE REAL ESTATE

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Where it is effectively utilised, corporate real estate proves to be a strategic resource that organisations can utilise to add value to the enterprise value and enhance good corporate governance. The paper reviewed and analysed previous related papers in respect of the subject in advanced countries as a guide for corporate executive of firms, especially the banks in Nigeria and other developing countries. The paper identified the attributes of real estate that makes it a unique value-adding product to a business organisation and pin pointed how it could be adopted to add value to the overall business. The paper documented performance measures found in the literature to be indicators of the contribution of CRE to organisations and argued that corporations could be effectively governed if corporate executives exploit the benefits of their real estate assets. It concluded that value adding elements of real estate can be captured by developing and adopting appropriate real estate performance measures.

Keywords: corporate, corporate governance, corporate real estate, performance and

INTRODUCTION

Without effective utilisation of resources, organisational effectiveness stands to be doubted. Effective use of these resources is a major determinants of the achievement of organisations goal. According to the shareholders vale theory, the goal of every organisation is to maximise the shareholders wealth (Lindholm and Gibler, 2005). This objective is achieved by revenue growth and productivity. Where this objective is not achieved, there is the tendency for crisis.

The recent global crisis could be linked to inefficient governance of corporate resources. In particular the widespread scandals in Nigeria financial system is closely linked to dishonest management decisions (Sanusi, 2003) while the collapse of the capital market, uncovering of the flagrant abuse of loans and perquisites in the banking sector and high incidence of corruption in the Nigerian economy generally are enough to pose the question indeed of effective corporate governance (Oyebola, 2009).

The events of the recent past, international economic development and globalisation of business and economic activities are necessitating the need for effective corporate governance. Along with corporate responsibility, corporate governance provides the foundation for market integrity and provides a lot of responsibility on the board of directors that involved striking a delicate balance between the various stakeholders (Sanusi, 2003). Corporate executives will, to this end, ensure the continuity of the business, deliver value to stakeholders value by ensuring effective use of organisational resources. One of the resources that could be repositioned to add value to organisation and create wealth is the real estate assets of the banks. Nigerian banks could overcome their financial crisis and ensure stability in the industry by tapping the added value of their real estate assets.

While the role of real property as an essential enabler of business has been recognised several decades in the developed world (Warren, Simmons and Trumble, 2007), little or none is known of the importance of real estate as an assets that could be effectively used to contribute to the value of business in developing countries like Nigeria. In addition, Nigerian banks seems not to have been awoken to the global business operations and other competitive pressures forcing corporations to re evaluate their real estate needs. In developed countries, the grave consequences of the neglect of CRE have been documented. RICS (2002) reported an annual loss of £18 billion through inefficient use of property, which could have improved gross trading profit by up to 13%. Nigerian banks seems not to have yet adopted the management of their real estate assets as a strategy for stability and a resource of wealth creation. Yet, real estate is the fifth resource of the organisation after human resources, technology, information and finance.

Even though, this resource seems to be neglected and attract less of corporate executives attention, Nigeria banks are seen embarking on aggressive branch opening. Competing for space in all and crannies of the country. With consensus in the literature that real estate costs on the balance sheets of organisations is the second largest costs of organisations after salary and wage, the question

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of what roles real estate plays in ensuring good governance in the banking sector in developing countries like Nigeria seems to be unanswered.

The paper therefore provided an overview of organisation's requirements for space and explore the attributes of corporate real estate products that are value-adding to overall business objectives of organisations. From this, a formalised real estate performance measures is outlined for adoption by corporate organisations for effective corporate governance. It will also make the CREM unit to be more relevant at the board level where strategic decision that affect the organisations are being taken and provide corporate real estate managers with needed tools to proof their value contributions to wealth creation within an organisation. First, it is pertinent to examine the question, why is space requirement an important decision making of an organisation?

BANKING BUSINESS REQUIREMENTS FOR SPACE

Although the current requirements and the size of corporate requirements for space might have changed, banks, like other organisations, have always been in the business of real estate. There is consensus in the literature that no organisation survives without a space requirement. Joroff et al. (1994) emphasised that, even a GSM operator would always operate from a space. Hence, the request of organisations for CRE is a universal one. Brown (2001) submitted that at various phases in their growth and consolidation, companies need new buildings. Sometimes, these are straight forward, off-the-shelf product like office warehouse facility. Sometimes, they are products that are almost always necessary custom-fitted laboratories, R & D, high-tech/bio tech factories. Occasionally, space requirements go beyond the custom-fitted facility to be high profile statements deriving as much from top management motivations from the space needs of the company.

Traditionally, property is seen as investment assets, the management focus of which is the yielding of the maximum return to the owner. To this end, many real estate and facilities units within corporations have been established from the perspective of managing existing buildings owned or occupied by them. In such situations, CREM decisions are based primarily on functions and requirements in relation to buildings and not the business that are performed within them (Sasoraja, Gibler and Ievainen, 2004). In recent times, the changing global business environment has attracted the attention of business managers to the significance of CRE as an operational asset and re-directed focus to it as a resource asset. In the current environment of increasing corporate governance, regulation and financial transparency, real estate in best practice occupier organisation is receiving a real estate strategic focus and is becoming firmly embedded into corporate decision-making. Other recent studies (Ilsjan, 2006; Bouris, 2005; McDonagh, 2002; Gibson, 2002, Breitenstein et al, 1998, Nourse and Roulac, 1993) established the importance of CRE in corporate organisations. HWA (2003) posits that it is the largest percentage of fixed assets of firms.

Organisations now use property not only to accommodate their system and/or staff, but also to express who they are and what they stand for. The use of property by corporations as a means of brand identity is now a common phenomenon. Hence, corporations are now embracing the strategic resource use of property. Owing to this development, the elsewhere practice of reactive management of real estate as an investment asset has changed drastically in the developed countries while corporations now embrace the view of CRE as a resource which is required to be treated in active manner, nothing its cost coming second to payroll at 20% - 40% of business value (Veale, 1989). CRE has almost been seen as a cost factor, decision regarding CRE have been driven by cost consideration only (Stradlhofer, 2010). In the recent years, it has become apparent that there are clear shifts in focus as the practice of CRE/FM matures (Then, 2001). Noticeable feature, according to the author, is the initial preoccupation with tasks and functions which has now given way to emphasis on processes and their management and in a more recent years on the provision of enabling working environment where the issue of people, process and property are elements of the same problem seeking a common solution (see Figure 1).

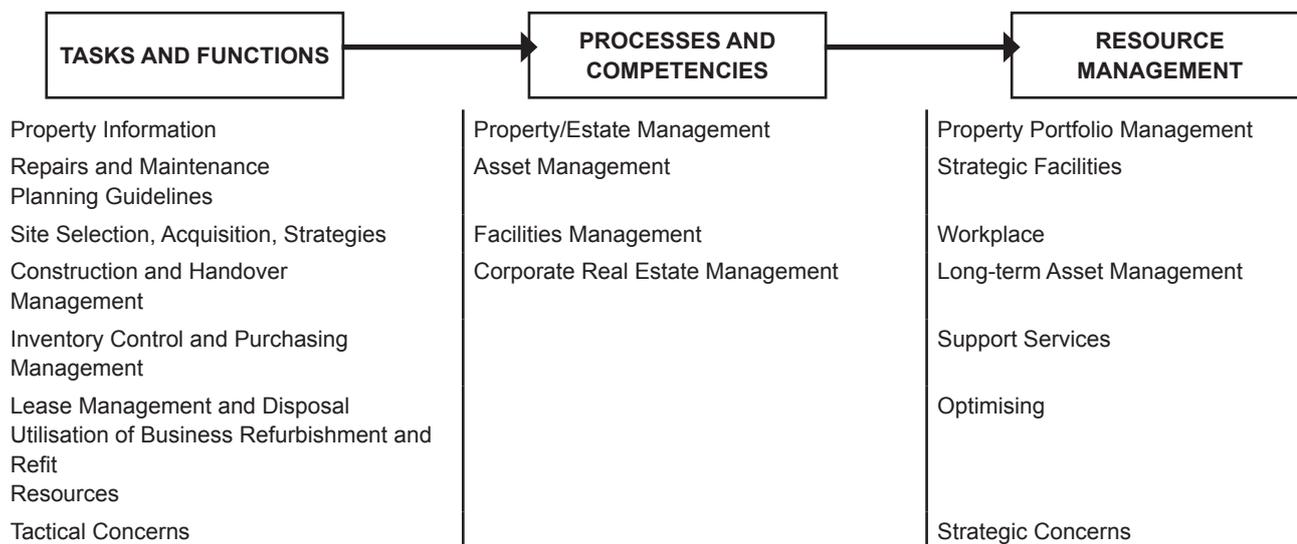


Figure 1: Changing focus in CRE/FM practice (source: Then, 1996)

PINPOINTING ADDED VALUE OF CRE

The corporations primary aim is to add to the wealth of investors (Sarasoja, et al., 2004). Contemporary investors jealously guard their investment and are more conscious of what business managers, who are repository of their hard earned income venture into. In actual fact, the demand for strict transparency of resource use arises from the strict sophistication of contemporary investors as well as the competitive global business terrain. In the midst of these, managers can still not do without incurring substantial portion on renting or owning real estate. However, understanding how real estate can add value to a business wealth can be a succour to investors and shareholders.

CRE is relevant to a corporation in two ways: as investors or development property and as property for operational use (Stadlhofer, 2010). In whatever capacity that CRE is being viewed, there is the evidence that CRE is being able to contribute significantly more to the success of a corporation as to save costs (Krumm et al., 1998; Chirgwin, 2000; de Jonge, 2006). However, in order to fully exploit the benefits of CRE, and to avoid the pitfalls of treating property as an avoidable cost of an organisation, Lindholm and Levainen (2006) provided CRE benefits from its strategic use and Management. According to them, besides improving profitability through space efficiency, cost reduction and capital minimisation, real estate decisions can also contribute to increased revenue.

Effective use of CRE may provide other tangible and intangible impacts on the company which may include efficiency and effectiveness of the activities of the organisation (Krummm and de Vries, 1998). In addition to the financial benefits of real estate, the authors submitted that unique qualities such as the location or the design of a building qualify real estate an assets that can be hard to initiate, substitute, or to trade. They argued further that the physical image of a building may advertise and attracts attention to a firm's goods and services. When building reflect the purpose of a business and encourage important work relationships they can become significant elements of corporate strategy (Duffy, 1997).

CRE is able to influence performance: directly e.g. lowering maintenance costs or energy consumption and Indirectly through other factors (staff, visitors, equipment/process) turned out to explain the majority of performance changes(Appel-Meulenbroek and Feijts, 2007). The authors, based on literature review, grouped other impacts of CRE as follows:

Office environments can impact on employee health by inaccurately designed, operated or maintained installations (Rostron and Moores, 1997; Leaman and Bordass, 1999; Seppaˆnen and Fisk, 2002), which can bring about sick building syndrome (SBS)-symptoms and can spread contagious diseases (Rostron and Moores, 1997; Fisk and Rosenfeld, 1997; Seppaˆnen and Fisk, 2002, 2004; Witterseh et al., 2004; Wyon, 2004).

Besides health, employee satisfaction can be influenced too. The indoor climate (e.g. ventilation, temperature, light and noise) and the possibility of (individual) control are significant and well known aspects (Palonen et al., 1993; Leaman and Bordass, 1999; CIBSE,

1999; Niemeila et al., 2002; Jusle'n and Tenner, 2005; Madhavi and Unzeitig, 2005). The spatial layout can result in friendship opportunities (Heerwagen et al., 2004) and finding each other useful (Penn and Vaughan, 1995 in Shpuza, 2006; Penn et al., 1999), what improves satisfaction. A consistent interior design and furnishing of this layout increases the "sense of belonging" and satisfaction with relationships too (Becker et al., 2003).

CRE enhances and contributes to the shareholders value. Bouris (2000) submission corroborated this assertion. The author identified two main areas where CRE plays a significant role in creating value. First, in operating margin in which case its activities affects the organisations' income statement through its contributions to the categories of selling, general and administrative costs (SG&A). Second, CRE influences assets efficiency through driving the costs related to property, plants and equipment (PP&E) on the balance sheets. The role of CRE in an organisations is thus a vital one if CRE is effectively utilised, it contributes to increasing the financial status of organisations and enhances the achievement of the overall business objectives. The various elements of added value of real estate are proposed by Lindholm (2006) to reflect its strategic role and contribution to the overall objective of the organisation is contained in Figure 2.

- | |
|--|
| <ol style="list-style-type: none"> 1. Increasing productivity <ul style="list-style-type: none"> Offering adequate accommodation Site selection Introducing alternative workplaces Reducing absence of leave 2. Cost reduction <ul style="list-style-type: none"> Creating insight into cost structure More efficient use of workplaces Controlling costs of financing 3. Risk control <ul style="list-style-type: none"> Retaining a flexible real estate portfolio Selecting suitable locations Controlling the value development of the real estate portfolio Controlling the process risk during (re)construction Controlling environmental aspects and labor conditions 4. Increase of value <ul style="list-style-type: none"> Timely purchase and sale of real estate Redevelopment of obsolete properties Knowledge and insight into real estate market 5. Increase of flexibility <ul style="list-style-type: none"> Organizational measures (working hours, occupancy rates) Legal/financial measures (mix own/rent/lease) 6. Changing the culture <ul style="list-style-type: none"> Introducing workplace innovations 7. PR and marketing <ul style="list-style-type: none"> Selection of branch locations Image of buildings Governing corporate identity <p><i>Note: The source of the information is De Jonge, 1996 in Krumm, 1999, p. 66.</i></p> |
|--|

Figure 2: Elements of added value of real estate

Depicted below in Figure 3 the following is the model linking real estate strategies to overall business strategy.

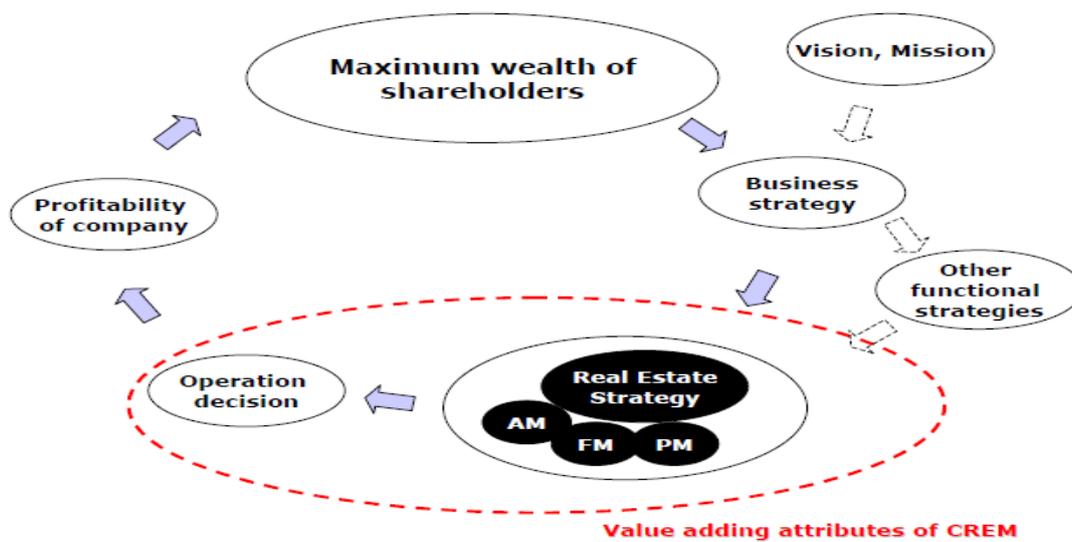


Figure 3: CREM as a Part of the Corporations Strategic Framework (source: Lindholm, 2008)

INTEGRATING REAL ESTATE AS A BUSINESS RESOURCE

Then (2001) proposed an integrated CRE/FM resource management framework as ‘road map’ for real estate governance. The author identified two categories of roles discernible from the activities associated with CRE/FM. First, activities related to the roles of providing the appropriate building (i.e. the corporate operational asset base measured in terms functional space) required by the organisation to carry out its core business activities. Second, activities related to the roles of on going management and servicing of building in use (i.e. sustaining the workplace environment).

Integrating real estate with other business resources requires business executives to understand and embrace the strategic roles of business at the corporate level, estate level and building level. The corporate level is concerned with the adequacy of real estate asset, as a business resource to fulfil strategic objectives. The estate level interprets the strategic intent in terms of implications on the current operational real estate portfolio i.e. facilities provision. The building level primary concern is with meeting users requirements on an on going basis, while at the same time, minimising disruptions while taking actions to adjust to the next steady state as a consequence of the strategic response initiated at the corporate level (Then, 2001). The interrelationships and interactions of these components are driven by continuously sustaining the corporate strategic relevance in CRE/FM actions and initiatives.

Within a business enterprise, real estate must align with the overall business strategy. It must not be alone, else it will lose its relevance. Rather, it must derive from and support the overall business strategy. Organisations exhibit these strategies through operational activities of assets management, property management and facilities management. Driving towards the overall business aim of enhancing shareholders wealth, real estate strategies and decisions must be directed towards enhancing the enterprise value.

By producing real estate strategic plans that address the business unit’s objectives (efficiency, customers, satisfaction, productivity, etc), corporate real estate can demonstrate their value and provide a platform for being involved in broader corporate planning process (Lambert et al, 1995; Sarasoja et al., 2004). However, Avis, et al., (1989) cited in Ali et al., (2008) reflected that organisations only take real estate matters seriously when they are under severe economic pressure in their main business. Such organisations are seen formulating CRE strategies in an ad hoc manner, there by providing a solution to a problem when it arises, where as superior CRE strategies should strengthen and increase the competitive advantage of the business organisation in an on going way (Ali et al., 2008). Nourse and Roulac (1993) developed a CRE strategy framework for business organisations. The author believed that there are eight types of real property strategies that can link real estate decision to corporate strategy. In a more recent study of Ali et al. (2008) an additional strategy of corporate social responsibility has been found to be a common driving force among corporations in the UK.

Figure 4 summarises the alternative real estate strategies that corporate executives could adopt to efficiently govern and administer their organisations for maximum performance.

1. Occupancy cost minimization
 - Explicit lowest-cost provider strategy
 - Signal to critical constituencies of cost-consciousness
 2. Flexibility
 - Accommodate changing organizational space requirements
 - Manage variability/risk associated with dramatic escalation/compression space needs
 - Favor facilities that can readily be adapted to multiple uses by corporation and others
 3. Promote Human Resources objectives
 - Provide efficient environment to enhance productivity
 - Recognize that environments are important elements of job satisfaction and therefore compensation
 - Seek locations convenient to employees with preferred amenities
 4. Promote marketing message
 - Symbolic statement of substance or some other value
 - Form of physical institutional advertising
 - Control environment of interaction with company's product/service offering
 5. Promote sales and selling process
 - High traffic location to attract customers
 - Attractive environment to support/enhance sale
 6. Facilitate and control production, operations, service delivery
 - Seek/design facilities that facilitate making company products/delivering company services
 - Favor locations and arrangements that are convenient to customers
 - Select locations and layouts that are convenient to suppliers
 7. Facilitate managerial process and knowledge work
 - Emphasize knowledge work setting over traditional industrial paradigm
 - Recognize changing character, tools used in, and location of work
 8. Capture the real estate value creation of business
 - Real estate impacts resulting from demand created by customers
 - Real estate impacts resulting from demand created by employees
 - Real estate impacts resulting from demand created by suppliers
- Note: The source of the information is Nourse and Roulac, 1993, p. 480.
Alternative Real Estate Strategies: Adapted from Lindholm et al., (2006).*

Figure 4: Alternative real estate strategies

CAPTURING THE ADDED VALUE OF REAL ESTATE

In order to achieve its desired result, organisations need to compute relevant measures which should derive from the firm's strategy (Keegan et al., 1989; Sarasoja et al., 2004). Very often, they are obliged to take stock of their activities and performance. Performance is the measurement of an object's ability to achieve desired results (Lindholm and Nenonen, 2006). Performance measurement helps managers and operators alike to determine four things.

First, those things that are crucially important to the overall organisation and its success (i.e. strategic alignment), those issues that similarly are crucially to the successful delivery of specific functions and operations. Second, the status of current performance for those previously identified issues.

Third, whether the performance is appropriate, whether it can be improved, and if so, by how much over what period of time; and lastly, how overall changes in the success criteria of the organisation affect the success criteria of the specific functions and operations (Varcoe, 2002). In the words of Lindholm and Gibler, (2005), performance is the process whereby the strategy of an organisation is translated into concrete objectives and achievement of those objectives is evaluated.

REAL ESTATE MEASURES

In the context of CREM, performance could be seen as the ability of CREM to support the organisational objectives, strategies and at the end, business success (Lindholm and Nenonen, 2006). Several studies (Nourse and Roulac, 1993; de Jonge et al., 1996; Krumm 1999; de Vries et al., 2008) have evaluated the performance of real estate vis-a vis the organisation performance.

The search for analytical tool to measure the contribution of CRE to the overall business has led to the development of performance tools that CRE managers could use to prove their relevance in the organisation. Organisations implementing corporate governance should be able to specifically capture and demonstrate the contribution of each of the resources to the enterprise value of the business. Real estate is a major resource which needs to be effectively measured for maximum utilisation.

Performance of the real estate assets of organisations can be measured, separately from, and in addition to, the overall performance of the organisation. An array of corporate real estate management performance measures found in the literature are grouped together in Figure 5.

The measured are, overtime, identified as acceptable means of measuring real estate management performance. These range from cost, space efficiency, satisfaction, CRE unit efficiency, portfolio efficiency, financial performance, employee satisfaction, marketing and sales, strategic involvement and productivity.

Cost	Occupancy cost per square foot (Arthur Andersen, 1993; Nourse 1994; Bon et al. 1994; Massheder and Finch, 1998; Bdeir 2003) Occupancy cost per customer (Bon et al ., 1994) Occupancy cost per employee (Arthur Andersen, 1993; Massheder and Finch, 1998; Bdeir,2003) Occupancy cost per dollar or per unit of revenue (Nourse, 1994) Occupancy cost per seat (Bdeir, 2003) Occupancy cost as a % of total operating expense (Arthur Andersen, 1993; Bdeir, 2003) Occupancy cost as a % of operating revenue by building or business unit (Massheder and Finch, 1998)
Space efficiency	Square feet per employee (Arthur Andersen, 1993; Nourse, 1994; Massheder and Finch, 1998; Bdeir, 2003) Percent of space occupied (Nourse, 1994; Bdeir, 2003) Gross floor area per usable floor area (Massheder and Finch, 1998)
Satisfaction	Customer satisfaction (Bdeir, 2003) Employee satisfaction with work environment (Arthur Andersen, 1993; Nourse 1994; Bdeir, 2003) Number of helpdesk calls per square foot (Bon et al., 1994) Provision of amenities (Bdeir, 2003) Absentee rates by buildings (Massheder and Finch, 1998)
CRE unit efficiency	Cost per CRE employee (Bdeir, 2003) Actual extra occupancy cost versus predicted cost (Massheder and Finch, 1998)
Portfolio efficiency	Cost of acquisitions versus returns (Massheder and Finch, 1998) Holding costs per year (Massheder and Finch, 1998) Cost of acquisitions versus returns (Massheder and Finch, 1998) Holding costs per year (Massheder and Finch, 1998)
Financial performance	Ratio of expenses to revenue (for income statement) (Lubieniecki and Desrcher, 2003) Capital expenditures (for cash-flow statement) (Lubieniecki and Desrcher, 2003) Value of property, plant and equipment (for balance sheet) (Lubieniecki and Desrcher, 2003)
Employee	Quality of indoor environment (lightning, air conditioning, temperature) (Kincaid, 1994)
Satisfaction	Noise level (Kincaid, 1994) Location success factors (proximity to required transportation modes, access to employees; amount of local amenities) (Duckworth 1993; Lubieniecki and Desrcher, 2003) Ratio of office to common areas (Lubieniecki and Desrcher, 2003)
CRE unit efficiency	Number of service requests handled in a month (Tranfield, 1995)

and quality	Response time to the service requests (Tranfield, 1995; Kincaid, 1994; Varcoe, 1996) Customer satisfaction with responsiveness (Amaratunga and Baldry, 2000) Time taken to turn around jobs (Tranfield, 1995; Hinks and McNay, 1999) Range of services offered (Amaratunga and Baldry, 2000) Projected revenue against budget (Lubieniecki and Desrcher, 2003) Employee satisfaction with CRE services (Duckworth, 1993; Lubieniecki and Desrcher, 2003) Total operating expenditures versus budget (Hinks and McNay, 1999; Lubieniecki and Desrcher, 2003)
Marketing and sales	Location success factors (proximity to requires transportation, access to customers, distance to other sites and businesses) (Duckworth, 1993; Lubieniecki and Desrcher, 2003) Rating based on building attributes (Duckworth, 1993)
Strategic involvement	CRE involved in corporate strategic planning (Lubieniecki and Desrcher, 2003) CRE integrated with HR strategies (Lubieniecki and Desrcher, 2003) CRE actively involved in firm-wide initiatives such as special asset use, consolidations, or shared services opportunities (Lubieniecki and Desrcher, 2003)
Productivity	Distance employees commute (Duckworth, 1993)

Figure 5: The most commonly used corporate real estate management performance measures found in the literature (source: Lindholm and Gibler, 2006)

These conventional measures allow the corporate real estate managers to compare their performance with the industry norm; they do not make clear whether the organization is spending the right amount for its needs or whether it is maximizing its results from the core business point of view (Lindholm and Gibler, 2006). It is a means at measuring an organisations stand and position within the industry. Embracing the culture of measuring the added value of corporate real estate management to organisations performance will assist corporations in developing countries benefit from the yet-untapped gains of CREM. It behoves every organisation to develop appropriate measures to measure the added value of the management of its organisation in line with the organisations objective (Oladokun, 2010).

In addition to the measures and indicators most common in literature, some additional innovative measures were discovered by (Lindholm and Gibler, 2006) arising from an interview with corporate real estate managers of organisations in US, UK, Finland and Netherlands. They can be grouped into 1) cost, 2) CRE unit efficiency quality, 3) flexibility, 4) productivity, 5) innovation, 6) marketing and sales, 7) portfolio return, 8) risk management 9) strategic involvement, 10) strategy implementation, and 11) corporate social responsibility. Figure 6 contained the details of the innovations under each of the measures.

Cost	Number of moves per year Cost of under utilized space Workplace standards in use
CRE unit efficiency and quality	Number of service providers Service level agreements (SLA's) in use with service providers BSC for partners in use Audits for service providers in use Time used in project versus time budgeted for the project Money spent on project versus money budgeted on the project Amount of advice given to other business units
Flexibility	Employee satisfaction with professional skills Employee satisfaction with information sharing Leased space relative to total space Length of lease terms Amount of distance work settings in use
Productivity	Employees' opinion on how well the workplace supports their productivity Time wasted with interruptions (due to open space layout) Distance to employees' homes
Innovation	Amount of teamwork space (information workers) Number of workstations per employee (information workers)
Marketing and Sales	Distance to customers Use of company logos and colour in workplace design
Portfolio return	Percentage of surplus assets sold Number of development projects (obsolete properties)
Risk management	Number of building quality audits

Strategic Involvement Strategy Implementation	Communication time with top executives Number of formal and informal meetings with top executives Fulfilment of strategic aims Self evaluation of how well decisions support strategy
Corporate social responsibility	Energy consumption (conservation) Number of energy audit

Figure 6: Examples of innovative performance measures (source: Lindholm and Gibler, 2006)

CONCLUSIONS

Among other resources of the organisation, real estate has not much been given the required attention. Corporate executives often neglect effective management of their real estate assets on the excuse that they are not primarily in the business of real estate. As true as this appear, organisations transact business in real estate business, although for various purposes. As well, the expenses incurred by corporations on real estate point to the fact that it could not be treated lightly. With commitment to ensuring good corporate governance, executives are under obligations to utilise the resources of the organisation effectively.

Real estate has roles to play in implementing good corporate governance. In its contemporary use, real estate has the potential to increase an organisation's productivity and profitability. Where it is well used, it improves the morale of the workers, enhances and contributes to shareholders value as well as increasing the financial status of the organisation. De jonge, 1996; Krumm, 1999 and Lindholm, 2006 identified the elements of added value of real estate to the organisation as: increasing productivity, cost reduction, risk control, increase of value, increase of flexibility, changing the culture and PR and marketing.

Where ever done, CRE performance has historically been done with focus on financial measures focusing on past activities. As these measures do not take cognisance of the overall business strategies and goals of the enterprise, more innovative real estate performance measures have been identified and suggested in the literature.

The paper has presented the eight alternative real estate strategies proposed by Nourse and Roulc (1993) as guide for corporate and real estate executives of organisations for developing appropriate real estate strategies that will be derived from the business strategy. The paper has also documented innovative performance measures that can be used to effectively integrate real estate into the overall business of the organisation for effective corporate governance.

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KEY DRIVERS OF CORPORATE SOCIAL RESPONSIBILITY IN THE CONSTRUCTION INDUSTRY

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Corporate social responsibility (CSR) doctrines are increasingly used by many mainstream construction firms to mitigate against damage to their business operations in a manner that fulfils and exceeds current legal and commercial expectations. The construction industry in the last decade has been heavily criticised in the media in relation to not so good business operational procedures. CSR is progressively becoming very important business strategy for many construction contractors and subcontractors partly because of the growing take-up of ethical codes of practice by key clients which is creating pressure for demonstrably responsible behaviour right through the supply chain. This paper presents key drivers of corporate social responsibility for construction operations elicited from local authorities, main contractors and subcontractors using semi-structured interview. The study concludes that corporate social responsibility holds many significant positive benefits to both the main contractors and subcontractors. It is also evident from the study that successful implementation of social corporate responsibility will encourage and aid responsible behaviour by those engaged in construction business operations.

Keywords: built environment, corporate, social responsibility

INTRODUCTION

The origins of social responsibility date back to the early days of capitalism (Crane, Matte and Spence, 2008), when individuals such as Jedediah Strutt and Titus Salt demonstrated through their activities that society should not be ruled by market forces alone. In a 2005, eighty-one percent of executives said in a poll, that “corporate social responsibility” is essential to their business (Blowfield and Murray, 2008) although they disagree about what exactly “corporate responsibility” means.

The majority of executives however, believed that business should serve as a steward in society, and that it has a duty to investors, employees, consumers, communities and the environment. CIRIA (2004, p11) defined CSR as a commitment by organisations to integrate socially responsible principles and concerns of stakeholders in their operations, in a manner that fulfils and exceeds current legal and commercial expectations.”

Barthorpe and Gleeson (2004) argued that before the formal advent of CSR as a recognised phenomenon, construction firms and professionals have already had a long tradition of implementing the fundamental tenets of CSR in communities by providing financial donations, sponsorships, training and disaster relief expertise.

Timms (2004) suggested that the key strategies for CSR are to:

- Promote business activities that bring simultaneous economic, social and environmental benefits
- Work in partnership with the private sector, community bodies, unions, consumers and stakeholders
- Encourage innovative approaches and continuing development and application of best practice
- Ensure that there is a decent minimum levels of performance in areas such as health and safety, the environment and equal opportunities
- Encourage increased awareness, open constructive dialogue and trust
- Create a policy framework which encourages and enables responsible behaviour by business.

Barthorpe et al., (2004, p 5) explain that CSR could be considered as an “umbrella” term, incorporating the tenets of environmental sustainability, business ethics, governance, public relations, stakeholder analysis and relationship marketing. Cannon (1994) however, contends that CSR was considered as early as the industrial revolution era of the late nineteenth century in the UK where “Victorian Philanthropy” influenced many eminent businessmen and politicians to respond sympathetically to the needs of those who failed to prosper from the industrial revolution.

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The current UK government through her 'Big Society Agenda' (Cabinet Office, 2010) says that it wants to make society stronger by getting more people working together to run their own affairs locally. The aim being to put more power and responsibilities into the hands of families, groups, networks, neighbourhoods and locally based firms and communities, and to generate more community organisers, neighbourhood groups, and volunteers, mutual co-operatives, charities, social enterprises and small businesses. The 'Big Society' agenda seeks to decentralise power to local authorities and give greater say communities in the provision of services and decision making to people through encouraging an expansion of communities led initiatives.

One of the major areas the coalition government is focusing attention involves encouraging organisations like construction firms and individuals to get involved in community led projects. This will provide the impetus and opportunity for private sector contractors to engage directly with local communities and all stakeholders when working for public sector clients. Professionals and others who provide services, whether directly in public sector organisations or in independent bodies will need to change how they think about themselves, how they understand others and how they themselves operate on a day-to-day basis. It requires organisations to work in partnership with those at the receiving end of services and to value, respect, and help each other.

This paper discusses the key drivers of corporate social responsibility for constructions and subcontractors in the construction industry.

RESEARCH METHOD

Three local authorities' executives directly responsible for the award of construction contracts in Derbyshire County Council, Nottinghamshire and Leicestershire City Council were interviewed. Also interviewed were five main contractors and fifty subcontractors that are in the 'approved lists' of these City Councils and regularly used for construction projects. The authors were granted access to the main contractors and subcontractors' database containing 'approved tender lists' used by city council with restriction that the data published would not name any contractor or subcontractor.

The main objective of the interviews was to find out how CSR are viewed by the County Councils, main contractors and subcontractors in their tripartite working relationships. The interview also provided accurate assessment of main contractors and subcontractors CSR implementations. The main contractor's interviews were held on construction site. The subcontractors interviewed fits within the category of small to medium enterprises (SMEs) as defined by the (European Commission 2011) of "having a turnover of more than two million Euros, and no more than fifty million euros." An equal ratio (to provide consistency in the results) of groundwork, superstructure, roofing and internal trades were selected to gain an overview of SME's input into CSR (see Figure 1).

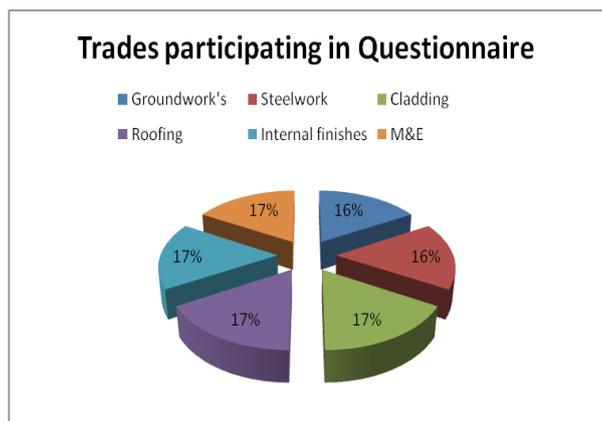


Figure 1: Participating Subcontractors

DISCUSSIONS AND ANALYSIS

All the respondents were interviewed individually and each interview lasts around an hour. The interviews are semi-structured, during which the interviewees are allowed to express their views and opinions openly and freely. The interview with the main contractors and subcontractors' shows that only around 20% of the respondents is cautious of embracing CSR stating that it adds significant overheads costs to their business operations.

Few are unaware of the incentives that CSR brings to their business operations as CSR does not always have to increase overheads costs to business operations but in contrast adds value. The key drivers of CSR elicited from local authorities, main contractors and subcontractors are listed below and shown in Figure 2.

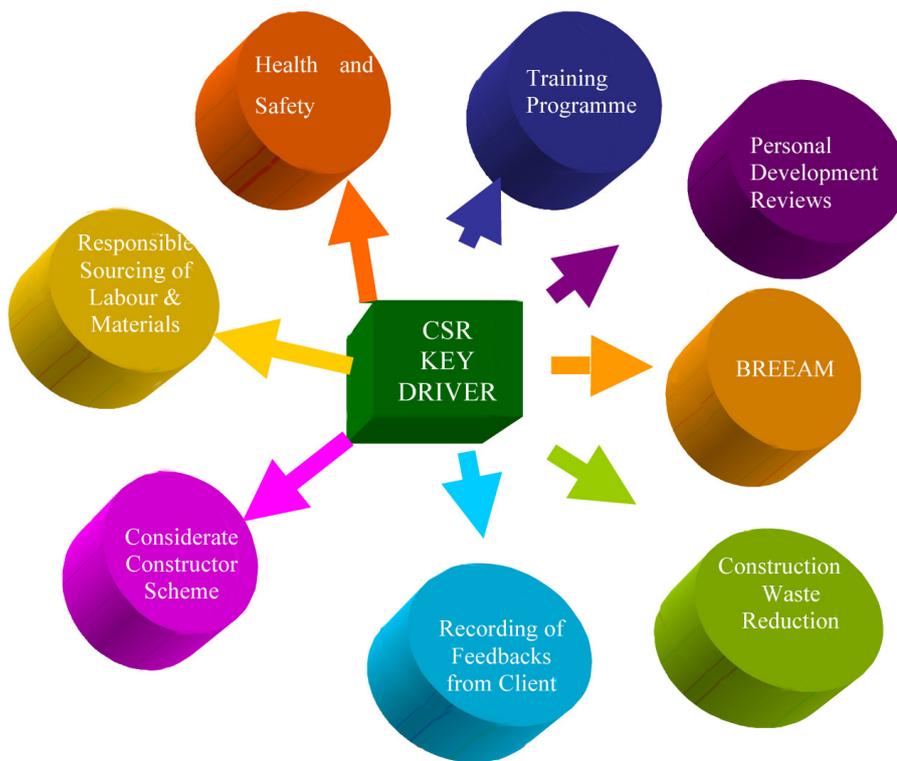


Figure 2: Key Drivers for Corporate Social Responsibility

- (i) Promotion of health, safety and well being
- (ii) Good policy on waste management and disposal
- (iii) Responsible sourcing of labour construction materials
- (iv) Considerate construction scheme
- (v) Personal development reviews (PDR)
- (vi) Provision of training programme for graduates and apprentices
- (vii) Recording of feedbacks from the client
- (viii) BREEAM implementation

PROMOTION OF HEALTH, SAFETY AND WELL-BEING

ISO 18001 is a leading accreditation recognised internationally (CIRIA, 2004) for companies demonstrating high level of safety management policy and majority of contractors and subcontractors use ISO 18001 to promote CSR by demonstrating high level of proactive safety management. For instance, where a contractor or subcontractor implements an effective health and well-being programme to all employees, it will demonstrate that the organisation is a considerate contractor. A large number of firms also use accident frequency rate (AFR) as a benchmark to measure effectively their safety performance. AFR is calculated (HSE 2011) using (Number of accidents x 100000/No of hours worked).

The national average of AFR for UK main contractors is 0.20 (HSE 2011). Construction firms which, achieves 0.20 AFR or above will be recognised as having met a credible safety performance benchmark.

The National Examination Board for Occupational Safety and Health (NEBOSH) is another route that contractors interviewed use to demonstrate their credible CSR status. This indicates that their site safety managers are competent and qualified to an expected level. Not only must these firms be demonstrating that they have a competent safety supervisor or manager but they will also be getting full benefits of CSR in this area.

CONSTRUCTION WASTE REDUCTION

About 60% of contractors and subcontractors are meeting their obligations in reducing the amount of waste sent to landfill. This is a great way of demonstrating positive CSR by showing that construction site waste are being sent to landfill sites and monitored. It is also evident that higher waste reduction targets achievable are continuously set.

RESPONSIBLE SOURCING OF CONSTRUCTION LABOUR AND MATERIALS

Similar to previous studies such as (CITB, 2009; Murray and Dainty, 2008), both contractors and subcontractors interviewed regard the procurement of local labour and materials as good CSR practice. They achieved this by sourcing both labour and materials used for construction works locally. The majority of construction materials purchased by these firms also came from reputable source of suppliers that are accredited by sustainable bodies. Partnerships are formed with local authorities; private clients, building merchants, and manufacturers to procure materials within a 20 mile radius.

CONSIDERATE CONSTRUCTION SCHEME

It was evident during the interview that not all the subcontractors are actively involved in the considerate constructors' scheme. The (Considerate Constructors, 2011) is a scheme set up by the UK construction industry to improve its image. Construction sites and construction companies that register with the scheme are regularly monitored against a Code of Considerate Practice designed to encourage best practice beyond statutory requirements. The scheme is concerned about any area of construction activities that may have a direct or indirect impact on the image of the industry as a whole. The main areas of concerns fall into three main categories namely, "the environment, the workforce and the general public" (The ESRC Department, 2006; CIOB 2011).

PERSONAL DEVELOPMENT REVIEWS (PDR)

Over 80% of the main contractors said that they carry out over 90% of annual personal development review of their employees. PDR gives employees an opportunity to raise any concerns or suggestions on how a company operates to senior management. All the subcontractors interviewed said that they have a diversity and equality policy which they use on a regular basis to resolve workplace grievances. It must be pointed out here that under the employment Act 2002, SME's are legally required to have diversity and equality policy

PROVISION OF TRAINING PROGRAMME FOR GRADUATES AND APPRENTICES

All contractors and subcontractors interviewed said that they have a policy for recruiting and training younger apprenticeship on the job from time to time. Most of the contractors also have graduate training programme and regularly recruit students on work placement.

RECORDING OF FEEDBACKS FROM THE CLIENT

Over 80% of contractors and 60% of subcontractors have a policy of evaluating and managing client satisfaction upon completion of a construction projects. Client satisfaction is the state of mind that customers have about a company when their expectations have been met or exceeded over the lifetime of the project or service being provided. The achievement of customer satisfaction leads to company loyalty and repeat business. Satisfaction itself can refer to a number of different facts of the relationship with clients. This could be as a result of contractors or subcontractors having met or exceeded client's expectations in terms of workmanship, costs or performance. Without doing so, improvements on operational procedure cannot be made. Good CSR practice requires the organisations to consider all stakeholders and respond to any criticism. Clearly defining and recording feedback can help construction firms identify opportunities for project and service innovation and serve as the basis for performance appraisal and reward systems. It can also ensure that quality improvement efforts are properly focused on issues that are most important to the customer.

BREEAM

All respondents said that, BREEAM now forms part of their contractual agreement and sets out various responsibilities in the contract particularly in terms of construction sustainability. The BREEAM assessment tool assess' buildings environmental performance throughout the life span of the building. Client's specifying BREEAM can establish the levels required by determining what they would like their building to achieve environmentally (outstanding, excellent, very good, good, pass unclassified) and cross reference this with the criteria to ascertain, which level it corresponds. One such requirement for instance, is engagement with the local community before and during the construction period which forms good practice in terms of CSR management (BREEAM, 2009; Todd, 2010).

CONCLUSION

Corporate social responsibility encourages and enables responsible behaviour by businesses and can bring about simultaneous economic, social and environmental benefits to society. This study has demonstrated that CSR can also be an excellent vehicle by which public sector clients can work in partnership with the private sector, community bodies, unions, consumers and stakeholders for the mutual benefits of one another. Good CSR policy will enable the development of key performance matrix strategy which would motivate construction firms to obtain credits whenever they achieved the recommended performance criteria which effectively measure their CSR credentials. CSR policy also offers both the main contractors and subcontractors' opportunities to respond to adverse criticisms from bad press received during recent years. It should be emphasised that the conclusion from this study is based on a limited sample responses from City Council, main contractors and subcontractors and therefore, maybe biased. For this reason, further on-going research based on large-scale survey is continuing.

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KEY ELEMENTS OF CSR STRATEGY - EVIDENCE FROM THE CONSTRUCTION AND ENGINEERING INDUSTRY

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Through multiple case studies of firms we argue that firms that have developed corporate responsibility strategies, albeit informally at first, do so by making intentional, informed and collective choices about CSR initiatives. More precisely, we point to the importance of considering corporate identity in making these choices and to the process of adaptive coordination, which includes both responding to and influencing the CSR environment. We conclude that CSR strategic landscape are determined more and more by the astute and careful management of a network of cooperative and competitive stakeholder interests which possess both tangible and intangible value to a firm.

Keywords: corporate social responsibility, case study, strategy, isomorphism, stakeholders, identity

INTRODUCTION

Most management texts on firm strategy do not consider project-based industries like construction and there is a lack of empirical research on strategy in the construction and engineering sector (Langford and Male 2001, Cheah and Gavin 2004, Green et al. 2008). Often firms that have tried to formally conceive and implement formal strategy have done so with mixed success, seeing it as an artificial and non-value adding exercise. Hillebrandt and Cannon (1990) argued that because construction and engineering firms are labour intensive, strategic planning must have a large emergent dimension. Effective strategy therefore involves constant timely and balanced decision making that match firms' available resources and management competence/expertise with a constantly changing physical, economic, institutional, social and cultural factors that are associated with different projects over time. More recently Green et al.'s (2008) research found that a construction firm's strategy is more often emergent than pre-planned and shaped by unexpected opportunities and maverick behaviour rather than in response to any formal mechanism. Green et al. (2008) also found that while boards of directors may occasionally intervene with planned strategies, there was little evidence that formal strategic planning techniques were used or that they had much impact on enacted strategy. This is in line with research showing that one common characteristic of successful firms is that they all have both 'clear' and 'fuzzy' strategies to enable them to respond flexibly to unexpected opportunities (Hubbard et al 2002, Mintzberg, 1994).

Traditionally strategy is seen as a top-down planning function which follows rational strategic analysis in a linear sequential fashion and all information was presumed to be available for top management about a relatively stable external environment. It was claimed that by understanding this environment, it is possible to develop long-range plans based on the extrapolation of long-term trends (Porter 1980, 1985 1987). Hence, the essence of strategy is about making choices and trade-offs and about choosing to be different and defining how firms will be different, rather than trying to be all things to all people. A company without a strategy will try anything and attempt to beat its rivals at their own game, which eventually forces customers to choose between competing firms on the basis of price. This is unsustainable because it forces firms into price wars and destructive competition which undermines an industry's competitiveness and margins. This is indeed a recurring problem identified by many commentators in the construction and engineering industry and could imply an absence of strategy in firms generally. The alternative explanation is that few opportunities exist in the industry for strategic difference between firms, although this is unlikely in an industry as diverse, large and competitive as construction and engineering. In response to growing public concerns about the impact of business on the environment and society, one area which firms have recently sought to differentiate themselves in the construction industry is corporate social responsibility (CSR) (Murray and Dainty 2009). The aim of this paper is to explore this new business agenda by investigating the extent to which strategic convergence (industry isomorphism) exists within the industry through identifying what firms do in terms of CSR, understand why they choose to include CSR into their business, and how CSR is integrated into these firms.

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CSR STRATEGY

As the concept of CSR gains traction across the business world, new ideas have emerged that question the adequacy of traditional business models to address a more socially and environmentally conscious business environment (Rumelt et al. 1994). In particular, it has been argued that traditional models of strategy neglect the critical role of social engagement and multiparty interactions in the strategic decision-making process and their implications for firm performance (Farjoun, 2002).

For instance, Pascale (1984) and Mintzberg (1994) have long recognised that although firms have a fundamental, long-term profit maximising strategy, they also have to pursue other conflicting goals and objectives which may lead to trade-offs between long-term and short-term performance. According to Pascale and Mintzberg, the best strategy comes from firms which are constantly responsive to their environment through the opportunistic, timely synthesis of ideas from all organisational levels rather than from a 'detached' or analytical top-down process.

This is especially pertinent when developing an effective CSR strategy since fast changing generational differences in attitudes, education and management approaches may render senior management less sensitive to changes in the CSR environment than junior level employees (Kotler and Lee 2005, Oury 2007). Yet according to Porter, despite the surge of interest in CSR, in most cases CSR strategy remains "too unfocused, too shotgun, too many supporting someone's pet project with no real connection to the business" (quoted in *The Economist*, 2008). It is not surprising therefore, that a recent survey in 2007 by the consulting firm McKinsey of CEOs participating in the UN Global Compact initiative found that a large gap exists between companies' CSR aspirations and their actions, indicating that despite the rhetoric, most companies have yet to effectively link CSR into their overall business strategy (Economist 2008). It would seem that while businesses are now much more aware of the need to appear to be good corporate citizens, they are much less clear about how to achieve this in a strategic sense, or indeed having a coherent strategy that incorporates the key elements of CSR to add sustained value to their business (Porter and Kramer, 2006; 2011).

METHOD

To explore this apparent deficiency, a case study approach was used i) to investigate how different types of firms in the construction and engineering industries have sought to integrate CSR into their overall firm strategy, and ii) to understand the rationale behind their respective approach, iii) to appreciate the different ways in which CSR can evolve and develop within each firm. Eight leading firms from various parts of the construction and engineering supply chain were selected for this exercise. They were selected, not on the basis of their CSR record, but to represent the range of companies one finds in the construction and engineering supply chain. The case studies were drawn entirely from Australia and include multinationals like the Lend Lease Corporation, The GPT Group, Leighton Contractors Pty Ltd and Stockland, international designers like Arup and HASSELL, project management consultants like Crown Projects, medium sized family-owned builders like Kell and Rigby Ltd and suppliers like CONCENTRIC Asia Pacific Pty Ltd. See Table 1 for sample details.

Data were collected using semi structured interviews with Managing Directors/CEOs and senior CSR executives from each company. Where relevant, information from annual reports and other corporate documents were used to supplement the interview data. Some CSR strategies appeared to be quite early in development, limited and 'informal' while others were mature, complex and multidimensional. Readers are referred to the corporate web sites and annual reports of each company for the many details we have had to omit due to word-limit constraint. It is worth pointing out that the intention of the study is not to report the successes or otherwise of any particular CSR initiative or strategy, or to promote any firm-specific initiatives. Instead, the case studies were based on interviews focusing on the connection of CSR to firm strategy which are underpinned by twelve broad questions:

1. What are the drivers of CSR in your business?
2. Describe your CSR strategy?
3. Who was involved in the development of the strategy?
4. Is the board able to effectively support CSR?
5. What are the broader external barriers to adopting CSR?
6. What are the internal barriers to adopting CSR within your company?
7. How have you developed a CSR culture?
8. What are the main challenges in successfully implementing CSR strategy?
9. How is CSR ROI measured?

10. How are CSR successes reported?
11. How are CSR failures reported?
12. From a strategic viewpoint, what are the key determinants of CSR success?

These questions served as a guide and were not intended to restrict discussions but rather to facilitate interviewees to convey their experiences of CSR. In the analysis of this data, we have presented our results in a narrative rather than attempt to convert the data into some quantifiable code in order to capture more succinctly the richness of the data source. The narratives were cross-referenced with other sources of information to ensure accuracy insofar as we are able to do so. However, because of space restrictions we are unable to include the full narratives hereii. The narratives are written without biasing one firm's CSR approach vis-à-vis another. What was apparent was that despite the diverse range of CSR initiatives pursued by individual firms, and irrespective of their size, age, sector, track-record, etc. the findings revealed a set of key elements that underlie their CSR endeavours and experiences.

Table 1: Case study firm details

HASSELL	Founded in Australia in 1938 HASSELL is a single, privately owned international network of design studios which employs over 3000 people worldwide. A multidisciplinary design practice, it is structured around the key disciplines of architecture, interior design, landscape architecture and planning, with integrated sustainability and urban design capabilities.
Arup	Established in 1946 as a consulting engineering business in London, Arup has grown into an international consulting firm which is owned in trust for its employees. Employing over 10,000 people worldwide, Arup's wide ranging portfolio of projects is served by over ninety offices across Europe, North America, Africa, Australasia and South East Asia.
Lend Lease	Listed on the Australian Stock Exchange, Lend Lease is one of the largest international integrated property companies. Operating in more than 30 countries worldwide and employing over 10,000 people, Lend Lease offers multiple services across the entire design and construction project delivery process.
Stockland	Stockland was founded in 1952 and was listed on the Australian Stock Exchange (ASX) in 1957. Stockland is one of Australia's largest, most diversified property groups with assets at 30th June 2008 of over \$14.7 billion in Australia, UK and Europe.
GPT	GPT has been listed on the Australian Securities Exchange (ASX) since 1971, and is one of Australia's largest diversified listed property groups with assets of over \$13 billion in the retail, office and industrial/business park sectors. The Group is one of the top 100 ASX stocks by market capitalisation.
Leighton Contractors	Leighton Contractors Pty Ltd is one of Australia's largest construction and resource services groups and a subsidiary of Leighton Holdings Limited, a company listed on the Australian Stock Exchange, with around 37,000 employees, and its head office in Sydney. Founded in Victoria in 1949, Leighton Contractors has grown from a small, privately owned civil engineering firm to become a large diversified group, with interests in telecommunications, infrastructure investment, facility management and energy.
Kell and Rigby	Kell and Rigby (K&R) is one of Australia's oldest family owned businesses. Established in 1910, K&R is a fourth generation family-owned construction company which has offices in Sydney, Brisbane and Canberra. It has a functional structure which focuses on different market segments and over the last five years has completed over AU\$700m of construction projects in commercial, retail, residential, age care and education.
Concentric	CONCENTRIC Asia Pacific is a small to medium sized privately owned firm of consulting engineers and designers which is a provider of technology for 3D design, simulation, interactive training, virtual ergonomics, and visualisation to the construction and engineering industry and other industries such as car manufacturing, automotive, defence and mining etc.
Crown Project Services	Crown Project Services (CPS) is an independent project management consultancy with over 40 staff which provides services in project management, program management, advisory and auditing services and event management. CPS service a wide variety of industry sectors including: Commercial & Industrial; Tourism, Hospitality, Sporting & Leisure; Government, Education, Health & Justice and; Infrastructure, Ports, Rail, Green Technologies.

DISCUSSION OF RESULTS

The social, political, institutional, and market-driven pressures for CSR are intensifying and firms in every sector of the industry are trying to respond or are responding strategically to this in their own way. The case studies reinforce this by demonstrating that firms

ii. Please refer to Loosemore and Phua (2010) for detailed narratives of case studies.

do indeed see CSR as having strategic benefits that can bring about certain tangible and desirable advantages to their businesses, even if these are not always formalised or officially articulated. In this regard, there is evidence of ongoing industry isomorphism towards CSR but it is still too early to draw any conclusion about its impact on overall industry performance in terms of the aspirational triple-bottom line of economic, societal and environmental improvements.

Far from jumping on the CSR bandwagon with the view that it is the solution for firms to do well, it seems that firms in this study do make intentional choices about CSR, have a truly good understanding of the specific business environment that they operate in, and the demands and implications that CSR initiatives may have on their resources. There is a strong sense that firms approach CSR in an essentially pragmatic rather than an ideological way, and this goes some way to dispelling much of the rhetoric surrounding the CSR agenda. The findings have shown clearly that each firm has their own interpretation of how and why CSR should be practiced and at what pace it should be implemented. In this context, there is a good degree of adaptation where some firms are more inclined to approach CSR from a compliance-based perspective while others appear more confident to incorporate discretionary approaches that go beyond meeting regulatory or statutory requirements. The fact that large firms generally have a more systematic and formal strategic approach to CSR compared to smaller SMEs which adopt a more informal, ad-hoc approach is not surprising as most SMEs do not yet seem to see the need for a formal CSR strategy – the kind that at least requires a change to the governance framework, reporting and auditing regime – as a prerequisite to gaining competitive advantage within the industry. Particularly for SMEs, their core day-to-day operations appeared to be largely unaffected by the CSR agenda, with many claiming that they have been practicing CSR in their own way without needing to label, formalise or market it as such. For large firms, CSR is regarded as an increasingly important aspect of their business, which is needed in response to a resource-constrained and regulated environment of more informed and empowered stakeholders. Many of these larger firms also see it as a way to exploit new business opportunities presented by challenges such as climate change and carbon trading. Hence, there is a wide scope for firms to be creative and innovative about how best to fit CSR into their respective businesses. Regardless of the particular type of CSR initiative/approach, there is evidence that the emergent and pre-planned components of CSR strategy are shaped and guided by the values, norms and belief systems that are inherent in each firm.

Because many of the real or perceived advantages of CSR are largely qualitative and firm-specific (reputation, financial, stakeholder engagement, cultural change, etc), it would be naive, if not misleading to suggest that one approach is more effective than another. What is consistent across the firms, however, is that there is genuine and widespread senior management commitment, leadership and support for the CSR agenda to gain traction in any meaningful way. This translates into varying degrees of cultural change which is important in redefining the roles and responsibilities of people within the firms in the context of how they allocate resources, engage with stakeholders, identify measurable targets, reward employees, etc.

Beyond focusing on their own firms, the interviewees in this study recognise that the increasing ‘connectedness’ and complexity in which businesses are carried out demands a more dynamic approach to engage and manage cooperative and competitive stakeholder interests. In other words, firms need to establish a common understanding and willingness to embed CSR across the entire construction and engineering supply chain. This remains a major challenge for the industry as a whole because maintaining the CSR momentum in a project-based environment requires the general commitment that extends beyond the goodwill, leadership and personal passion of a handful of people, which is currently the case. The firms in this study suggest that perhaps the most practical way forward is for them to become more astute in managing the network of stakeholder interests which possess both tangible and intangible value to the firm, and in doing so, develop a strong corporate identity that enhances the belief system and norms that are associated with CSR and which forms part of their core business culture.

CONCLUSION

Within the limited range of case studies that are included in this study, there seems to be a clear indication that most of the firms interviewed associate CSR with the need to do or to be seen to do, in their own words, ‘the right thing’. From this duty-based (deontological) ethical philosophical stance, emerges a diverse range of CSR initiatives that are deemed by each firm to be best suited to their individual circumstances and conditions. However, significant overlap in certain areas such as better employment practices, increased philanthropic activities and community presence, also suggest that the field of CSR is in its early stages of development in the construction and engineering industry and firms are searching for ways to differentiate themselves in this space and to thereby derive competitive advantage. Importantly, the CSR approach adopted by firms in this study is determined by both the emergent and pre-planned components of corporate strategy that relies as much on taking advantage of market-, institutional-driven trends and

opportunities as it is on the need to enact a strong corporate identity that serves as a guiding principle for firms to effectively respond to and influence the broader CSR environment.

Finally, although there is as yet no definitive link between CSR and improved economic performance, firms in this study recognise that the business case for CSR may not lie entirely with its economic advantages but with its effectiveness through enhanced legitimacy of corporate activities in the longer-term. This could well be the key element to obtaining better returns in the future.

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SESSION 11

MAINTENANCE & MAINTAINABILITY

HARMONIZING MAINTENANCE BUDGETS FOR BUILT ASSETS

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The adequate maintenance of existing buildings is one of the major contemporary challenges facility managers are faced with. The increasing economic pressure forces managers to constantly reduce the arising costs, while having to assure the best function and quality of their buildings. To improve the quality of maintenance, the KIT developed the so-called “PABI” Budgeting tool (Practical, Adaptive Budgeting of Maintenance Measures). It aims at evaluating future maintenance budgets for large building assets. Calculations with PABI reveal that the maintenance expenditures may differ significantly from one year to another according to the composition of the asset particularly in terms of its age structure and the detected maintenance lifecycle of 40 years. However, facility managers favour a rather constant and harmonized yearly maintenance schedule and budget due to financial company restrictions. Hence, the present research work aims at analyzing the harmonization potential of built assets in order to avoid large deviations in the future maintenance budgeting. The study is based on quantitative research methods, especially the analysis of empirical data of an asset of 824 sacral buildings. The corresponding data was transformed into a data base, covering the construction year, the dates of the last extraordinary maintenance measures and the description of the current building condition. The reallocation of the asset was carried out in 4 steps based on the building specifications and operation standards that were newly defined with the help of expert interviews. The outcome of the study is a harmonized maintenance schedule structuring the temporal order of the future extraordinary maintenance measures of the asset.

Keywords: maintenance management, harmonized maintenance schedule

INTRODUCTION

The adequate maintenance of the tremendous number and variety of existing buildings worldwide is one of the major contemporary challenges facility managers are faced with. The increasing economic pressure forces facility managers in private and public sectors to constantly reduce the arising costs, while having to assure the best function and quality of their buildings. Nevertheless the large diversity in terms of construction, utilization, building age and building value combined with a lack of specific maintenance know-how usually leave the experts unable to plan a reasonable budget for the upcoming year.

To improve the quality of maintenance, the Karlsruhe Institute of Technology (KIT) developed the so-called “PABI” Budgeting tool (Practical, Adaptive Budgeting of Maintenance Measures). Based on numerous statistical analyses covering empirical maintenance costs of office-, school-, residential and church buildings the PABI-tool was consistently advanced and adjusted. Today it enables the user to calculate the essential maintenance costs for a large asset in a transparent and simple way.

AIMS

Calculations with PABI reveal that the maintenance expenditures may differ significantly from one year to another according to the composition of the asset particularly in terms of its age structure and the detected maintenance lifecycle of 40 years. However, facility managers favour a rather constant and harmonized yearly maintenance schedule due to financial and personnel company restrictions. Hence, the present research work aims at analyzing the harmonization potential of built assets in order to avoid large deviations in the future maintenance budgeting.

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METHOD

The study is based on quantitative research methods, especially the analysis of empirical maintenance data of an asset of 824 sacral buildings of the Protestant Church in Baden. The corresponding data was transformed into a data base, covering the year of erection, the dates of the last extraordinary maintenance measures and the description of the current building condition. The reallocation of the asset was carried out in 4 steps based on different building specifications and the operation standards that were newly defined with the help of expert interviews.

RESULTS

ASSET STRUCTURE

The church asset comprises a total of 824 church buildings dating from various building periods. The oldest church was built in the year 875, the youngest building was finished in 2005.

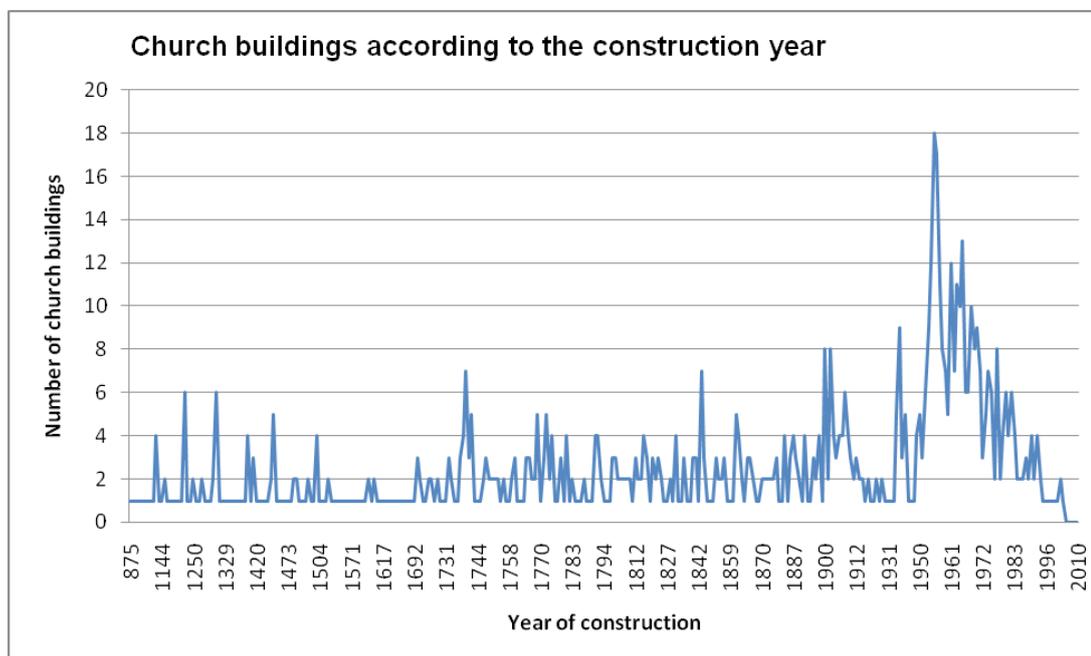


Figure 1: Distribution of new church buildings according to construction year

The asset thus covers a total of 1130 years of building history with a considerable variation in the number of new buildings per year: in many years, no new church was built under the responsibility of the Protestant Church in Baden, while in the peak year of 1995, 18 church buildings were finished. This diagram shows that building activities over the centuries were never constant but rather cyclical. The period of reconstruction after the Second World War (1950 – 1975) catches the eye with an especially high building activity.

For the period between 875 and 1923, Figure 1 shows only few new buildings with 6 – 8 churches per year (e.g. 1200, 1300, 1740, 1843 and 1900). Between 1950 and 1975, however, we find more than 20 years in which a minimum of 6 new churches per year were built. According to figure 2 this period hence saw an unprecedented surge of building activities. However, this phase of highest activity contrasts with phases of very low activity, in particular the years during inflation (end of the 1920s), the Second World War (1938 – 1945), and more recently the period since the beginning of the 1990s.

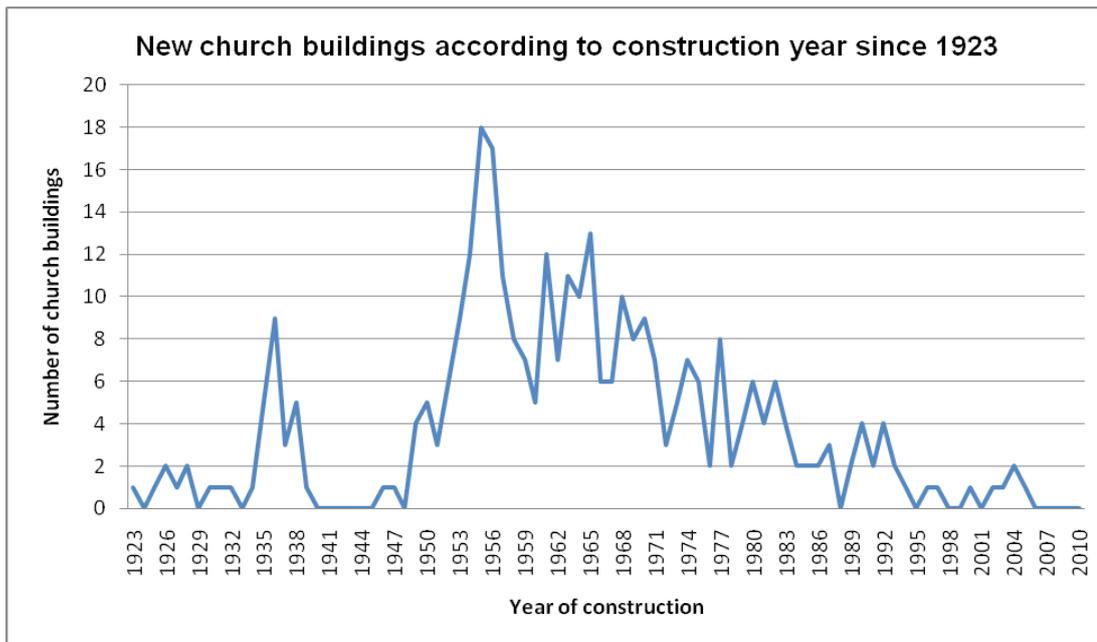


Figure 2: Distribution of new church buildings according to construction year since 1923

Looking at the distribution of new church buildings over the years, as shown by Figures 1 and 2, it is not surprising that over one third (35%) of all churches in the asset were constructed between 1950 and 2000. If you add the buildings that originate from the years 1900 to 1949 (12%), you can see that nearly half of all church buildings (47%) of the Protestant Church in Baden were built in the 20th century.

Of the remaining 53%, 19% stem from the 19th century, 17% from the 18th century and another 17% date from earlier centuries before 875 (see figure 3). The variations are due to several influencing factors: differing social, economic and political necessities (e.g. demographic factors, financial crises, war) had a considerable influence on the building activities and structure of the church portfolio.

STRATEGIC REORGANIZATION OF THE CHURCH ASSET

The reorganization of the asset wants to consolidate future maintenance costs at a constant level in order to avoid cost peaks and to minimize deviations between annual maintenance budgets. Based on past research experience (Bahr2010), (Boss2010), (Bahr2009), (Boss2008) the desired maintenance cycle for the complete church portfolio was set to be 40 years.

In order to evenly spread the 824 church buildings of the Protestant Church in Baden over a 40-year maintenance cycle, several reallocations become necessary.

1ST REALLOCATION BASED ON THE LATEST EXTRAORDINARY MAINTENANCE MEASURE

The first reallocation is based on the latest extraordinary maintenance measure carried out to the interior of a church building or to the building shell. The real year of construction is replaced by a fictitious construction year, i.e. the year of the latest extraordinary maintenance measure. This is done due to the assumption that a completely renovated building counts as new due to the improvement measure.

Figure 3 visualizes the generated graph of all extraordinary maintenance measures carried out since 1949 to the building shell and interior. A total of 1450 improvements were carried out since 1949.

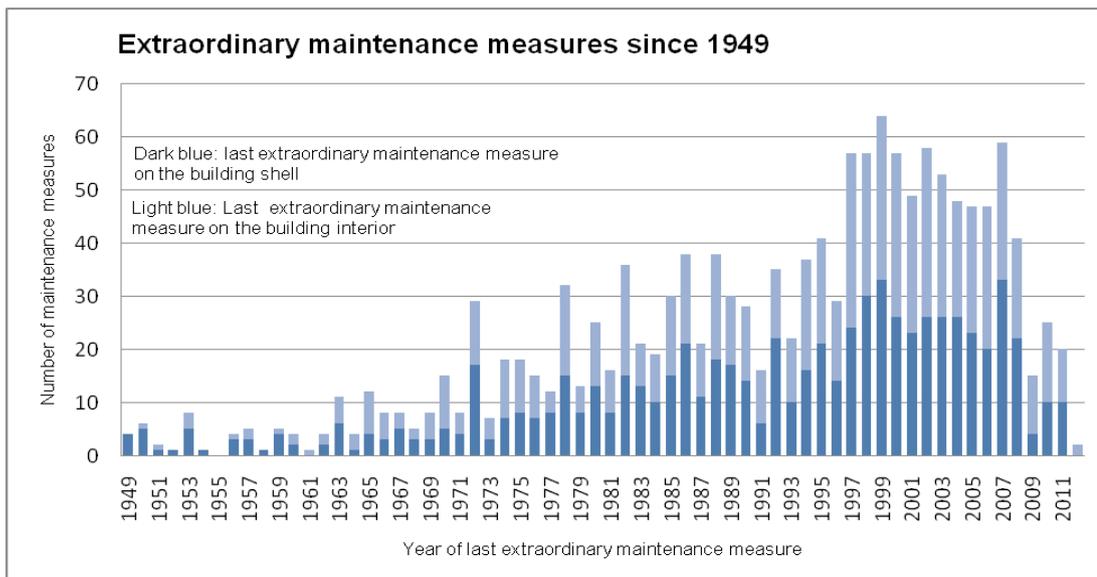


Figure 3: Distribution of the church asset according to the latest extraordinary maintenance measures

Of all measures, 719 were carried out to the building shell and 731 to the interior of a church. A further data differentiation shows that in the past, for ca. 91% of all church buildings, one or more improvement measures were carried out to the interior of building shell. For only ca. 9% of all churches, no improvement measures have been recorded since 1949. These are mainly new churches which have not yet reached the phase of increased maintenance needs.

With the aim to evenly structure the complete asset of the Protestant Church in Baden within a 40-year cycle, it is of great interest to have a closer look at the statistics of the last 40 years.

Figure 4 shows the number of all improvement measures and new construction measures of the past 40 years. A total of 1333 measures were carried out to building interior or shell, against a total of 192 new construction measures (new construction = one improvement measure to the interior and building shell) recorded for the same period. The annual average is ca. 38 measures. In 1973, only 17 measures (incl. new constructions) were carried out, while for the peak year of 1999, a total of 66 completed measures are recorded. This great difference shows clearly that maintenance work over the past decades was by no means constant but that there have been considerable deviations. Between 1971 and 1996, for example, the average is 24 completed maintenance measures per year. Between 1997 and 2007, the average jumped to a total of 54 measures per year, while the number of new constructions decreased considerably.

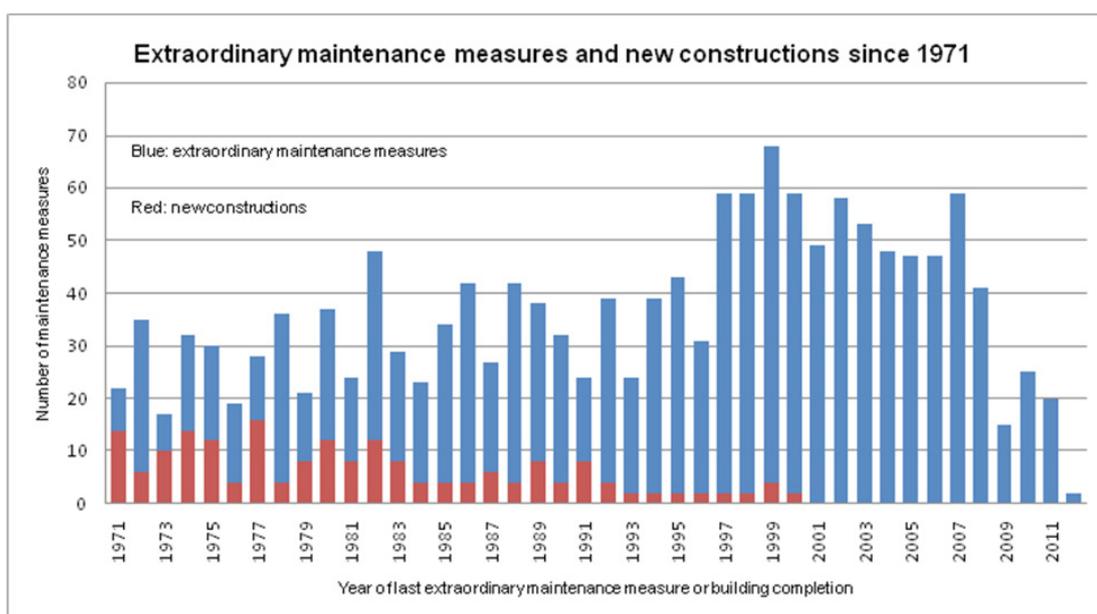


Figure 4: Measures of improvement and new construction over the past 40 years

The reason for this surge in maintenance activities becomes clear looking at figure 2: Due to the high number of new churches being built in the 1950s and 1960s, maintenance needs show a sharp increase corresponding to the critical period of 30 – 40 years after the construction year. Due to the high number of 824 church buildings in the portfolio, an average of 42 maintenance measures per year can be assumed in order to carry out one maintenance measure per building to the interior and one to its shell during the 40-year cycle.

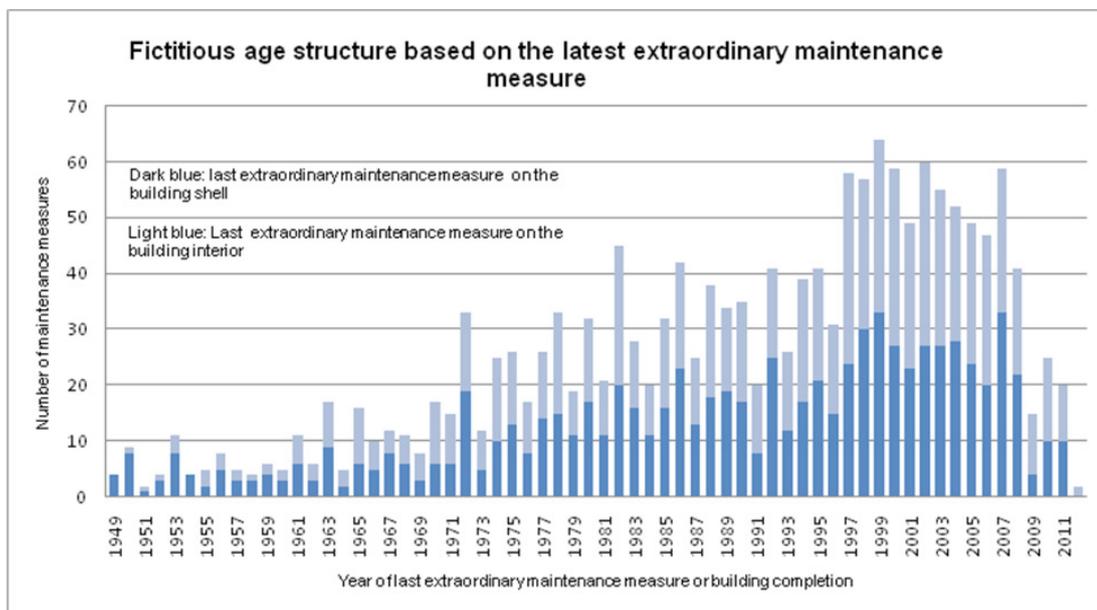


Figure 5: Fictitious age structure based on the latest important improvement measure

This suggests that the increased maintenance needs of the past years were due not only to the building boom of the 1950s and 1960s, but also to a lack in maintenance activity between 1950 and the mid-nineties. In order to get a clearer picture of the fictitious age structure of the church portfolio, figure 5 includes the years of all extraordinary maintenance measures recorded as well as the construction years of all buildings with no maintenance record. This means that the graph is a combination of fictitious and real construction years. As can be seen in the graph, the fictitious age structure of the overall asset of all 824 church buildings covers a period of 63 years. This means that for part of the buildings, the average maintenance cycle of 40 years was exceeded considerably; 180 of the total of 1648 measures on record date from before 1971. This means that for up to 11% of all buildings a considerable maintenance backlog cannot be excluded.

2ND REALLOCATION BASED ON TIME INTERVALS OF EXTERIOR AND INTERIOR RESTORATION

The aim of the second reallocation is the harmonization of the complete asset within a 40- year maintenance cycle. To this end, all buildings with no recorded maintenance measures as of 1971 (see figure 5) need to be included in the cycle. Also, the sequence of staggered maintenance measures needs to be clarified.

In the past, 53% of all church buildings saw maintenance work to the interior and the building shell being carried out in parallel, while for 47%, the maintenance activities to the interior and the building shell were carried out at different times. On request of the Protestant Church in Baden, congregations can keep on carrying out maintenance work to the interior and the building shell independently in the future, however, the time interval should not exceed 10 years. This 10-year rule was set so that congregations can carry out maintenance activities at different intervals (possible advantages regarding financing, fewer limitations of use, higher flexibility, etc.). The 10-year limit guarantees the timely realization of both kinds of maintenance activities, so that the building shell and interior are kept in a similar state over the full maintenance cycle.

The following data set constellations show some exemplary cases illustrating the procedure of the second reallocation.

CASE-RELATED METHOD

Case 1.0

The last important maintenance measures to the interior and to the building shell were carried out after 1971 and in the same year. Method: The years for which extraordinary measures are recorded are taken and reallocated, with the data set being integrated into the new strategic order via the addition of a 40-year maintenance cycle.

Case 2.0

Since the construction of the building (after 1971), no important maintenance measure to the interior or building shell has been carried out or documented.

Method: As no extraordinary measure has been carried out, the construction year serves as a basis for the reallocation. The data set is integrated into the new strategic order via the addition of 40 years.

Case 3.0

The latest important maintenance measures to the interior and to the building shell took place in different years (difference > 3 years). The earlier measure took place after 1971.

Method: For a difference of < 30 years, the date of the latter measure is antedated by half of the difference in years between the second and the first measure minus the desired delta of 10 years $(MM_latter - MM_earlier - 10 \text{ years}) * 1/2$, while the date of the first measure is postdated by the same number of years. The resulting data set is integrated into the new strategic order via the addition of 40 years.

Overall there have been 7 different cases defined and used. Figure 6 illustrates the result of the 2nd reallocation and visualizes the number of required extraordinary maintenance measures per year for the coming 4 decades. For the first time, all 824 church buildings were included in a 40-year maintenance cycle.

The distribution of the measures per year, however, remains quite inhomogeneous. Especially for 2012 (212 measures scheduled) and 2042 (125 measures scheduled), the number of measures considerably exceeds the desired average of 40 – 45 measures (represented by the dashed 42-year line). The majority of the years 2013 - 2021, and 2022 – 2036, however, remain below the desired number of measures. The extreme peaks in 2012 and 2042 are due to the fact that during the 2nd reallocation, all measures dating from before 1971 were postdated to 2012 for the current maintenance cycle (see case 2.1 and table 3). The idea behind this is that the latest measures documented were carried out more than 40 years ago and therefore, a new improvement measure is overdue.

The high number of extraordinary maintenance measures before 1971 thus leads to peaks in 2012 and 2042.

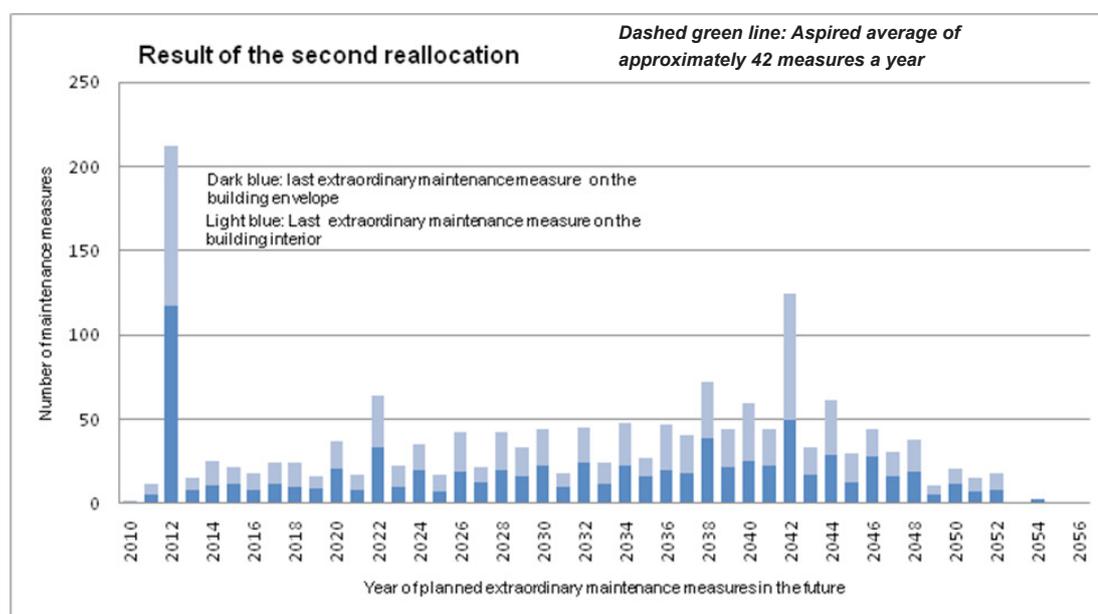


Figure 6: Overview of future improvement measures after the 2nd reallocation

In order to further harmonize the complete 40-year maintenance cycle and to smooth out or remove peaks, another reallocation becomes necessary.

3RD REALLOCATION BASED ON THE VALIDATION OF THE BUILDING CONDITION

The 3rd reallocation of church buildings is based on the validation of the building condition of church buildings provided by the Protestant Church in Baden. This validation is done in the form of condition grades, from 1 (very good condition) to 5 (insufficient condition). In a first step, all measures scheduled for 2012 after the 2nd reallocation are validated one by one and assigned a condition

grade. The grades range from 2 (good) to 5 (insufficient).
The reallocation began following the method described below.

CASE - RELATED METHOD

Case A

The building condition (interior or shell) has not been assigned a condition grade.

Method: Due to the low number of cases (9% of all church buildings concerned), the respective measures are scheduled for 2012 to be on the safe side.

Case B

The building condition (interior or shell) was assigned grade 5 (insufficient).

Method: The required measures need to be carried out urgently and are therefore scheduled for 2012.

Case C

The building condition (interior or shell) was assigned grade 4 (sufficient).

Method: The required measures need to be carried out as soon as possible and are therefore scheduled for 2012 and 2013.

Case D

The building condition (interior or shell) was assigned grade 3 (satisfactory).

Method: The required measures need to be carried out in the near future and therefore scheduled for 2013 - 2016.

Case E

The building condition (interior or shell) was assigned grade 2 (good).

Method: The required measures need to be carried out in the medium term and are therefore scheduled for 2017.

The following principle applies to all cases: Buildings whose latest improvement measure was carried out earlier (e.g. 1950) are scheduled earlier than buildings whose latest measure e.g. only slightly exceeds the 40-year cycle (e.g. 1969). Those measures which would have been scheduled for the years 2013 to 2018 according the 40-year maintenance cycle are carried out at a later date due to the cases A-E and packed into the years 2018 – 2020. This method guarantees the maintenance of all church buildings in order of priority and leads to an optimized annual distribution of maintenance measures over the full cycle for the years 2012 – 2020.

The reallocation of all improvement measures scheduled for 2012 according to condition grades helps to considerably smooth out the peaks seen before (2012 and 2042) and to evenly distribute the number of measures between 2012 and 2020. The new distribution leads to a projected number of 40 – 43 measures per year for the upcoming 8 years.

The period from 2021 to 2037, however, remains very inhomogeneous regarding the number of measures. Years with far less than 42 projected measures are followed by years slightly exceeding this number. On average, the number of planned measures for the period between 2021 and 2037 is considerably lower than the future objective.

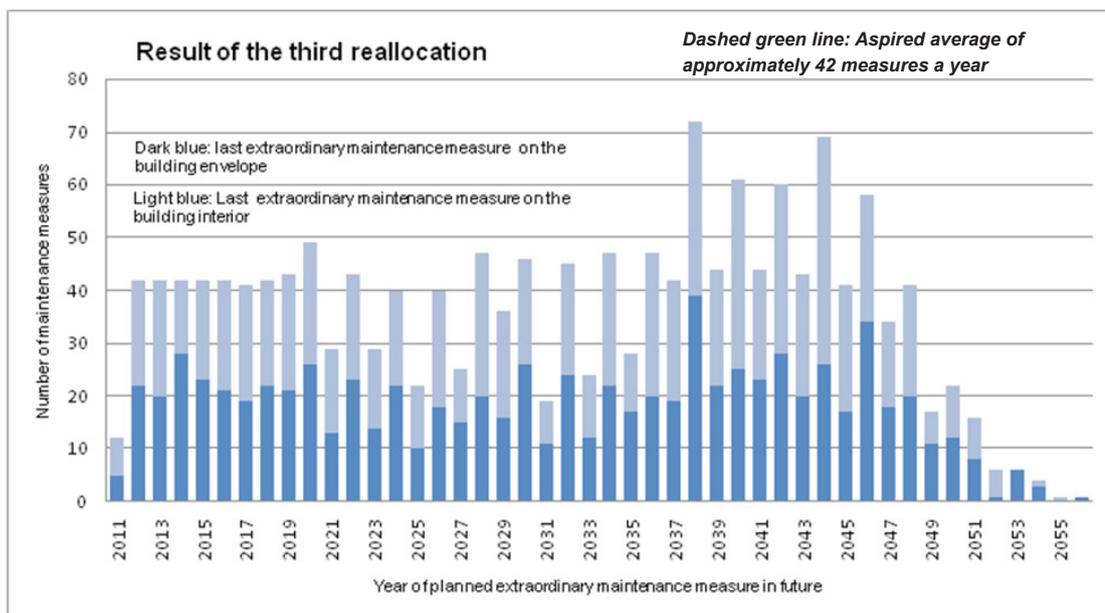


Figure 7: Overview of future improvement measures after the 3rd reallocation

On the contrary, the average number of measures scheduled for the period between 2038 and 2048 is considerably higher, as the number of measures scheduled per year nearly always exceeds 42. The year 2038 represents the peak with 72 measures. Against this background, the potential for further harmonization needs to be analyzed.

4TH REALLOCATION – POTENTIAL FOR FURTHER HARMONIZATION

While the upcoming decade has been smoothed out via the 3rd reallocation, the period between 2020 and 2051 remains considerably inhomogeneous regarding the number of measures per year (19 to 72 measures). The period between 2020 and 2037 remains under average and the period between 2038 and 2051 exceeds the average by far.

In order to reach a complete harmonization of the portfolio, a 4th reallocation becomes necessary. The aim of the 4th reallocation of church buildings is to reach harmonization across all years of the future 40-year maintenance cycle. To this end, the following method was applied:

Within a period of low maintenance activity (2020 to 2037), the measures were antedated depending on the year of the latest extraordinary measure combined with the building validation (condition grade). Example: In order to raise the number of measures from the 29 measures scheduled for 2021 to 42, the measures scheduled for 2022 are put in order depending on their date and condition grade. The buildings with the earliest extraordinary measure and the worst condition grade are antedated to the year 2021, until the desired number of 40 – 43 measures per year is reached. This procedure is repeated for each year.

If antedating is not possible, because the previous year has already 42 measures scheduled, and the current year exceeds the objective of 42 measures, the method is slightly altered: After the data has been structured according to condition grade and date (as described above), the buildings with the best validation result and latest extraordinary measure are postponed to the following year.

The basic idea behind this antedating and postdating is the assumption that no harm is done if buildings in a bad condition are renovated 1 to 2 years earlier as required by the maintenance cycle, while buildings in a good condition should be able to wait up to 2 years longer than intended by the maintenance cycle.

Thus, under-average years can take on more measures and over-average years can be relieved. Figure 8 shows the result of the 4th reallocation regarding the building condition.

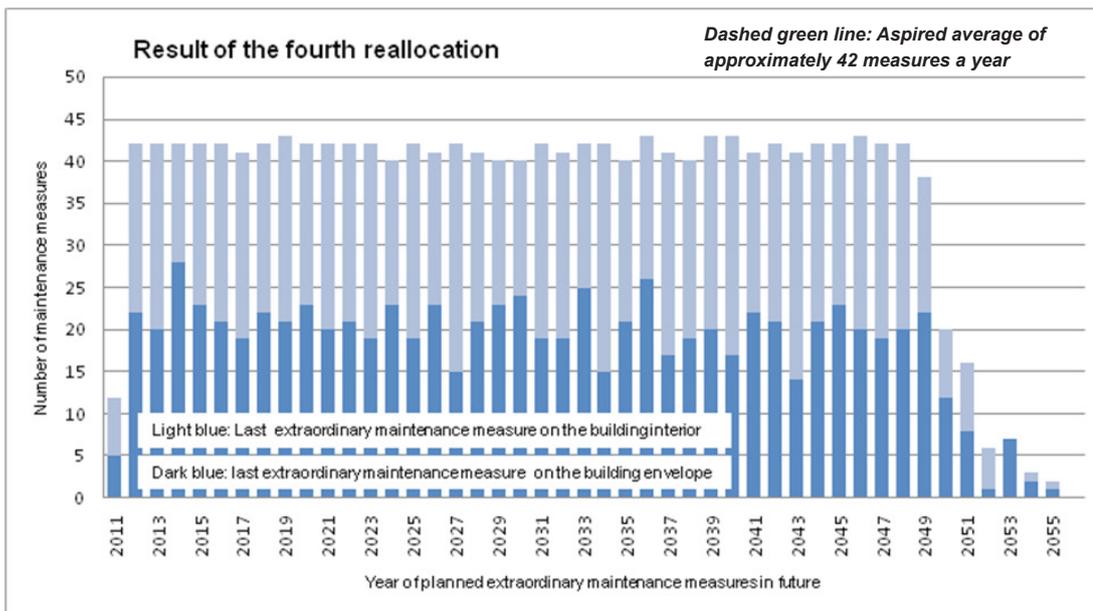


Figure 8: Overview of future improvement measures after the 4th reallocation

The method described in chapter 4.4.2 leaves the portfolio almost completely harmonized with 40 – 43 measures scheduled for each year of the 40-year maintenance cycle. The ratio between extraordinary measures to building shell and interior only varies slightly. Peaks appear in 2014 (28 measures to building shell/14 measures to interior) and 2043 (14 measures to building shell/17 measures to interior). For the majority of the 40 years, however, the distribution is even.

CONCLUSION

The result of this study shows that the complete portfolio can be harmonized using the fictitious construction year, the latest extraordinary improvement measure (building shell and interior) as well as the building validation (via condition grades). The resulting comprehensive overview of all extraordinary maintenance measures over the complete 40-year cycle provides the maintenance specialists of the Protestant Church in Baden with a reliable basis for maintenance management: the result gives a transparent and clear picture of the position in time of each congregation within the overall church maintenance process. This makes it a particularly useful tool for medium- and long-term maintenance planning.

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ASSESSING THE LEVEL OF PRACTICE OF DO-IT-YOURSELF (DIY) MAINTENANCE APPROACHES TO HOUSING

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The study assessed the level of practice of do-it-yourself (DIY) maintenance as a means of improving housing stock in Lagos state. In the process the study identified the level of practice within the study area in the state. To achieve the objective, the study adopted research survey technique. A total of 300 structured questionnaires were used for data collection. The survey covered 300 buildings which was selected from fifteen (15) local government areas in Lagos state. Based on stratified random sampling technique. Data collected were analysed using descriptive statistics. The findings of the study revealed that, the level of the practice of do-it-yourself (DIY) maintenance is low compared to other maintenance outsourcing options. Cleaning of drainage, cutting of grass, clearing of block drains, replacing of faulty electrical sockets, improved door security lighting and internal space re-arrangement are the most predominant service being carried out with the system. The study recommends that public enlightenment program should be used to educate the citizen to practice the system, landlord/tenant covenant should mandate proper building care and provision of do-it-yourself (DIY) building products and tools that will facilitate the practice.

Keywords: building care, do-it-yourself (DIY), housing stock, maintenance, outsourcing

INTRODUCTION

Despite the importance of housing to human beings there seems to be no consensus on the meaning of housing. The concept of housing is changing, particularly from the narrow historical conception as mere shelter, to the contemporary view of housing as the total residential environment. According to WHO (1961), housing is the residential environment, neighbourhood, micro-district or the physical structure that humankind uses for shelter and the environs of that structure, including all necessary services/facilities, equipment and devices needed for the physical health and social well-being of the family and the individual.

A residential building can be described as such building (a house) that is suitable for living in or a structure that can offer a living accommodation for people. Housing in general consists of buildings, infrastructure facilities and other services that make up our built-environment. Provision of housing in a country is very essential to the social welfare of her citizens. Housing (residential building) is one of the necessities of life and it has been said to be the second most essential human need after food.

Regardless of design or quality, all buildings deteriorate physically over the years. The physical deterioration of the structure describes its wear and tear from usage, age, neglect, lack of maintenance, vandalism and weather. Buildings are born or created just as 'man'; it grows and wears out with age to the point of death just as man. Building life cycle begins from the inception stage to the design stage then the building construction stage through usage stage and finally the demolition stage. As man becomes unhealthy if no proper medical care is taken, good food, quality water, clothing, proper rest, over stress etc. so also is a building if not properly taken care of becomes unhealthy, sick, out of context, disgusting, unattractive, bad, out of shape, stinking and appalling this is a state of dilapidation. Adenuga 2002 stated that an assessment of our built environment in contemporary Nigeria shows that many publicly and privately owned buildings are in various states of disrepair and dilapidations. The medicine for a building that is built-to-last is proper and effective maintenance care. Maintenance as a concept refers to all works relating to repairs, replacement and or redecoration performed on any building with the aim of increasing the useful economic life; enhance its value as well as promoting its beauty and functionality and preventing damage and injury (Olatubara et al 2007). Maintenance, according to Bello (1994), is the entire endeavour to keep physical facilities – structure equipment, machinery and services at a satisfactory level of technical performance and quality of the lowest total cost. Odudu (1994) sees maintenance with respect to building and their services as a continuum of the construction process. According to him, the level of maintenance governs the health of a building throughout its life cycle. Therefore, maintenance involves the total package of all activities taken in caring for a building and all its facilities and services in a state to continue to perform its intended functions to the benefits of the end users, owners and the environment. However, despite the importance of maintenance to building, the occupants as well as the economy as a whole, maintenance decisions

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are usually a result of expediency, reflecting series of ad-hoc and sometimes unrelated compromises between the immediate physical needs and the availability of financé (Lee, 1976). The general levity with which housing buildings maintenance is treated is evident in the appalling state of the buildings in Lagos State today the situation have gradually and increasingly turn our city to slums.

Unfortunately, the level of maintenance or lack of it speaks volume about the people who inhabit or have anything to do with housing. This is particularly so as lack of regular maintenance can render a building and its auxiliary facilities and services unhealthy for living and drastically depress the quality of life and contribute to some measure of anti-social behaviour (Lee, 1976) as is prevalent in most slum and delighted areas of the cities all over the world. To tackle the rate of dilapidations of our housing stock is greatly determine by our reaction toward how we maintain the housing and its auxiliary facilities. The occupants/users or dwellers of a house and it's environ are responsible for the state or condition of the facilities serving them. So therefore their ability to carryout or implement an effective maintain of such facilities will enhance the performance and improve the state and condition of such house and its facilities. Do- it-yourself (DIY) maintenance is like “human caring for is physical body daily to improve and retain good and acceptable appearance in the society”. So also is an individual or a home owner/occupier taking care of the home and its facilities to an acceptable standard without the involvement of professionals, contractor etc. which save some monetary value for the practitioner. That is why this research work aims to assess the practice of do-it-yourself (DIY) maintenance approaches to housing stock in Lagos State. The objectives of the study is to assess the level of the practice to others maintenance outsourcing options and to identity the building components and facilities that the system is most practice on in Lagos State.

STATEMENT OF RESEARCH PROBLEMS

All the components of housing-the building structure, the internal and external facilities services and equipment and any other physical facility –deteriorate with age and at various rates. The rate of deterioration will depend on the materials used, the exposure of environmental conditions, construction methods and the use. From various studies, the first twenty years of the building or housing is accompanied by some defects, which are easily corrected. However, when these initial defects are neglected, the next stage of deterioration, which usually involves physical, functional and environmental deterioration will manifest. This often leads to obsolescence and abandonment (Olateju, 1994). This state of dilapidation which is paramount with housing stocks in Lagos State have led to the increasing number of obsolete housing facilities with social, economic, functional, physical and environmental obsolescence.

THE PURPOSE OF MAINTENANCE

According to Oyefeko (1990), the seven different purposes for undertaking maintenance work are:

- i. To preserve building structure in its initial state as far as practicable so that it serves effectively the purpose for which it was built.
- ii. To maintain an acceptable quality standard in terms of the structural stability to meet the current state and demand.
- iii. To retain or preserve the value of the investment on it, by presenting good appearance.
- iv. To prolong the life span of a building structure its facilities and services.
- v. To upgrade the quality and standard of a building its facilities and services by renewal and refurbishments especially where facilities have deteriorated beyond normal repairs.
- vi. To attract higher rental value where such a building is to be placed on commercial use.
- vii. To maintain and retain aesthetic value.

APPROACHES TO MAINTENANCE

There are various types of maintenance for example, we have preventive maintenance (to keep), and corrective maintenance (to restore). However, according to BS 3811, (1984) maintenance can be categorized into “planned” and “unplanned” maintenance. According to BS 3811 (1984), planned maintenance is described as the maintenance work organized and carried out with fore thought, control and the use of records to a predetermined plan, while on the other hand, unplanned maintenance is the work carried out to no predetermined plan (Seeley, 1987).

BUILDING DETERIORATION PHENOMENA AND MAINTENANCE CONCEPT

Maintenance free buildings are impossible to produce. The reality is that all the elements and components that make up a building unavoidably, deteriorates with time due to inherent defects in design and construction and the effects of environmental agents and users activities. All buildings are subject to aging, wear and tear in the performance of their functions and determination by exposure to the operating environment. Hence left to themselves, buildings will eventually become inefficient, unreliable and fail (Winderlich, 1991).

Building defects result from failure or shortcomings in the function, performance, statutory or user requirements of the structure, fabric, services or other facilities. However, Org (1997) states building defects may be an issue only if they are major or excessive. When a building reaches a certain level of deterioration, economic or safety requirements may demand a slow down, a halt or intervention at this stage to make it possible to preserve building and their technical installations for the length of their functional lifespan (Iyagba, 2005). Building deterioration start immediately when a building is commission and continues overtime, lack of maintenance and care is what accelerate the impact of the agents of deterioration on such building. Only repair or rehabilitation can bring a building back to an improved state or as-good as-new state (Iyagba 2005). Amarilla (2002) states that housing structures depreciate at a rate varying between 6% and 10% depending on their physical conditions in a period of 100 years. When maintenance is ignored (delayed or not executed at all) the effect is to aggravate the rate of building deterioration from year to year (Brumara 2000). Unfortunately, however, maintenance can only reduce the rate of deterioration but cannot eliminate or reverse it as a structure cannot maintain, let alone improve itself (Winderlich, 1991). This is the reason why even effective maintenance, cannot stop the building life cycle.

DO-IT-YOURSELF (DIY) MAINTENANCE

The perusal of academic bibliographic databases shows little information on the understanding of what specifically counts as DIY. 'DIY' crops up in references repeatedly in relation to fields such as law, health and IT maintenance, or in relation to anti-corporate counter culture. Across different fields of activity the term is used to refer to people providing for themselves services which they could otherwise be (be expected) to pay a professional to do. However, as reflected in dictionary definitions, the term conventionally refers specifically to accomplishing home repair or decoration yourself without the paid services of a professional. A number of statisticians have paid attention to DIY and home maintenance and improvement behaviours, based on rational choice modeled analysis of large data set such as the American Housing Survey (Pollakowski 1988; Bogdon 1996; Baker and Karl 2002) and the Scottish House Condition Survey (Littlewood and Munro 1996). These analyses provide useful background on generic correlates of decisions to undertake home improvements, and whether to employ someone to do it or not.

FACTORS INFLUCENCING THE PRACTICE OF DO-IT-YOURSELF MAINTENANCE

Pollakowski (1988) finds a complex relation between income and the likelihood of a household undertakins g DIY, but a strong correlation with age, and that renovations are most likely to be undertaken by a recent mover (Bogdon 1996). Bogdon (1996) finds household composition a major determinant of the likelihood of a household taking on DIY. With multiple adult households most likely to undertake it, single parent families the least likely, as well as finding that, people are more likely to take on a contractor where projects are of larger scale, complexity or risk. Baker and Kaul 2002, highlights the significant relationship of changes to household composition with the likelihood of home remodeling.

THE LEVEL OF PRACTICE OF DO-IT-YOURSELF MAINTENANCE

Davidson and Leather 2000 stated that the increase consumer interest in DIY is the growth of home ownership and in real incomes, but developments in tools, materials, techniques, and in the marketing of DIY through superstores also have made building work more accessible to the layperson. Sadler and ward (1992) carried out an interviewed in the UK with a sample of home-owners about

their repair activities, but did not consider DIY specifically. Leather et al 1998 studied the factors influencing the propensity to carry out building work, and touch just the issue of how work is carried out.

The term DIY has been used to cover all works not carried out by contractors or professionals but directly by the home-users. But building works may sometime be complex in nature or character, this is organised in a more complex ways, where some components has to be contracted to contractors, or undertaken on an unpaid basis by friends, relative, in- house skill workers and other contract. The 1991 EHCS (DoE, 1993) highlighted more detailed picture of the organisation of domestic repair, maintenance and improvement work by owner-occupiers. Due to the difficult of providing adequate information on building work, the 1991 EHCS (DoE, 1993) distinguished between three types of work basic which are DIY, unpaid help and contractor work.

TYPE OF WORK CARRIED OUT

According to Davidson and Leather (2000) certain types of work were much more likely to be carried out through DIY or unpaid labour than other. The works that is likely to be left to contractors included larger and more complex tasks, jobs involving the use of specific skills (like plastering) or equipment which most households would not own (such as scaffoldings; those involving hard physical work and unpleasant or dangerous tasks (example, electrical or drainage work); tasks which would have adverse consequences if substandard (example, gas installations) and tasks which needed to be completed quickly (example to restore the dwelling to a weatherproof state).

From their studies, they analysed based on the EHCS 1991 (DoE 1993), that

- i. That a large amount of contractor executed double glazing work which owners commissioned.
- ii. The majority of major jobs which commonly involved DIY (with the exception of external painting), were concerned with upgrading the dwelling rather than with basic repairs.
- iii. Jobs involving the assembly and or fitting of ready-made components were very common DIY tasks.
- iv. 43% of major jobs involving kitchen units and worktops used DIY, with even higher levels of wardrobes or cupboards (52% DIY), and internal doors (52% DIY).
- v. Insulation and security works also were commonly undertaken through DIY.
- vi. Major jobs of basic repair or maintenance involving specific skills, such as replacement of a central heating boiler (9% DIY), difficult or dangerous jobs such as recovering the roof (12% DIY) or repointing the chimney (8% DIY), were much more likely to be left to contractors.
- vii. Owners were more willing to tackle small jobs through DIY than larger ones.
- viii. There was a general increase in the use of mixed DIY/ contractor arrangements, except in the most challenging tasks such as roof work, and those such as double glazing. There was a decline in DIY installation of external doors, which may reflect the increased popularity of contractor installed UPVC products.
- ix. Extension, bathroom conversions, or roof replacement were categorized as complex jobs while low skill jobs included laying loft insulation, draught-proofing windows, and most internal or external decorative work also described by Davidson et al (1997).
- x. Nearly 50% of low skill jobs were carried out exclusively by DIY compared with only 11% of very high skill jobs. Nonetheless, over 25% of very high skill jobs (for example extension involving many job components or different trade skills) were carried out using a mixture of DIY and contractor works.

RESEARCH METHODOLOGY

To achieve the aim of the study, a survey research approach was selected. A structured questionnaire was designed as an instrument for data collection from 300 respondents both owner-occupiers and tenants. The analysis was generalised between the two respondents. The data collected were analysed using descriptive statistics.

Mean score was used to ranked the level and frequent of the practice of do-it-yourself maintenance on selected building components and home facilities. Percentage score was also used to shows the different levels of maintenance works outsourcing based on the EHCS (DoE 1993) work classification i.e DIY, unpaid help, contractor and mixed arrangement(combination of any of the three).

ANALYSIS OF DATA AND DISCUSSION

CHARACTERISTICS OF RESPONDENT'S

According to Table 1, 160 (53%) of the respondents were owner-occupiers while 140 (47%) were tenants. Majority of the household head were male with 75.3% and the female counterpart 24.7%. The household head age limit was mostly above 40 years (55.3%), followed by those within 30-40 years old. Household head within 0-10 and 10-20 years old had percentages of 0.7 and 3.0 respectively. Financial income of most of the respondents was above N50,000 per month while 4.7% had a monthly income within N5,000-N15,000. Family size i.e. the number of household of respondents within 2-5 and 5-10 had 150(50%) and 103(34.3%) respectively. Respondents that occupied single rooms, a room and living room and duplex had 12.7%, 22.7% and 14.3% respectively, while 48% occupied flat apartments and just 2.3% occupied mansion. 46 (15.3%) of them were classified to be in high social level and 12.3% and 72.3% were in low and average social level respectively.

Table 1. Characteristics of Respondents (source: Field survey, 2010)

ITEMS	FREQUENT	PERCENTAGE
Types of occupant		
owner-occupier	160	53.0
Tenant	140	47.0
Gender		
Male	226	75.3
Female	74	24.7
Age Limit		
0-10	2	0.7
10-20	9	3.0
20-30	42	14.0
30-40	81	27.0
40 above	166	55.3
Monthly Income		
5,000-15,000	14	4.7
15,000-30,000	47	15.7
30,000-50,000	70	23.3
50,000 above	169	56.3
Family size		
0-2	22	7.3
2-5	150	50.0
5-10	103	34.3
10 above	25	8.3
Apartment occupied		
single room	38	12.7
Room and living room	68	22.7
Flats	144	48.0
Duplex	43	14.3
Mansion	7	2.3
Social Class		
Low Class	37	12.3
Average Class	217	72.3
High Class	46	15.3

LEVEL OF THE PRACTICE OF DO-IT-YOURSELF MAINTENANCE

To examine the level of practice of do-it-yourself (DIY) maintenance management strategy in use, among others maintenance outsourcing options practice in improving housing stock. Buildings users were asked to rate the frequency of usage of do-it-yourself (DIY) maintenance in terms of the activities mentioned below. Table 2, shows that do-it-yourself (DIY) maintenance is not a major maintenance option practice among the respondents i.e. the level and the frequency of the use of do-it-yourself (DIY) maintenance in restoring, repairing or retaining building elements, components and home facilities to an acceptable standard is low amongst other options of maintenance works outsourcing. Cleaning of drainage (3.23), cutting of grass (2.91), and clearing of block drains (2.81), replace faulty electrical sockets (2.77) were the major activities carried out by both the owner-occupiers and the tenants.

Table 2: Frequency of the use of DIY maintenance on building components (source: Field Survey, 2010)

ELEMENTS/COMPONENTS/FACILITIES	LEVEL OF PRACTICE OF DIY			
	OWNER-OCCUPIER		TENANTS	
	MEAN	RANK	MEAN	RANK
Cleaning of drainage	3.30	1	3.16	1
Cutting of grass	2.89	2	2.89	2
Unblock drains	2.86	3	2.88	3
Replace some electrical sockets	2.73	4	2.79	4
Improve door security lighting	2.58	5	2.50	7
Internal space rearrangement	2.51	6	2.60	5
Repaint faded internal painting	2.48	7	2.50	7
Install/repair damaged fans	2.43	11	2.52	6
Replace a bathroom amenity	2.47	8	2.44	10
Replace broken louver/glass	2.44	9	2.46	9
Improve window locks/security	2.42	12	2.36	11
Install security lighting	2.40	13	2.24	13
Replace repair bathroom fitments	2.31	15	2.32	12
Install/repair damaged taps/stop valves	2.44	9	2.16	16
Replace/repair burst pipe	2.33	14	2.13	17
Completely refurbish bathroom	2.24	16	2.17	15
Install additional bathroom amenity	2.12	21	2.18	14
Replace all bathroom amenities	2.18	17	2.11	19
External painting	2.14	18	2.04	27
Repair cracks in wall plaster	2.08	24	2.10	20
Completely rewire dwelling	2.11	22	2.04	27
Fitted wardrobes/cupboards	2.09	23	2.07	23
Repair damage ceiling	2.01	27	2.12	18
Replace internal door	2.00	28	2.08	21
Replace kitchen cupboards/worktops	2.00	28	2.08	21
External wiring circuit	2.14	18	1.87	37
Completely refit kitchen	1.97	34	2.05	24
Fix burglary proof	2.14	18	1.89	36
Replace damaged wall and floor tile	2.02	26	1.98	29
Replace external door only	1.99	31	1.94	32
Extend water supply pipe work	2.03	25	1.91	35
Patch cover to leak roof	1.90	39	2.05	24
Replace external door and frame	1.96	35	1.95	31
Replace cover to leak roof	1.89	40	2.05	24
Work to paving	1.98	33	1.94	32
Fit shelving	1.93	37	1.98	29
Repair garage/out building	1.99	31	1.86	38
Work to fences/boundary walls	2.00	28	1.77	41
Renew pitched roof covering	1.87	42	1.86	38
Install double glazed windows	1.91	38	1.79	40
Replace bath water heater	1.95	36	1.74	44
Repoint external wall	1.77	45	1.93	34
Plaster/replaster ceiling	1.89	40	1.77	41
Replace/refix roof slates or tiles	1.85	44	1.76	43
Install security alarm	1.87	42	1.69	45

Note: Mean score is based on a likert scale of Never (1), rarely (2), less frequently (3) Frequently (4).

The two group of respondents also agreed that improve door security lighting (2.56), internal space re-arrangement (2.56) and repaint faded internal painting (2.51) were predominance do-it-yourself (DIY) maintenance activities carried out. Plaster/replastering of ceiling, replace/refix roof slates and tile and install security alarm amongst others were activities that were rarely executed using do-it-yourself (DIY) maintenance option by both respondents.

Table 3: Nature of executing maintenance work (1999 – 2010) among respondents (source: Field survey, 2010)

ELEMENTS/COMPONENTS/ FACILITIES	N	NO OF JOBS EXECUTED MINOR AND MAJOR	OUTSOURCING OPTIONS (%)				
			N	Unpaid help	DIY	Contractor	Mixed arrangement
External painting	245	900	199	3.02	10.56	73.87	12.56
Install double glazed windows	150	372	153	0.00	16.34	67.32	16.34
Completely refit kitchen	194	449	188	7.98	26.60	46.81	18.62
Replace external door and frame	224	498	207	2.90	16.43	64.73	15.94
Work to fences/boundary walls	169	425	174	4.05	13.87	63.01	19.08
Internal space re-arrangement	229	1,132	221	5.88	62.44	12.67	19.00
Completely refurbish bathroom	200	583	188	2.13	23.40	52.66	21.81
Fitted wardrobes/cupboard	176	484	180	5.56	26.11	50.00	18.33
Replace bath water heater	133	356	133	6.77	31.58	41.35	20.30
Work to paving	167	444	165	7.27	34.55	44.24	13.94
Cutting of grass	191	3,975	198	9.60	64.14	11.11	15.15
Cleaning of drainage	226	6,522	226	8.85	59.73	13.71	17.70
Completely rewire dwelling	161	566	154	7.79	13.64	58.44	20.13
Renew pitched roof covering	156	348	149	4.03	7.38	80.54	8.05
Replace internal door	192	443	189	5.29	13.76	59.26	21.69
Replace kitchen cupboard/ worktops	182	385	178	5.62	20.79	49.43	24.16
Plaster/replaster ceiling	154	385	178	5.62	20.79	49.43	24.16
Replace/refix roof slate	165	372	163	4.91	12.27	66.87	15.95
External wiring circuit	196	387	184	4.35	16.30	61.41	17.93
Replace external door	194	434	188	7.44	11.17	59.04	22.34
Install security alarm	126	249	135	2.96	31.11	48.15	17.78
Replace all bathroom amenities	177	474	176	2.27	25.57	52.84	19.32
Repaint external wall	165	412	160	9.38	13.75	63.13	13.75
Fit shelving	155	345	151	13.91	27.15	38.41	20.53
Replace some electrical sockets	252	1,218	240	5.00	45.83	34.58	14.58
Install security lighting	194	655	189	6.88	38.62	39.68	14.81
Replace/repair bathroom fittings	214	801	215	6.98	28.37	42.79	21.86
Improve door security/ locks	227	673	220	8.64	34.55	40.00	16.82
Replace a bathroom amenity	203	666	196	6.12	31.63	41.84	20.41
Unblock drains	226	2,611	221	9.05	50.23	24.89	15.84
Replace cover to leak roof	165	575	162	4.94	17.28	59.88	17.90
Patch over to leak roof	149	403	145	3.45	15.17	59.31	22.00
Install additional bathroom amenities	181	469	181	3.87	29.28	48.09	18.70
Extend water supply pipe work	162	385	165	5.45	17.58	62.42	14.80
Repair cracks in wall plaster	192	506	186	3.76	20.43	51.61	24.48
Repair garage/out building	141	514	132	7.58	16.67	52.27	23.48

Note: N is the total respondents out of the total of 300 in both cases.

The percentage total of the outsourcing options is based on the total of respondents (N) that selected an option.

In addition, the study sought to show the level of the use of other outsourcing maintenance options to do-it-yourself (DIY) maintenance from the number of maintenance jobs executed either minor or major maintenance works within the year 1999-2010. According to table 3, internal space re-arrangement (62.4%), cutting of grass (64.1%), cleaning of drainage (59.7%), replace faulty electrical sockets (45.8%), and clearing of block drains (50.23%) have more number of times of executions. Respondents used do-it-yourself (DIY) maintenance option instead of outsourcing to a contractor to execute the activities. However, maintenance work carried out on the others elements, components and facilities were executed according to the respondents mostly by engaging a contractor or by the used of mixed arrangement. The use of unpaid help option is low compared to others options.

DISCUSSION OF FINDINGS

According to Davidson and Leather (2000) that large amount of contractor executed double glazing work which owners commissioned, is in support of the findings from table 3, installation of double glazed windows (67.32%) was majorly executed by contractors. 43% of major jobs involves kitchen units and worktops used DIY, with even higher levels of wardrodes or cupboards (52% DIY), and internal doors (52% DIY) as stated by Davidson and Leather (2000) which is in contrast to the study. Replacement of internal door (59.26%), fitting wardrodes/cupboard (50.0%), replacement of kitchen and cupboard/worktops (49.43%) were all carried out using contractors. Installation of security lighting had (39.68%) and (38.62%) for contractor's and DIY respectively.

Improving window locks/security was majorly executed by contractors (48.31%), with 30.43% DIY practice. In Davidson and Leather (2000), security works were commonly undertaken through DIY. Also stated, that major jobs of basic repair or maintenance involving specific skills, such as replacement of a central heating boiler (9% DIY), difficult or dangerous jobs such as recovering the roof (12% DIY) or repointing the chimney (8% DIY), were much more likely to be left to contractors. The study shows similar trend in home maintenance, where major jobs were executed by contractor instead of using DIY. Such as renewal of pitched roof covering (80.54% contractor), external painting (73.87% contractor), e.t.c. Minor jobs that can easily be handled were executed by DIY such as internal re- arrangement (62.44%), cutting of grass (64.14%), cleaning of drainage (59.73%), unblock drains (50.23%) and replacement of some electrical sockets (45.83%).

CONCLUSIONS

From the study, it is revealed that the level of practice of DIY maintenance approaches to housing is low compared to other outsourcing options. Minor jobs such as home cleaning and re - arrangement was the major work that DIY maintenance is used to execute. Which is low to the practice of the system as revealed in Davidson and Leather (2000) study in United Kingdom London. These can be cause by many factors that militate against the practice such as human, technological, economic and social factors in Nigeria. The general basis for the low practice of the system is technology and the level of awareness of DIY maintenance amongst the populace. The practice of the system can be encourage among the populace by public enlightenment, provsion of DIY products, kits and tools.

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USING THE FACTOR METHOD TO GET REALISTIC SERVICE LIVES OF APPLIED BUILDING COMPONENTS

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Obtaining information on reliable (standardised) service lives of building components and products is of great importance when completing environmental life cycle assessment (LCA) reviews, for life cycle costing (LCC) and for maintenance planning tasks. In the Netherlands a catalogue for the service life of building components exists since 1995. The catalogue covers all common building components and building services. ISO 15686 is the in development ISO standard dealing with service life planning. A research project funded by the Dutch Building Research Institute (SBR) was focused on re-evaluating the assigned service lives provided in the existing available service life catalogue and exploring the practical use of the factor method of ISO 15686 in the Netherlands. By means of the factor method reference service lives of building components can be modified into estimated service lives to take account of the specific project circumstances. The research methodology comprised a literature review and expert meetings. Although the experts raised objections to the use of the factor method, the method offers good opportunities to take the project or design specific situation of building products into account, not mathematically but analytically. Generic data about the service lives of building products can be tailored to specific project circumstances by describing the factors, the underlying criteria and the reference in use-conditions.

Keywords: life cycle assessment, life cycle costing, maintenance management, service life

INTRODUCTION

Obtaining information on reliable (standardised) service lives of building components and products is of great importance for, amongst others, building owners, designers and consultants when completing environmental life cycle assessment (LCA) reviews, for life cycle costing (LCC) or whole life costing (WCC), and for maintenance management. Other reasons to obtain reliable service life data are the development of national and international standards and legislation (e.g. the Construction Products Directive of the EU and Environmental Product Declarations), (new) national building codes, building defects insurance and the use of procurement routes like PPP and PFI.

For maintenance planning purposes one has to know the service lives of the building components. If replacements cycles are known, the financial forecast can be made. This financial forecast for maintenance is of great importance for service life planning and life-cycle costing of new buildings and (renovated) existing buildings.

Life cycle costs are the costs of an asset or its parts throughout the life cycle, while fulfilling the performance requirements (ISO 2008 (15686-5: 2008)). Generally these are the cost for construction (including design and engineering), operation (including energy), maintenance and end-of-life (disposal and demolition). Life-cycle costing and whole-life costing methodologies are increasingly being used to compare new design and redesign alternatives. In refurbishment irreversible decisions with major consequences for the costs in the use phase, for example cleaning, maintenance and energy, are made too. In new procurement routes performance requirements instead of descriptive specifications are being used and operating and maintenance risks of built assets are transferred from clients to contractors. Working with performance requirements necessitates the provision of reliable information about alternative building products, including technical specifications with indications of service life and performance over time (Trinius and Sjöström 2005). Reliable data about service lives of building component may reduce the calculated risk by the contractors.

Life cycle assessment (LCA) can be used to quantify the contribution of building activities to environmental effects (ISO 1997). LCA should concern the entire life cycle of the assessed product (ISO 2004). In an LCA study, the effects that the production, use and disposal of products have on the environment are calculated. In construction the environmental effects are determined by first making an inventory of the flow of all substances to and from the environment over a building's complete life-cycle (e.g. Blom et al. 2010). Each substance's potential contribution to pre-defined environmental effects is calculated. In order to do this, for each

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environmental effect, the impact of a particular of substance flow is compared with that of a reference substance, a process that is referred to as the 'impact assessment'. The quantified effects are usually abiotic depletion, global warming, ozone layer depletion, photochemical oxidation, human toxicity, fresh water aquatic eco toxicity, terrestrial eco toxicity, acidification and eutrophication. The complete set of environmental effects is known as the 'environmental profile'. Klunder and Van Nunen (2003) provide some solutions for including the factor time, including technical service lives of building products, in building LCAs, e.g. by sensitivity analysis.

The lack of reference service lives of building components and products led the Dutch Building Research Institute (SBR) in the 90s of the last century to the publication of a service life catalogue of often applied building products (Huffmeijer et al. 1998). This catalogue gives reference service lives of roughly 600 building products. Data was gathered from various sources and judged by experts. Only service lives were include on which consensus was reached by these experts. One average technical service live of general building products is given. Specific attention is given to needed interim maintenance. An update of the data was considered since.

To make the life-cycle cost calculations and the outcomes of LCA-studies more robust and to estimate the risk of shorter and longer lifespans of the building components a research project was set up to answer the following research questions: (1) What are reliable service life data of current used building products, and (2) How can generic data about the service lives of building products be tailored to specific project circumstances using the 'factor method' described in the ISO 15686-series Buildings and constructed assets – Service-life planning – (ISO 2000).

RESEARCH METHODOLOGY

The research methodology comprised a literature review and expert meetings. The literature review comprised the international literature about service life prediction, service life data and the factor method. The experts were appointed by a research steering group, constituted by the Dutch Building Research Institute, the Ministry of Internal Affairs, the Government Buildings Agency, The Ministry of Defence Support Command Real Estate, and scientists. The eight experts are working at universities, consultancy firms and large property owners. They cover all disciplines of real estate and building products and materials (timber, roofing, masonry, building services) and are well respected in their discipline.

In the first place service life data of building products collected by standardized verifiable procedures in different countries and the use and criticism of the factor method was analysed, based upon a literature review and contacting scientists in Canada, Finland, France, Germany, Italy, Portugal and the UK. In the second place ways to use the ISO 15686 methodology were explored during expert meetings. The experts were also asked to judge the (reference) service lives of the building components expressed in the existing catalogue of 1998.

Finally the service life data of building products will be part of the National Environmental database that is being established to standardise the data for environmental life-cycle assessments used in environmental assessment tools (e.g. BREEM-NL). All data to be stored in the National environmental database, including service lives of building components will be judged by experts of industry organisations for building materials and products in 2011 and 2012.

LITERATURE REVIEW

REFERENCE AND ESTIMATED SERVICE LIFE

Generally three forms of service lives of built assets are distinguished: functional, technological and economic. The technical service life is the only service life that is tied to a building product or component. A functional or economic service life is defined by other influences, for example the society (the demand for a product), or the price of fuel (Van Nunen 2010). Therefore if the reference service live of a building product or building component is mentioned, it is the technical service life. The ISO standard 15686 defines the reference service life (RSL) as the service life that a building or parts of a building would expect (or is predicted to have) in a certain set (reference set) of in-use conditions (ISO 2000). In addition is the estimated service life (ESL) the service life that a building or parts of a building would be expected to have in a set of specific in-use conditions, calculated by adjusting the reference in-use conditions in terms of materials, design, environment, use and maintenance.

Environmental product declarations

Reference service lives are often provided by the manufacturers of building components. In the near future they are obliged to provide these data to be used in Environmental Product Declarations (EPD) (CEN 2010). Here a relationship is made with the ISO 15686-series: "RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with specific rules of European product standards and shall take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on deriving RSL, such guidance shall have priority." (CEN 2010).

SERVICE LIFE PREDICTION

Service life predictions can be based on evidence from previous use, on comparisons with the known service life of similar components, on tests of degradation in specific conditions or on a combination of these (ISO 2001). "Ideally a prediction will be given in terms of the service life as a function of the in-use condition".

Analytical and probabilistic (stochastic) methods for service life prediction assume that all factors in quantitative terms are known and that the relationships between the influencing factors or processes can be described in mathematical models. Fundamental and empirical research that make use of standard test models is needed to develop these models (see e.g. Daniotti and Re Cecconi 2010; Shohet and Paciuk 2004). Several EU-funded international research projects were conducted on durability, service life models and service life prediction of building materials and components, e.g. LIFETIME (Bamfort 2005) and EUROLIFEFORM (Kirkham et al. 2004). ISO 15686:2 (ISO 2001) gives a systematic methodology for service life prediction. Daniotti and Re Cecconi (2010) give an overview of the current test methods (best practises) for service life prediction for several building components.

SERVICE LIFE DATA OF BUILDING PRODUCTS

CRITERIA FOR DATA SELECTION

The Dutch Building Research Institute service life wanted to re-evaluate the existing reference service lives and collect reliable reference service life data of current used building products, preferable using data sources that meet the ISO 15686 standard. The ISO standard gives the following criteria to the data records (ISO 2008):

- general information;
- scope (including purpose);
- material /component;
- methodology;
- reference in-use conditions;
- degradation agents;
- critical properties and performance requirements;
- reference service life;
- data quality;
- reliability of data;
- additional information considered;
- references.

For reliable data at least the methodology, the reference in-use conditions and the critical properties should be clear. The ISO standard also gives the rules for validation of data sources that are not fully in accordance with the standard. In brief, depending on the quality of the data source, a laborious process with more extensive research and validation by experts has to take place.

AVAILABLE DATABASES

Although the wide field of applications systematic international data records of reference service lives of building components hardly exist or not made public. The availability of RSL data of building products that already meet the ISO standard criteria is very limited. The research centre CSTB of France and the Research Group on Durability of Building Components of the Polytechnic of Milano is establishing a French-Italian database for reference service lives of building components, based upon the ISO standard (Daniotti et al. 2010).

The data records that exist vary, e.g. some take the used materials as a reference and others the compounded building products, some describe the reference in-use conditions, others do not. A complicating factor is that the in-use conditions and critical properties in one country or region valuated as being 'normal' or 'average', might for a another country being not be normal or average at all. In

Germany some databases exist, but without any information about the reference-in-use conditions and the properties (e.g. IEMB 2009). In the UK some service life databases are especially meant for contractual liabilities and insurance purposes, e.g. the HAPM Component Service Life (HAPM Publications 2003) and the Building services component manual (Building Performances Group Limited 2001). The UK Life Expectancy of Building Components; Surveyors' experiences of buildings in use (BCIS 2006) meets some of the ISO criteria but not all. To establish this database a list of generic building components (over 300), used in normal conditions was presented in a questionnaire to surveyors who are experienced in inspections of existing property. The results are based upon 92 respondents. They were asked for the average or typical life span, and the minimum and maximum life span of building products. They were not asked for statements about the causes for a shorter or longer life, but only the life expectancy. Assumptions that the examiners had to take into account were:

- The components are installed according to instructions of the supplier or best practices (this is partially verifiable in practice, if visible).
- The components meet the requirements of installation and use.
- The components are subject to average exposure.
- The components are maintained according to instructions of the supplier or as directed by trained personnel.

Although the methodology of this UK database looks very sound, a number of problematic issues related to expert judgements remain; like the unknown experience of the surveyors with the building products and for instance their geographical location. Unfortunately the database lacks clear statements for interim maintenance.

NEW SERVICE LIFE CATALOGUE

The lack of robust international data sources forced the SBR to take the existing Dutch service life catalogue as the starting point for the new one and to ask the experts to judge the service lives and to add new building components and their service lives.

The forthcoming publication will provide service life data of 600 generic building products. The reference service lives are an average based on given assumptions. In practice, the service life of the building products will be around this average with a certain distribution. Recorded service life data concerns substructure and frame, external walls, upper floors and floor finishes, roofs and roof finishes and window and external doors. Paints are not included as separate products. Paintwork is seen as an maintenance activity necessary to maintain the service life of substrates. Compared to the existing catalogue internal components, fittings, sanitary appliances and building services were left out.

PRACTICAL APPLICATION OF THE FACTOR METHOD

FACTOR METHOD

The factor method modifies reference service lives by factors to take account of the specific in-use conditions. The ISO 15686 says: "The factor method does not provide an assurance of a service life: it merely gives an empirical estimate based on what information is available. It is different from a fully developed prediction of service life."(...) "Certain parties involved in building projects may be concerned about liability for forecasting future performance. For the avoidance of doubt, the recommendations of this part of ISO 15686 are not intended to implement contractual liabilities and the expectation is that "best efforts" will be applied, but that forecasts cannot be expected to always be either accurate or precise" (ISO 2000).

The seven factors are:

1. A Quality of components;
2. B Design level;
3. C Work execution level;
4. D Indoor environment;
5. E Outdoor environment;
6. F In-use conditions;
7. G Maintenance level.

The factor method offers the possibility to make a correction of the reference service life using the factors and criteria. Each factor has the default value 1.0. An effect that leads to life extension results in a value greater than 1.0, lifetime shortening gives a value lower than 1.0. Factor values less than 0.8 or greater than 1.2 imply that the chosen reference service life (RSL) is not suitable and should not be used (ISO 2000). The factor values are determined by the underlying criteria. For each factor several possible criteria exist. The factors are multiplied giving the estimated service life (ESL). In a formula: $ESL = RSL * A * B * C * D * E * F * G$.

The obtained ESL is focused on a specific situation. This allows for a building to indicate specific influences. Two identical products, applied at different locations or otherwise used, will also get a different lifespan. The key is to know the situational factors (which does not involve incidents) and value them. If the situation is similar to the described principles of the RSL, the value is 1.0 and the reference service life (RSL) and the estimated life (ESL) are equal.

OBJECTIONS TO THE USE OF THE FACTOR METHOD

The factor method would be a realistic and practical method to obtain estimated service lives of building components in use. However, since the standard exists scientists and experts around the world express objections to the use it and made suggestions to enhance the method (e.g. Bahr and Lennerts 2010; Re Cecconi and Iacono 2005; Nireki et al. 2002). Bahr and Lennerts (2010) argue that the ISO 15686 does not give any information on reference service lives or the values of the factors. The proposed adapted German model does give statements with regards to the application of reference service life parameters. They suggest also to differentiate between primary and secondary influencing factors. The values of the influencing factors are, opposed to the ISO, restricted in their model, enhancing transparency and significance. To minimize the subjectivity of the factor method. Re Cecconi and Iacono (2005) evaluated factor A of the factor method: quality of components. They introduce ‘evaluation grids’ to establish the value of each sub-factor. The forthcoming French-Italian database will content grids, that will drive users in choosing the right values of each (sub-)factor according to the context conditions in which building components are placed (Daniotti and Lupica Spagnolo 2008; Daniotti et al. 2010).

The Dutch experts expressed also great doubts about applying the factor method according to the ISO standard. The acknowledge that the availability of reliable RSL data precedes knowing the bandwidth of the ESL. To know the RSL of building products more (longitudinal) research has to be executed. Their objections are:

- the RSL of each building product has a certain unknown bandwidth;
- the question is whether the factors can be expressed in numbers. The attention points can be mentioned, but they are difficult or impossible to quantify;
- the question is whether the factors themselves can and should be multiplied. The factors may be interdependent;
- questioned is the use of the method and described factors for building services.

The SBR decided to make a practical application of the factor method that meets the concerns expressed and that makes a connection to international research into service lives of building products possible in the future.

GUIDELINE FOR FACTORS AND CRITERIA

The existing factors are classified into properties and inherent performance level, in-use conditions and stages. The described reference situation, refers to the average conditions and common construction practice in the Netherlands. Deviations from the reference situation will result in a longer or shorter estimated service life of the building product. Figure 1 shows how the estimated service live of a building component could be deduced from the reference service live.

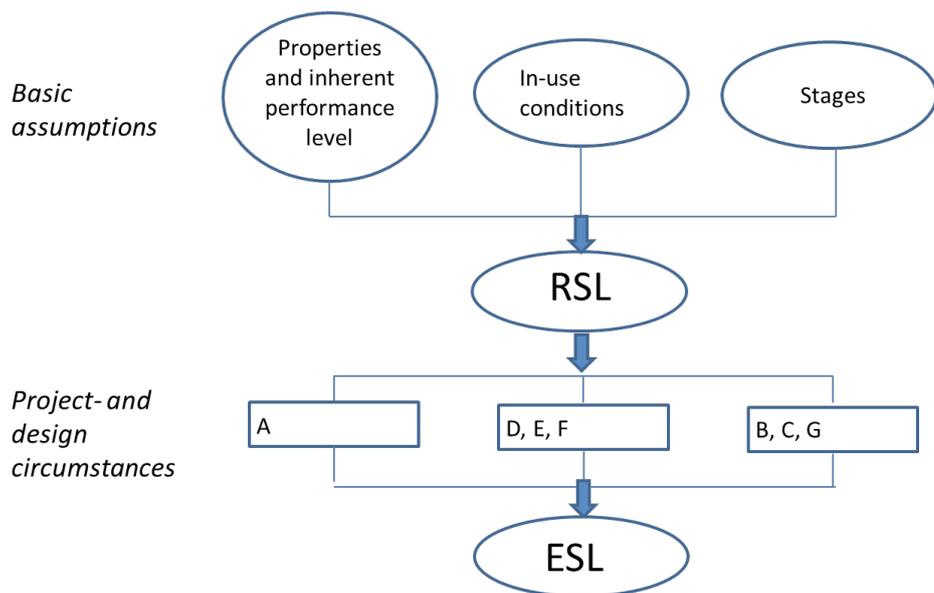


Figure 1: From RSL to ESL

The properties and inherent performance level of the building product determines whether the required or desired performance can be achieved. The reference service lives of specific building products are based on the properties and inherent performance level of these specific building products. If another product alternative is being applied belonging to the same group of building products without notice of the reference service life of this alternative, one has to judge the properties and the inherent performance level compared to the known one. One has to think about the resistance to deformation, durability, stability and sensitivity for aesthetical, mechanical, biological agents and degradation, and sensitivity for incorrect use.

Indoor climate

The life of building products used indoors are subject to the conditions of the indoor climate. See Table 1. The average Dutch indoor environment is the basic assumption: a relative humidity between 30-70%, with no external sources of moisture present. The indoor humidity can not only be displayed in a percentage, it also has to do with time of wetness and variations therein. The reference is that temperature ranges between 15 and 25° C and that the temperature fluctuations are limited. In the reference situation there are no contaminants in the air. The air velocity is within 'acceptable limits'. Assumed is ample opportunity to ventilate, so no favourable environment for biological agents is formed and fungi will not occur.

Table 1: Factors and criteria indoor climate

Criteria	Specification
Humidity	Extent, variations, condensation, rising damp, cold bridges
Temperature	Air temperature, variations
(Chemical) substances	E.g. CO ₂ , carbon, chlorine
Air flows	In relation to pollution
Biological agents	Presence and preventing agents
Light	In relation to discoloration and aging

Outdoor climate

The life of building products used outdoors are subject to the conditions of the outdoor climate (Table 2). The soil can affect the life of certain components (foundation, walls). Basic assumptions are that no (extreme) variations in the soil occurs and the absence of external stresses. If extremes in humidity and temperature occur, may this negatively affect the life of the product. E.g. frequent variations in temperature can (by swelling and shrinkage) may reduce the service life. Shelter of the project by for instance trees, can prevent for extreme temperature changes.

Table 2: Factors and criteria outdoor climate

Criteria	Specification
Humidity	Duration, variations, associated with the building orientation
Temperature	Air temperature, variations, shelter
(Chemical) substances	E.g. CO ₂ , soot
Biological agents	Presence and preventing agents
Soil	Variations
External load	Vibrations from nearby (rail) roads, factories etc.
Light	In relation to discoloration and ageing

Building function and use

The building function and use may shorten or extend the service life of the building products (Table 3). The reference is that a building product is applied according to the requirement of the manufacturer or supplier. This means for instance that building products for applications in public buildings have such properties, expected that the building products will be used very frequently. Application of this product in housing means a longer life. Also frequent variations in load can, if the building product as required by manufacturer or supplier is not explicitly taken this into account, negative effect the longevity. The basic principle is that loads are more or less continuous and practically no overload occurs. The reference is based on proper use and no vandalism.

Table 3: Factors and criteria building function and use

Criteria	Specification
Intensity	Building function, private / public, commercial / residential
Loads	Variations, overload
Type of use	Incorrect, vandalism

Design

Building products are selected during the design stage (Table 4). Determined is how products are exposed during their lifetime. The positioning of the building component may be positive or negative. The reference is a 'normal' position for the product. A frame, for instance, is always part of a wall exposed to the elements. If the frame is strongly affixed inward (e.g. an indoor balcony), the estimated service life will be longer. Specific details and the presence of many connections with other components, can be negative for the life of the product. The reference assumes that the construction product is accessible for the necessary maintenance. Another assumption is that the materials used in the selected building product are compatible with the materials adjacent to the building product. Think of galvanic corrosion of metals.

Table 4: Factors and criteria design

Criteria	Specification
Positioning	Exposure, shielding from weather, drainage, orientation, height
Detailing	Connections
Provisions for maintenance	Accessibility, space to work
Material compatibility	Suitability of the (combination) of materials
Dimensioning	Construction, subdivision, excess

Execution

The production of the building can affect the life of the building product. See Table 5. The reference is production on site. Production methods such as prefabrication meaning production under controlled conditions, may increase the life of building products. To ensure that implementation occurs as previously thought, the execution takes place according to rules (processes, procedures and instruments). These rules do not guarantee, but encourage to ensure quality. In particular for the management and maintenance stage it is important to record any changes to the design and used materials and products. The reference is that the registration is made. Another reference is a limited exposure to the elements before installation. The products are delivered 'just-in-time' or being stored protectively.

Table 5: Factors and criteria execution

Criteria	Specification
Production	Prefab, in situ, working conditions, method of execution and exposing during execution
Discipline regarding execution rules and skills	Quality systems, supervision performance, competences, expertise and experience staff
Tracking changes	Registration for maintenance
Transport and storage on site	

Maintenance and management

Maintenance can be of great influence for the service life (Table 6). Reference is a well maintained building. This involves planned preventative maintenance, such as lubricating moving parts, cleaning and paintwork, and planned interim replacements of building parts with a shorter lifetime than the entire building product. Assumed is proper preventive maintenance and corrective maintenance, carried out according to maintenance instructions. The reference is that spare parts remain available.

Table 6: Factors and criteria maintenance and management

Criteria	Specification
Maintenance planning	Implementation of preventive maintenance on schedule
Discipline regarding maintenance rules and skills	Quality system maintenance contractor, supervision performance, quality of materials, competences, expertise and experience maintenance staff
Tracking changes	Registration for maintenance
Availability of spare parts	

CONCLUSIONS

There is a lack of reliable reference service life data of building products, needed for environmental and economic reasons: for reliable environmental life-cycle assessments and life-cycle cost calculations. All available international service life databases are not in accordance with criteria for reliable data, set down in the ISO 15686-series. In the Netherlands a review of the existing service life catalogue was made by expert judgements. In the near future, a data format according to ISO 15686-8 should be used by suppliers of building products to declare the service lives of their products and the reference in-use conditions and critical properties. This data could be combined with data by property owners and managers, consultants and surveyors, etc. in accordance with ISO 15686-7. Especially the Dutch Governmental Buildings Agency will do further research to the service lives of building services. By means of the standardised factor method reference service lives of building products can be modified to take account of the project and design circumstances. Experts have raised objections to the use of the factor method for deriving mathematically a bandwidth of estimated service lives of a building product from the reference service life of the product. However, the factor method described in the ISO 15686 series offers good opportunities to take the project or design specific situation of building products into account, not mathematically but analytically. Generic data about the service lives of building products can be tailored to specific project circumstances by describing the factors and underlying criteria, and the reference in-use conditions.

European research communities should co-operate to develop an international service life database of building components and to address the factors and underlying criteria for service life estimation. The factors and criteria have to be placed in each national context.

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MAINTENANCE OF UNIVERSITY FACILITIES IN DEVELOPING COUNTRIES

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Universities in developing countries are deteriorating physically due to among other things lack of planned maintenance, lack of maintenance policies in the institutions, lack of up-to-date security system, and also lack of qualified personnel at decision making level. Lack of planning leads to reactive maintenance. It also leads to unbudgeted expenditure and has an impact on the amount of money allocated to maintenance which results in unavailability of funds in most cases to carry out maintenance duties. Institutions which have no maintenance policy lack guidelines to follow when a maintenance problem arises. Most personnel in charge of maintenance are junior management or at supervisory level as a result they are not part of middle management that strategically directs the organisation. Most of the decisions made at supervisory scale are easily overruled at management level where the maintenance manager is not present during meetings to motivate maintenance cases. Lack of up to date security also allows vandalism to rise which contributes to deterioration of facilities. The universities lack creativity and cost management skills to raise its own funds to supplement maintenance budget which is largely funded by the government. This study recommends employment of built environment professionals in decision making position. It also recommends that organizations should have a maintenance policy in place. Investment should also be made in good security of the facilities and management of the facilities should include income generating activities that could subsidise maintenance budget.

Keywords: developing countries, maintenance planning, security, maintenance policy

INTRODUCTION

The maintenance of university facilities is important for the wellbeing of users, i.e. students, lecturers, administration, clerical, technical and support staff; and, furthermore, it is indispensable for the promotion of productive activities and social development. The vast majority of people spend over 95% of their time in or next to a building of one kind or another; so in this sense the built environment has become our 'natural environment' (Wordsworth, 2001). The conditions of the surroundings in which we live and learn, are a reflection of the nation's wellbeing (Lee, 1987). Neglecting maintenance implies increased costs of operating facilities and a waste of related natural and financial resources (Jackson, 2003). According to Banful (2004), the financial consequences of neglecting maintenance are often not only to be seen in terms of reduced asset life and premature replacement, but also in increased operating costs and the waste of related natural and financial resources.

There can be little or no doubt that dilapidated and unhealthy buildings in a decaying environment depress the quality of life and contribute in some measure to antisocial behaviour (Wordsworth, 2001). Bastidas (1998) suggests that a school maintenance programme is an organizational activity that needs to be carried out by the school community, in order to prolong the life expectancy of school buildings, the furniture and equipment. Maintenance is a continuous operation to keep the school buildings, furniture, and equipment in the best form for normal everyday use, and to ensure the use of the school building as a shelter in case of an emergency caused by natural and hazardous events.

A school maintenance programme should be systematic and proactive - to prevent the need for any unnecessary repairs. It should have sufficient staff and an adequate budget for proper maintenance. According to findings by Buys (2004: 199), "Regular maintenance inspections" are perceived to be one of the most important criteria in maintenance management. By having regular inspections of the building and all its facilities to identify any defective work, maintenance work can be carried out before expensive corrective maintenance is required.

Most developing countries neglect maintenance and have no policy at all to curb and deal with the deteriorating facilities. The University of Malawi, for instance, situated in developing Malawi is deteriorating physically due to, among other things, lack of maintenance. Management of the institution has mainly blamed the situation on lack of adequate funding from the government, which is the main financier.

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BEST PRACTICE

Buyss and Nkado (2006) suggested that an effective management system should include best practice of the following elements:

- Budgeting: A budget is made based on the financial requirements based on the maintenance plan.
- Communication: There should be clear lines of communication between decision makers and implementers and also users of facilities and the implementers in order for maintenance required to be reported and done.
- Computerised maintenance management system: There should be a computerised system that should be able to monitor progress, outstanding work and cost estimates.
- Craftsmen: well trained personnel should be employed.
- Design input: The maintenance manager should take part in the design of new buildings so that they can contribute to the design including provision of information on behaviour of materials based on history.
- Maintenance plan: The plan helps to list down requirements and prioritise.
- Maintenance policy: A policy helps give guidelines as to what action should be taken when a maintenance requirement arises.
- Top management: Top management should be aware of the importance of maintenance and the consequences of neglecting maintenance. It should make sound and timely decisions.

RESEARCH METHODOLOGY

The first sub-problem was to establish whether there are any maintenance management policies for university facilities in developing countries. The second sub-problem was to determine whether security in university facilities is adequate in eliminating vandalism, which contributes to the physical deterioration of facilities. The third sub-problem was to determine whether there are construction qualified personnel at university management level to take proper maintenance decisions. The fourth sub-problem was to identify ways of raising funds to supplement government's funding for maintenance.

This research has involved both qualitative and quantitative methods. Qualitative research seeks out the 'why', not the 'how' of its topic. It does this through the analysis of unstructured information – things like interview transcripts, emails, notes, feedback forms, photos and videos. It does not just rely on statistics or numbers; these are the domain of quantitative researchers (Ereaut, 2007). The qualitative approach is typically used to answer questions about the mature phenomena - with the purpose of describing and understanding the phenomena from the participants' point of view (Leedy, 1997). In this research 'why' there is no proper maintenance of university facilities is answered.

Qualitative research is also used to gain insight into people's attitudes, behaviours, value systems, concerns, motivations, aspirations, culture and lifestyles. It is used to inform business decisions, policy formulation, communication and research. Focus groups, in-depth interviews, content analysis and semiotics are some of the many formal approaches that are used, but qualitative research also involves the analysis of any unstructured material, including: Customer feedback forms, reports or media clips (Ereaut, 2007).

Quantitative research, on the other hand, is concerned with measuring how people feel, think or act. It provides 'hard' robust, statistical and numerical data that can be defended or challenged and is more than just an opinion. A large sample is recommended and the key is that all the respondents are asked the same series of questions, regardless of the sample size. Quantitative research employs highly structured procedures throughout the research process. Data are collected using sampling techniques and structured questionnaires, incorporating a fixed set and order of questions with a closed list of responses, although a limited number of open-ended answers may be allowed (Ereaut, 2007).

Methodology is merely an operational framework within which data are placed, so that their meaning may become clearer. In practice, many methodologies resolve into two major approaches for collecting and analysing data: the quantitative and qualitative methods (Leedy, 1997). This study used questionnaires constructed using the information gathered in the literature review and other similar papers regarding maintenance. The questionnaire was intended for the Registrars and Works Supervisors/Technical Services Managers of the university colleges concerned. Primary data is from observation or collection directly from first-hand experience (BusinessDictionary.com, 2010). The primary data were obtained from visits to the universities. This enabled the author to hand over the prepared questionnaires and also assess the physical state of the facilities.

The main purpose of the questionnaire was to get information regarding maintenance planning, sources of funding for maintenance,

the design of new buildings by management, security of the facilities, common items that require maintenance, the qualifications of those involved in maintenance and the positions they occupy in the administration hierarchy. Secondary data refers to material which is not originated by the investigator but obtained from records, or when primary data is utilised for any other purpose at some subsequent enquiry it is termed as secondary data. This type of data is generally from books, newspapers, magazines, bulletins, reports and journals (Singh, 2010). The secondary data used in this research were obtained from various sources, *inter alia*, journal and conference papers, articles, books, reports, theses, and the Internet. The questionnaire targeted those involved with the management of the university colleges of the University of Malawi, especially those directly involved in making maintenance decisions.

There are four universities in Malawi: the University of Malawi, the University of Mzuzu, the University of Livingstonia, and the Catholic University. The University of Malawi is the biggest and one of the oldest among the universities. It has five constituent colleges situated in the central and southern part of Malawi, which are managed autonomously, i.e. the Malawi Polytechnic, the Kamuzu College of Nursing, the Bunda College of Agriculture, the Chancellor College and the College of Medicine.

This means they have administration offices of their own and produce separate budgets, which are consolidated as the University of Malawi's budget. The five university college campuses were targeted. The registrar, deputies, the works supervisor and the finance officers of each college received questionnaires. These are the personnel involved both directly and indirectly in making all maintenance decisions.

The approach in this research was exploratory and judgement sampling was used. The objective of exploratory research is to gather preliminary information that will help define the problems and suggest hypotheses (Kotler, Adam and Armstrong, 2006). The goal is to learn what is going on. Judgement sampling is a common non-probability method. The researcher selects the sample based on his/her judgement. This is usually an extension of convenience sampling used in exploratory research. For example, a researcher may decide to draw the entire sample from one "representative" city, even though the population includes all cities. When using this method, the researcher must be confident that the chosen sample is truly representative of the entire population (StatPac, 2009). In this research the sample taken in the developing Malawi represents the developing countries.

The questionnaire was designed by initially doing informal random interviews with the people in the management of the university – in order to find out how they felt about the general management of maintenance problems in the university. It was perceived that policy issues might be one of the reasons why management were having difficulties in solving their maintenance problems. Therefore, a question on policy and maintenance planning was included.

Informal interviews were also conducted with random samples of students on different campuses of the University of Malawi constituent colleges - to find out how they felt about living in residences, learning in classrooms and all their surroundings in general; and also how their maintenance needs were being addressed in their halls of residence. Members of staff who live in staff houses were informally asked questions to establish how they felt about how management addresses the maintenance needs.

It was established that it takes a long time for management to respond to maintenance needs. As a result, a question of how management responds to maintenance requisitions was included. A visit to colleges also included a physical examination of the facilities to determine the state of the structures and observe items that needed maintenance and attention. It was also observed that most of the colleges were not fenced; and access to buildings was easy to do - without any security checks.

This facilitates thieves and vandals to come on campus and get out of the site without checks. Some of the items like mirrors in bathrooms were removed as a result of security flaws. This encouraged inclusion of the question on security in the questionnaire, as most of the vandalised buildings were clearly not being maintained.

QUESTIONNAIRE ADMINISTRATION

The questionnaires were delivered by hand, as well as being electronically sent to all would-be respondents. A follow up was done by telephone - to find out if the respondents had any problems in understanding the questions or in replying. Out of the twenty-two (22) questionnaires sent, seventeen (17) were responded to, representing a seventy-seven percent (77%) response rate.

It took sometime for the questionnaires to get responded to. One questionnaire from the Kamuzu College of Nursing was responded

electronically. The other four from Kamuzu College were collected in person after contacts through the telephone from both of the campuses in Lilongwe and Blantyre.

The four questionnaires from Bunda College of Agriculture in Lilongwe were collected from the campus after a date was set for collection three weeks from the date copies were delivered by hand. Three questionnaires were completed in person by asking the respondents and ticking the answers at the Polytechnic campus.

Three more which were left with the secretaries of the registrar and college finance officer were not responded to (registrar, deputy registrar (academic and finance officer did not reply). Out of the four questionnaires from the Chancellor College three were responded to and sent to Polytechnic campus by surface mail - the author was based at the Polytechnic campus.

All three questionnaires to the College of Medicine (COM) were replied to and collected from the central registry office at the COM campus in Blantyre, Malawi.

RESEARCH FINDINGS

On a scale of 1 (Strongly disagree) to 5 (Strongly agree), your organisation does the following:-

Table 1: Maintenance plan

1.00 PARAMETER	1	2	3	4	5	MEAN
1.01 Prepare annual maintenance plan	10	0	2	3	2	2.24
1.02 Daily inspection of the facilities	2	8	2	2	3	2.76
1.03 Receive yearly maintenance funding from government	0	2	2	0	13	4.41
1.04 Raise funds from other sources for maintenance	13	2	2	0	0	1.35
1.05 Receive donations for maintenance	10	2	0	3	0	1.73
1.06 Recover maintenance costs from users	15	0	0	0	0	1.00
1.07 The maintenance manager is involved in the design of new facilities	2	0	0	0	15	4.53
1.08 Put in place a sound maintenance policy to ensure that maintenance funds are available	11	2	0	0	2	1.67
1.09 Do maintenance according to priorities, e.g. emergency, routine	0	0	0	0	17	5.00
1.10 Put out tenders for and outsource maintenance work	0	0	4	9	4	4.00
1.11 Outsource only major maintenance work	0	0	0	0	17	5.00
1.12 Management determines minimum accepted standards of buildings	13	2	0	0	2	1.59
1.13 Maintenance manager makes ultimate decisions with regard to maintenance	2	12	0	0	3	2.41

The following are graphs derived from the above data in Table 1 on a scale of 1 (Strongly disagree) to 5 (Strongly agree) in the y-axis and percentages of the total sample in the x-axis, stating to what extent the university does the following (Note: the percentages of respondents have been rounded off).

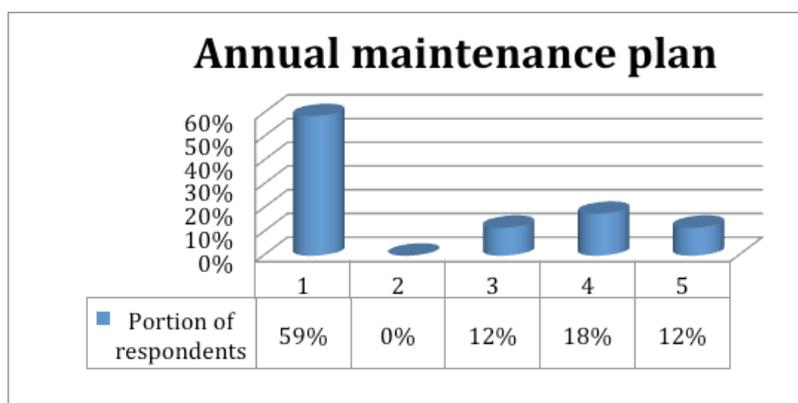


Figure 1: Annual maintenance plan

Fifty-nine percent of respondents 'strongly disagree' that there is any annual maintenance plan; 12% are 'neutral'; 18% 'agree', while 12% 'strongly agree' that there is a maintenance plan. The mean score of 2.24 shows that the majority of respondents 'disagree' that there is an annual maintenance plan. Therefore, maintenance planning are mostly done on an ad hoc basis, if at all. Maintaining facilities on an ad hoc basis can lead to funding problems, because the lack of forward planning leads to costs that are unpredictable and therefore incorrectly included in the budget. The lack of annual maintenance planning can lead to a lack of required skilled labour at the time of need.

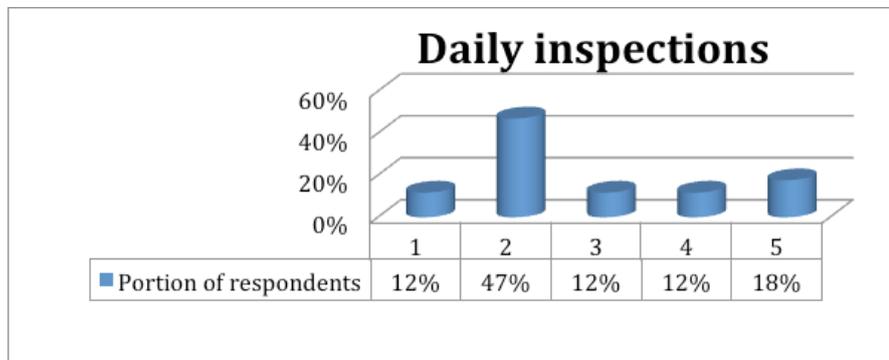


Figure 2: Daily Inspections

Twelve percent of the respondents 'strongly disagree' that there is daily inspections, while 47% 'disagree', 12% are 'neutral', 12% 'agree', and 18% 'strongly agree' that there are daily inspections. The mean score of 2.76 shows that the respondents are 'neutral' that the facilities are inspected on a daily basis. This shows that some colleges may be inspecting facilities, while others may not. There is some indication that more of the colleges do not have any daily inspections, as 47% 'disagree'. A visit to one of the University colleges discovered some toilets that had not been in use for over five years, due to the lack of any maintenance.

According to Buys (2004), the ranking of the criteria for best practice in maintenance management systems in order of importance, established that 'regular inspection cycles to identify maintenance work' was ranked first. On a scale of 1 (Minor contribution) to 5 (Major contribution), the following items contribute to the universities sources of funds for maintenance.

Table 2: Sources of funds

		MINOR CONTRIBUTION				MAJOR CONTRIBUTION	
2.00	SOURCES OF FUNDING	1	2	3	4	5	MEAN
2.01	Student fees	8	0	3	0	0	1.55
2.02	Government funding	0	0	0	2	15	4.88
2.03	Donations	4	3	0	0	3	2.50
2.04	Fund raising	10	0	0	0	0	1.00
2.05	Cost recovery from user charges	8	2	0	0	0	1.20

Table 3: Ranking sources of funds

3.00	SOURCES OF FUNDING	MEAN	FUNDING	RANKING
3.02	Government funding	4.88	Very large	1
3.03	Donations	2.50	Little	2
3.01	Student fees	1.55	Very little	3
3.05	Cost recovery from user charges	1.20	Very little	4
3.04	Fund raising	1.00	Very little	5

The following are results derived from the above data in Table 2 and 3 on a scale of 1 (Minor contribution) to 5 (Major contribution). It was assumed that funding for maintenance is obtained from all five sources and the least source of funding is regarded as contributing very little or no funding while the one with most votes among the sources would be assumed to contribute the majority of funds. For the purpose of interpretation, the following terminologies were used regarding mean scores for funding: 'Very little' (≥ 1.0 to ≤ 1.8); 'Little' (≥ 1.9 to ≤ 2.7); 'Average' (≥ 2.8 to ≤ 3.6); 'Large' (≥ 3.7 to ≤ 4.2); 'Very large' (≥ 4.3 to ≤ 5.0).

In this case, the data shows that Government funding, with a mean score of 4.88, is the major source of funding for the maintenance of buildings. Respondents indicate that 'little' funding comes from donations. Student fees, cost recovery from user charges and fund raising are minor contributors of funding as they contribute 'very little' funds. Most students' fees and tuition in the universities under study are subsidised by the government. Figure 3 was based on Table 1 expressing if maintenance manager makes maintenance decisions.

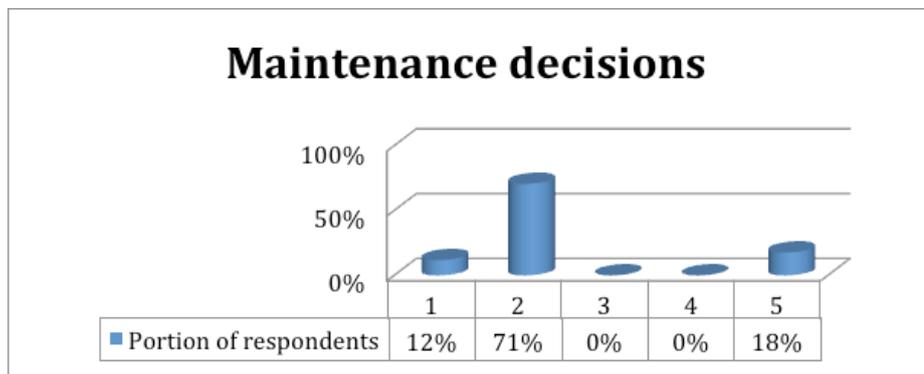


Figure 3: Maintenance decisions

Figure 3 indicates that 12% of the respondents 'strongly disagree', 71% 'disagree', while 18% 'strongly agree' that ultimate decisions for maintenance works are made by the maintenance manager. The mean score of 2.41 indicates that the respondents generally 'disagree' that ultimate decisions concerning maintenance are made by the maintenance manager. This simply shows how the position of maintenance manager or works supervisor lacks any real influence. It therefore shows that the maintenance manager does not make ultimate decisions concerning maintenance of facilities.

Table 4: Maintenance caused by vandalism

	0%	1-19%	20-39%	40-59%	60-79%	80-99%	100%	MEAN
6.00	1	2	3	4	5	6	7	
6.01	0	4	2	2	0	9	0	4.47

The following statements are derived from the above data in Table 4 for maintenance caused by vandalism on a scale of 1 (0%) to 7 (100%). This was done to find a percentage of maintenance caused by vandalism. For the purpose of interpretation, the following percentages were used regarding mean scores: '0 %' (1); 1 to 19% (≥ 1.0 to ≤ 2.0); '20-39%' (> 2.0 to ≤ 3); '40-59%' (> 3.0 to ≤ 4.0); '60-79%' (> 4.0 to ≤ 5.0); '80-99%' (> 5.0 to ≤ 6) and 100% (> 6 to 7).

Table 4 shows that the respondents feel that between 60% to 79% of the maintenance work is caused by vandalism. Vandalism is mainly influenced by a lack of security, as vandals take advantage of deserted surroundings. It is evident that a security presence is questionable. This shows that security of university facilities in developing countries is not up to date and vandals find it easy to vandalise the property.

Table 5: Security

5.00	PARAMETER		1	2	3	4	5
5.01	General school grounds	10	0	0	0	7	2.65
5.02	Effective perimeter boundary wall	14	0	0	0	3	1.71
5.03	Number of entrances to campus are absolute minimum	14	0	0	0	3	1.71
5.04	Effective access control system operated by security personnel at the entrance gates	14	0	0	3	0	1.68
5.05	Effective lighting between boundary and buildings	12	2	0	0	3	1.82
5.06	Available tools, e.g. ladders around the building to enable intruders to gain access	2	15	0	0	0	1.88
5.07	Trees that offer concealment to intruders	8	2	0	2	5	2.65
5.08	Guards have unobstructed sight lines covering the building	4	0	0	8	5	3.59
5.09	Minimum of entrances (access points) to the building	2	3	5	0	7	3.41
5.10	Doors and windows with adequate construction and strength	4	0	0	5	8	3.76
5.11	Secure locks to windows and doors	0	3	3	2	9	4:00
5.12	Effective intruders detection alarm system	2	13	0	0	2	2.24
5.13	CCTV surveillance system monitored by security personnel	4	13	0	0	0	1.76
5.14	Adequate security accommodation, e.g. surveillance and search rooms	4	7	3	3	0	2.29
5.15	Processes exist to limit any unnecessary movement of valuable items within the building	7	2	0	2	6	2.88

According to the respondents, there is no existence of ‘effective perimeter boundary wall’ that allows intruders to access college grounds at any time. This is backed by a mean score of 1.71, thereby indicating that the boundary wall does not exist. On the other hand, the ‘number of entrances are an absolute minimum’ had a mean score of 1.71, indicating that there are many entrances to the colleges, which makes the campus vulnerable to attack by vandals. ‘Effective access control system is operated by security personnel at the entrance gates’ had a mean score of 1.68, indicating that the entrance to the college is not operated by security checks. This also allows people with evil intentions to damage college property and enter without being checked. ‘Effective lighting between boundary and buildings had a mean score of 1.82, indicating that it does not really exist. This allows thieves to approach and leave the college in the dark without being noticed.

Available tools, like ladders around the building that can allow intruders to access the building, with a mean score of 1.88, are not available, so that the site is fairly secure. ‘Trees that offer concealment to intruders’, with a mean of 2.65, do not significantly exist, making it possible for passers-by to see attractive items on the campus grounds. The ‘Guards have unobstructed sight lines covering the building’ has a mean score 3.59, showing that guards exist and have a clear sight to each other making the buildings secure. It was, however, established during the visit, that the guards had no clear lines of sight and had no radios, which would make it difficult for them to communicate.

Practically, there is a minimum of entrances (access points)(doors used for entering) to the building with a mean score of 3.41. This means that there are few entrances to the buildings which make it is easier to control and monitor entrants. ‘Doors with adequate construction strength’ has a mean score of 3.76, which means there are strong doors that offer adequate security to the building. This makes it hard for a thief to easily break-in. ‘Secure windows and doors’ with a mean score of 4.00, indicates that secure doors and windows do heavily exist. The only problem is that when they are broken they are not replaced in a reasonable timeframe because lack annual maintenance plan (Graph 1), which makes it easier for intruders to occasionally access rooms.

There is no ‘CCTV surveillance system monitored by security personnel’ evident by a mean score of 1.76, which makes it hard to identify vandals or thieves. ‘Effective intruders’ detection alarm system’ has a mean score of 2.24, which means that the intrusion of people cannot be detected. ‘Adequate security accommodation, e.g. surveillance and search rooms’, with a mean of 2.29, means there is not adequate security accommodation to efficiently carry out duties. This can allow intruders to take advantage of the weather when guards hide in unsuitable areas on a rainy day. It also creates environments where intruders can go without being physically searched due to a lack of rooms.

‘Processes to limit unnecessary movement of valuable items within the building exists’ has a score of 2.88, which means there is some control of movement of items among rooms.

In order for security to be efficient all of the above requirements need to exist on any building facility. Failure in some of the requirements of security indicates a weakness in the whole security system.

Table 6: Qualifications

QUALIFICATION	MAJOR PROGRAMME	EXPERIENCE
Part 2 Cert. in QS & CT	None	10 Years
Construction Tech II	Construction Technology	22 years
Diploma in Construction	Construction	over 20 years
City and Guilds Part 2	Construction	12 years
City and Guilds part 2	Construction	15 years

All maintenance managers of the colleges interviewed maintained that maintenance managers have either a Diploma in Construction, or a City and Guilds of London Institute Certificate Part 2 in construction. Their position is called ‘Works Supervisor’. This is evidence that the college employs maintenance managers at a lower level of management. These people can therefore not make any decisions that are acceptable at top-management level. Even with experience if the position is lower there is high chance that senior members would not accept everything from juniors.

CONCLUSIONS

The results of the empirical study show universities in developing countries lack planning approaches to maintenance issues. For instance, like the University of Malawi, while they have maintenance procedures, they do not have any specific maintenance policy. It was confirmed that there are no regular inspections of the facilities to check maintenance needs. The colleges do not use the facilities to raise extra funds - other than government funding - for maintenance purposes.

Vandalism is the main reason for the need for maintenance, apart from reactive maintenance caused by deterioration of the facilities. The colleges have a Works Supervisor who is only at a supervisory grade and who runs maintenance projects. This is a junior position. As a result, management makes very important decisions - including maintenance without his vote.

The general maintenance needs include replacements of plumbing accessories, general electricity and tending to gardens. There is a general feeling among the Works Supervisors that they should be educated to a higher level in order to make and to be able to contribute to more informed decisions.

RECOMMENDATIONS

A maintenance department needs to be structured according to the size of the organisation. In universities, it is important to employ a maintenance manager who should sit in on management meetings. It is at management meetings where most decisions are made. Maintenance managers, while co-ordinating on all maintenance work, should also be able to plan strategically.

Maintenance managers should spend as much time planning works, as in getting involved in daily operational problems. This can only be done by empowering other members of the team to make decisions, and by encouraging problems to be addressed at the lower levels of the hierarchy. Making formal and regular meetings to discuss workloads and performance objectives is also useful. Weekly meetings could be ideal to discuss workloads and check the progress on a daily basis -- by visiting sites and inspecting facilities.

Investment in information technology is another way of making information processing easier. This is becoming a popular option, and there is an ever-increasing number of specialist maintenance management software packages appearing on the market. These packages offer a variety of different features, so that the maintenance manager has to choose a package that suits his organisational needs.

One of the methods of improving maintenance services is to become more proactive. This can be achieved through arranging meetings to discuss the services provided. This can be done every two months; and should involve the heads of each department.

These men would have been briefed on the meetings. Proactive behaviour could also include addressing emerging areas of significant activity, such as environmental management and business-continuity planning.

In universities, efforts are directed towards making the students' stay as pleasant as possible; therefore, maintenance managers should target people who can provide them with useful information, for instance, residence hall representatives or members of the students' representative council. Maintenance managers should also develop an audit system that seeks to improve services through feedback.

The university also needs to have a maintenance policy in place, which should be distributed to all heads of departments. This should include all necessary items that are required to enhance and further improve maintenance issues. Recovery of user costs can be planned by way of pricing the rooms of residence per academic year. Sports facilities can be named after advertisers that are able to pay an annual fee for naming, for example, naming a stadium or any building complexes after the sponsoring organisation.

The university can also open an exclusive club for alumni and company executives, where they can meet for lunch or during the evenings. The subscription money can be used for the maintenance of buildings and facilities as a whole. This club can offer services, including the sports facilities for members to use them privately, and also a restaurant and boardrooms. This could generate the much-needed money for maintenance, making them thereby self-sufficient.

Regular inspections should be made periodically, to take into account all necessary maintenance needs. This would help monitor the frequent maintenance needs, and also facilitate the preparation of an annual budget.

Investment in security would also minimise the costs caused by vandalism. Investment in more sophisticated and sustainable security equipment initially would enhance the protection of facilities and minimise future maintenance costs. Creating a maintenance management senior post in middle management would give the opportunity for a maintenance manager to attend heads' and deans' meetings -- thereby allowing them to give their views at a decision-making level. This would enable management to take maintenance tasks seriously, as they would be able to deliberate with a person from their own ranks, and one who is an individual with the relevant technical know-how. From an administration perspective, management could then be told where they are going wrong.

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SESSION 12

SUSTAINABILITY

CONTEXTUALISING THE EVALUATION OF THE SUSTAINABILITY OF LOW COST HOUSING

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This paper reports on a pilot investigation that sought to evaluate alternative housing technologies from a 'green' point of view. Interviews from a number of case studies indicated that there are various building technologies and sustainability is often an ambiguous concept fraught with difficulties in its definition and understanding. Findings from this initial study indicated a range of perspectives on what sustainability actually is and the need for a context-based approach to evaluation arose given the range of housing technologies and possible interventions available in the upgrade / improvement of dwellings. This seeks to answer the question, in any given situation what is the most sustainable response achievable? The findings challenge conventional views as to what is acceptable house construction technology and seeks to make a direct comparison from a sustainability point of view between concrete block housing and some alternative technologies. The conclusion hints that context based evaluation in terms of sustainability of various housing solutions offers scope for improvements in future housing policy and delivery.

Keywords: context based evaluation, sustainability, alternative technologies, low cost housing

INTRODUCTION

What is a sustainable dwelling for a poor low-income person living in South Africa today? Indeed, who is the judge of what is sustainable? This paper presents an argument that the developed western worldview on what constitutes a sustainable built environment and its favoured solutions is at odds with the reality many people face in the townships and low-income area of South Africa. Further, the paper proposes that what is required is to appreciate what may, or may not be appropriate and it is argued that context based evaluation is required due to the following factors:

- The range of building technologies in use.
- Possible options that exist for various construction / renovation activities.
- The various material resources available to undertake the works.

In the view of housing policy developments in South Africa (Department of Housing, 2005) and also developing climate change policies (Department of Environmental Affairs, 2010) it would be informative to evaluate housing delivery in South Africa with both these delivery drivers in mind. The National Department of Housing, through its provincial service providers, seeks to provide sustainable solutions to the growing housing need in South Africa (City of Cape Town, 2010) and strategies are developed for the provision of sustainable human settlements such as ISIDIMA in the Western Cape (Western Cape Department of Local Government and Housing, 2007). Despite these initiatives doubts remain about the efficacy of aspects of these strategies (Southern African Housing Foundation, 2011).

Many alternative low cost ecological housing technologies have been attempted throughout the country (Allen and Ellmann, 2010) including re-cycled building materials, sand bag structures, mud-brick, wattle and daub, straw bale and cob. The research also indicated that many different perspectives exist regarding the successes and / or failures in the sustainability of low cost housing. This paper argues for the need to contextualise the evaluation of sustainable development and alternative housing technologies that are often developed and implemented informally with "found" materials. Through extensive interviews, the problem of consensus amongst practitioners regarding the term sustainability resurfaced as identified in other studies (Hill and Bowen, 1997; Pearce, 2006; Du Plessis, 2007). This research is important as it provides a discourse into understanding sustainability and due to the difficulties that exist here surfaces the need for contextual evaluation of sustainable practices in South Africa.

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This understanding of sustainable development was based upon the realisation that the concept is based upon the “quality of life” from a human / societal perspective in relation to biophysical factors in the environment. Thus referring to the very complex and integral relationships of environment versus action, growth of humanity. “... the requirements of sustainable development, how they can, and should, be achieved differs between ‘developing’ and ‘developed’ sectors of society.” This forms the key conceptual idea behind the research presented in this paper.

SUSTAINABILITY OF LOW COST HOUSING SOLUTIONS

To begin to answer the question as to how environmentally sustainable current low cost housing solutions are, it is necessary to consider the model of environmental sustainability that has been implemented by the National Department of Housing. The Department of Housing reviewed “alternative” building methods for low cost housing (Department of Housing, 2003) and identified that lack of proper knowledge, cheap shortcuts, poor workmanship and quality control resulted into many sub-standard and defective housing units being delivered and also that some of the building systems available, like precast concrete panels, were cheap and often poorly implemented on site and others had compatibility problems once owners started renovating (for example, when an extension was added using concrete brick to an original structure of compressed earth brick). In a ministerial address in 2010 National Housing Minister Tokyo Sexwale mentioned that approximately 12 million South Africans were in need of better shelter and a maintenance backlog had developed due to poor construction practices.

Other research studies found poor construction standards, high maintenance bills and a serious amount of occupier / user dissatisfaction (Boaden et al, 2010). Indicators that the housing delivery process up to now has been unsatisfactory include the re-selling of RDP homes within the 5 year grace period under market value, and the subletting of dwellings and relocating back to old community (Boaden et al, 2010).

The majority of completed projects since 1994 were concrete block housing with limited facilities and infrastructure like the Symphony Village development in Delft were relatively simple conventional solutions were found and implemented. However to address ecological sustainability takes time. An attempt is made to review this in the case study evaluations which can be considered as a pilot to a potentially larger evaluation study.

Concrete block houses are quick to erect and it is easier for town / city planners to work with grid-like plot layouts as this makes infrastructure easy to design, construct and service. Ample space for roads is also provided due to access issues and fire regulations. There are a few problems with this approach however, for example:

- Localised sandstorms occur due to the removal of vegetation (albeit mostly alien vegetation).
- Benefactors are the engineers and construction companies because roads generate easy footprints (fool proof design) to charge fees on.
- Most inhabitants don't have cars therefore roads are redundant.
- Roads and grid like structure is designed in cul-de-sacs and this segregates the community and compromise the flow of pedestrians and cyclists.
- The houses are too far apart to form proper neighbourly relationships. With large plots it is open to more informal settlement in back settlement in back yards that increases the density sprawl.

(Horn, Ellmann and Freedman, 2010)

More recently the CSIR has began to take a serious look at ways to improve the efficacy and uptake of innovative technologies in South Africa (van Wyk, 2010) which bodes well for future housing delivery.

RESEARCH QUESTIONS

Given this background, the research challenge was to identify and evaluate ecologically sustainable technological solutions within the low cost housing sector as examples of alternatives to current mainstream building solutions. Specifically key questions were:

1. Do alternative housing technologies deliver more sustainable solutions than the typical RDP houses in South Africa?
2. With any particular housing development, what is the most sustainable response achievable?
3. How can the above be evaluated effectively?

METHODOLOGY

This research adopted a case study approach to the problem of evaluating the environmental sustainability of alternative low cost housing solutions. The rationale for this is that the case studies were selected for their diversity of material, difference in brief (all under the low cost housing umbrella) and ecologically sustainable design to provide a preliminary evaluation. Further case studies will be undertaken in subsequent studies. In total, 7 case studies were undertaken of schemes that have been built in the Western Cape including a cob house (straw and clay), typical concrete block RDP houses and also a sand bag structure. For reference purposes it is worth noting that the typical RDP house would be sized between 30 – 50 m², made from concrete block with a corrugated roof, have running water and access to electrical supply.

The various case studies are reviewed and compared against a hypothetical typical informal dwelling that provides a benchmark for evaluation purposes. The typical informal dwelling is built from sustainable materials that are either found or recycled, thus supporting ecologically sustainable practices. Given the lack of ecologically sustainable solutions implemented (Southern African Housing Foundation, 2011) in the low cost housing sector by the Department of Housing it is important to investigate and critically analyze dwellings built in the private capacity by new home owners and to examine the material choices and decisions that are made. This paper reports on 2 of these case studies and also the benchmark informal house to illustrate the problem of 'evaluating' sustainability.

THE EVALUATION FRAMEWORK

Having established that sustainability in the building industry can have various meanings depending upon whose perspective it is being considered from, it then becomes problematical to "evaluate sustainability". Evaluation is the process whereby the value, merit, worth or significance a something is reflected upon and the answers to these questions about "value" can only be fully comprehended by reference to their context (Wadsworth, 1997). The approach utilised in this research was an interpretive evaluation by the researcher (who was trained in architecture) utilising a five point likert scale that related to the evaluation framework.

The basis of the evaluation framework utilised in this study is the "Manifesto for Green Architecture" that was presented at South Africa's first conference of "Sustainability in the Built Environment" and provided a set of guidelines and principles for a greener approach to architecture (Horn 1998). The six broad principles for a greener approach to architecture outlined in the Manifesto are:

1. Socio-economic - Social, economic and cultural upliftment
2. Land - Respectful and in symbiosis with the local environment and its resources
3. Water - The protection, conservation, efficiency and reuse of water
4. Energy - The conservation, efficiency and renewable use of energy
5. Health - Non-polluting environments and healthy materials
6. Holism - Holistic and intrinsically recyclable

These principles were not used as loose criteria but rather in the context of the following ecological sustainable areas during the project delivery process; at the development stage (design, planning and conceptual phases); within the individual dwelling whilst under construction (construction phase); and, within the rest of the lifespan of the building (occupation phase).

CASE STUDY SUMMARIES

This section presents a summary of the case studies which are evaluated in this paper, namely the RDP house, cob house and the informal dwelling which is used as a benchmark for comparison purposes and has been described earlier in this paper.

CASE STUDY 1 - THE RDP CONCRETE HOUSE ADDITION (HOUSE MONICA - KHAYELITSHA)

THE PROJECT

Monica (home owner) shares her 60 m² house with her daughter who has 4 children and one grandchild. Her son and his family live in a shack built on the side of the house. The house is part of an RDP project in Site C, Khayelisha and was provided with an outside toilet, a living room / kitchen and two small rooms. When the family moved in, the house had no electricity, the walls were not plastered or painted, and there was no ceiling, internal doors, floor covering or plumbing. Prior to the alteration there was still no ceiling and the electrical conduits were missing.

Funding (R10 000) was received from St. Martin's Church in Vermont (US) to extend the dwelling and initially Monica's employer (Karen Suskin) wanted the structure to be the sandbag construction method due to the fact that this was more economical and seen as an option for an environmentally sustainable building method. Plans were drawn up with a timber frame structure, sandbag infill walls, glass bottle walls and a light weight planted roof. A concern of the role players was that the sandbag structure might seem to the family and neighbours as a 'glorified shack' and inhabitants would think it to be inferior. Little input was received from the family regarding the design due to the lack of knowledge and understanding of the building process. Yet, the son showed vigour, motivation and innovation when he started constructing some of the timber ladders for the main structure of the sandbag extension.

Unfortunately the project needed more funding and assistance for the extension as recycled materials needed to be collected, sorted, cleaned and a fast delivery and could not be provided as materials would be collected haphazardly by various donors. The timber ladders needed to be built, sandbags sewn and recycled glass bottles/timber off cuts/ corrugated roof sheets collected and stored. The project became an administrative nightmare and additional costs had to be absorbed voluntarily by various project participants including the designers, Monica's employers, the original funders and the occupants.

The sustainability of the project was compromised once the designers could not afford the financial strain any longer. Short cuts were taken to finish the alterations by a local builder who offered his services. A simple reliable concrete block addition was drawn up, measured and erected. The project took about 10 weeks to be built.

TECHNICAL BENEFITS OF CONCRETE BLOCK CONSTRUCTION

- It is fast method of building.
- It is an acceptable building form.
- This building method is known to most artisans / builders.
- Materials are cost effective and readily available in any local hardware shop.

CRITIQUE

"To do an alternative building project, have more people involved who know how to do it AND/OR commitment to learning together. Do not have all the knowledge in one person alone, especially if they're not good at managing or delegating. Give plenty of time; expect it to take a long time, long hours and big commitment. I'm satisfied that they got what they wanted: more space. I'm dissatisfied that we couldn't build the way we had intended. But, maybe what's most important - in terms of helping someone out - is to help them meet THEIR goals, rather than imposing ours (e.g. alternative building technique)" - Hannah Morris (Designer, friend and whose parents supplied the funding from church in Vermont, US).

CASE STUDY 2 - THE COB HOUSE (HOUSE LUCAS - MASIPHUMEMLELE)

THE PROJECT

Lucas Sobhuwa is the owner of the house and the main breadwinner; he shares his home with his wife and four children and grand children. Lucas is a temporary construction worker for the RDP housing department and Habitat for Humanity. The construction of a new house for Lucas and his family was driven by Adam Perry, a volunteer from Canada for the Habitat for Humanity in October 2005. Perry has his own green building practice in Canada (hobbit homes - www.hobbithomes.ca) and enjoys focussing his attention on the community of Masiphumelele and the Habitat builders there, as Habitat for Humanity focussed upon this area in Lucas' time as volunteer.

Perry decided to build a pilot project of a cob bench in the garden area to showcase the technology and construction method on Lucas' plot. This helped the sourcing of natural resources, local suppliers and local professionals interested in environmentally sustainable construction techniques. A 60m² house was designed according to the larger Habitat house model template that incorporated 6 rooms as an addition to the existing toilet/bathroom, allowing enough space for future extensions.

The plans were structurally approved by an engineer but it was decided as a collective that council submission will not be necessary and also non-beneficial if Lucas wishes to apply for a future housing subsidy. Lucas would need the NHBRC's approval for a housing subsidy and cob housing does not fall under the NHBRC's structural building regulations. Thus Adam went back to Canada and raised some funds to return in October 2006 to start working on Lucas' house.

BUILDING METHOD

"Cob" is a mixture of straw, clay and sand. Sand and clay are mixed in equal quantities adding straw and water until a dough-like workable consistency is reached. The cob is piled up by hand, creating the walls and once a height of about 500mm is completed, it is left to dry for the day. The following day the sides of the wall are trimmed and neatened with a saw, to continue the top is slightly wetted and scored. Once the roof is constructed the gable ends are filled in with more cob mixture.

TECHNICAL BENEFITS OF COB BUILDING

- Fast and light weight - suitable for all ages and body strength
- Easy to use- low technical knowledge needed as simple materials are used and easy to apply
- Healthy - natural materials can cause little or no physical discomfort.
- Zero emissions - not harmful to the natural environment- excess can be used in the garden i.e. straw as decaying organic matter (mulch) or the cob mix can be used in landscaping.
- Materials (clay, stone and sand) are easy to acquire
- Straw is an agricultural by product and thus recycled for the construction industry
- Thermally comfortable

CRITIQUE

Natural building materials allow a building to breathe, a membrane allowing moisture through. Only breathable plasters and paints are to be used on this construction. In this instance 2 x15mm coats lime plaster and Breathecoat paint was used. Inside the dwelling it is warm and comfortable, the texture on the walls is soft.

Due to the lack of finance a lot of finishes were resolved in ecological recyclable manners and not because it was intended to be ecologically responsible, for example the shower head was made out of a milk bottle, dishes are washed in a plastic bucket because the plumbing has not been installed and a basin and cupboard is missing. However, despite this, the family seem to enjoy the comfort of their home.

CASE STUDY EVALUATION

The interpretive comparative evaluation used the framework established by Horn (1998) and was based upon the following likert scale for each of the criteria:

- 0 out of 5 (0%) = Not environmentally responsible / criteria was not achieved
- 1 out of 5 (20%) = Limited environmental responsibility
- 2 out of 5 (40%) = Some environmentally responsible effort was initiated
- 3 out of 5 (60%) = A good amount of environmentally responsible effort was initiated
- 4 out of 5 (80%) = Implementation of environmentally responsible effort was successful
- 5 out of 5 (100%) = Perfection in harmonious environmental responsibility was achieved through innovative design, thinking and implementation. Multiple layers of criteria were achieved in implementation.

ECOLOGICALLY SUSTAINABLE PRINCIPLE	TYPICAL INFORMAL DWELLING	HOUSE MONICA	HOUSE LUCAS
Socio-Economic – social, economical and cultural upliftment	71.5 %	48.5 %	77.7 %
Land – Respectful and in symbiosis with the local environment and its resources	47.1 %	12.8 %	47.1 %
Water – The protection, conservation, efficiency and re-use of water	40 %	17.5 %	72.5 %
Energy – The conservation, efficiency and renewable use of energy	56.8 %	39.4 %	53.7 %
Health – Non-polluting environments and healthy materials	66.6 %	53.3 %	68.3 %
Holism – Holistic and intrinsically recyclable	65 %	40 %	72.5 %
TOTAL SCORE	57.7 %	35.3 %	65.3 %

Figure 2: Comparison between case studies - see appendix for detailed breakdown of scores (Allen and Ellmann, 2010)

It is interesting to note that House Monica and House Lucas found ecological solutions for elements of the completed dwellings due to a lack of funding by incorporating found / recycled material for example the use of a plastic bucket as a basin and a milk bottle with the bottom cut out as a shower head. The typical informal dwelling was used as a benchmark as the type of house in which millions of poor and low-income households in South Africa are forced to live in. Found material is used as a matter of survival and not as an ecologically responsible decision. Thus ecologically responsible decisions for sustainability can be achieved within the low cost income sector. Thought and care should be taken in application of elements in such a structure yet opportunities and options for building material is endless.

The scores presented above were tested at an internal research presentation at the University of Cape Town that found that the score given is purely based on a 'feeling' regardless of the fact that the opinion is based upon an experienced perception of the sustainability. It is also noted that the process of developing instruments to measure sustainability is a complex matter and will require a consensus of professionals across the entire building industry. Work has begin to develop these instruments by organisations such as the Green Building Council South Africa whose GreenStar SA seeks to give buildings a 'green' rating according to their predefined criteria (<http://www.gbcsa.org.za/home.>) Yet, the evaluation framework does not allow for innovative design principles to filter through. For example a higher rating is given to larger glazing areas on north facing facades yet if a building building's North façade is blocked by another tall building it makes no sense for the designer to maximise that aspect. Thus scoring will be compromised in the evaluation process and innovative methods to maximise natural daylight may not be listed under that particular evaluation framework. Thus focussing purely on a benchmark based evaluation framework proves to be problematic and projects need to be assessed in light of contextual specifics.

From previous literature and interviews it was found that many professionals and role players have different ideas as to what sustainability is and how it can best be implemented. A degree of this difference can be related to the level and the type of education. As mentioned before, the lack of a common understanding of sustainable measures and implementation is a difficulty. This is further complicated by the fact that many different courses of action are an option for each project. Variables that need to be considered include:

- Key role players
- Available resources/materials
- Available funding
- Community involvement and availability of certain skills
- Access to local sustainable resources / materials
- Acceptance of possible sustainable solution

As a result of this, to evaluate the sustainability of dwellings requires an appreciation of the above in any given development. It is premature to say that each natural building system will be ecologically sustainable and each project needs to be assessed individually.

CONCLUSION

Defining sustainability still presents difficulties and many perspectives exist due to knowledge, experience and individual realities of householders and communities. There are many examples where attempts have been made to incorporate sustainable building methods but further investigation is needed to establish how successful these have been on an individual basis but also comparatively in relation to other technologies. This research identified the need for both 'customised' housing solutions to be supported and also the need for evaluations that consider localised contextual factors and these individual realities.

An area for further research would be to explore the proposition that informal settlements are intrinsically ecologically sustainable; their spatial design and layout occurs in such a manner that it supports a sense of community due to the fact that they build the informal dwellings in a intuitive pattern in order to create smaller courtyards between homes. In addition use of local materials and re-use and recycling is a widely practiced in the design and construction of these dwellings.

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APPENDIX

This evaluation was made based upon the researcher's direct practical experience in the field and observations of the case study dwellings. Half points were awarded if environmental responsibility was intended or to award a percentage between two defined scores.

1. SOCIO-ECONOMIC Social, economic and cultural upliftment		Typical informal dwelling	Concrete Block (House Monica)	Cob House (House Lucas)
Principle	Criteria			
Consensual and consultative.	Being sensitive to local community needs and concerns. Involving affected peoples in the decision-making processes.	3.5	3	3
Preserving local history and culture	Respecting of local materials, skills and vernacular designs.	4	2.5	4
	Prioritize the conservation and preservation of old buildings as cultural beacons in the history of a place	2	3	3
Respecting and promoting of a sense of place	Imparting a sense of uniqueness and diversity that helps instil a sense of identity and community	4	4	4
Providing for mixed-use, pedestrian-friendly neighbourhood	Promoting a safer, more integrated multi-functional use of land.	4.5	4	4
Respecting the health of builders and occupant	By using only healthy, non-polluting processes and materials, improving productivity and higher property value	2.5	1	4
Supporting environmentally responsible suppliers and contractors	Promoting the use of socio-economic responsible products/ contractors etc	2	2	4.5
Minimize high running costs and respect user's finance	Design for efficiency of services. Insuring initial implemented decisions don't leave habitants with on-going financial burdens and additional service costs. i.e. , dependence on artificial lighting, high water and rate bills etc	5	2.5 Due to the initial intention extra ½ a point	4
Duty of care	Responsive in protecting of local and global planetary systems.	3	1.5 Due to the initial intention extra ½ a point	4
	Place community interests over and above any short-term, profit-Motivated developer interests.	4	2	4
Providing for local job opportunities	Labour-based processes are to be preferred over machine processes.	5	3	4
	Enhance the transfer of skills thereby providing for local self-reliance and the development of local human resources.	2	2.5 Due to the initial intention extra ½ a point	4.5
	Support locally manufactured products	5	1	3.5
TOTAL POINTS (65)		46.5	31.5	50.5

2. LAND Respectful and in symbiosis with the local environment and its resources		Typical informal dwelling	Concrete Block (House Monica)	Cob House (House Lucas)
Maintain and restore the Earth's diversity and ecological vitality	Avoid disturbance to ecologically sensitive areas	2.5	0	3.5
	Protecting existing natural vegetation	2	0	0
	Restoring degraded land.	2	0	3
	Protecting soils	2	0	2.5
	Protecting natural watercourses.	1	0	0
Maximize the beneficial use of locally available resources	Natural resources i.e. sun, water, vegetation, wind and landforms	2	2.5	3.5
	Locally available building materials	5	2	4
Total points(35)		16.5	4.5	16.5

3. WATER The protection, conservation, efficiency and re-use of water		Typical informal dwelling	Concrete Block (House Monica)	Cob House (House Lucas)
Protecting all water sources	Eliminating all polluting activities during construction as well as life span	1	1.5	3
Conserving the use of water sources	Reducing the need to use water	3	0.5	3.5
Water Efficiency by using less water through greater efficiency	Incorporating water saving devices and appliance	3	0.5	4
Recycling, water	Promoting recycling of 'waste' water, while being mindful of its potential to pollute local ecological systems if not properly managed.	1	0	4
TOTAL POINTS(20)		8	3.5	14.5

4. ENERGY The conservation, efficiency and renewable use of energy		Typical informal dwelling	Concrete Block (House Monica)	Cob House (House Lucas)
Reducing the production of greenhouse gases	Minimizing CO2, CFC's, HCFC's and halon emissions by using less electricity	4.5	1.5	3.5
Energy Conservation	Reducing the reliance on the vehicles	4.5	1.5	3.5
	Minimizing land-use separation, zoning and sub-division	4.5	2	2
	Enhance local urban micro climates using dense belts of planting to protect various urban	1	0	1.5
	Conservation and adaptive reuse of existing buildings and materials	5	3	2
Passive solar design	Maximizing natural light	3	2.5	2.5
	Maximize the use of natural ventilation	2	3	3
	Use insulating materials or layers to reduce the effects of heat transfer	2.5	1	4.5
	Design for adequate sun shading	2	0	3
	Avoid the excess use of un-insulated glazing on the cold side of buildings	3	2	2.5
Energy Efficiency	Geyser blankets and pipe lagging with hot water systems	0	0	0
	Position electrical equipment(i.e. geysers, solar panel etc) as close as possible to its point of use	4	4	3
	Using energy saving lights	2.5	4	4
	Using energy efficient appliances	2	2	3
	Using natural gas as a fuel	5	5	5
Renewable Energy	Maximize the use of non-polluting renewable energy sources i.e. solar panels	0	0	0
TOTAL POINTS(80)		45.5	31.5	43

5. HEALTH Non-polluting environments and healthy materials		Typical informal dwelling	Concrete Block (House Monica)	Cob House (House Lucas)
Considering Global Warming	Using alternatives to non-renewable tropical hardwoods so as to prevent the destruction of rain forest	5	4	4
Ozone Depletion and CFC's	Avoid specifying materials, which utilize CFC or HCFC in their production	4	2	3
Reducing Indoor polluting Trace Organics	Using solvent free or low solvent based products in the finishing of the building i.e. water based paint, natural timber preservatives	2	1	4
Ensuring a comfortable environment for inhabitants	Minimize eyestrain	2	3	2.5
	Minimize unpleasant static by incorporating natural finishes, plants and limit the exposure of metal and electrical equipment	4	2	4
	Maximize natural movement within dwelling with design	3	4	3
TOTAL POINTS(30)		20	16	20.5

6. HOLISM Holistic and intrinsically recyclable		Typical informal dwelling	Concrete Block (House Monica)	Cob House (House Lucas)
Cyclical consideration	Encouraging repair, reuse and recycling of elements at every phase	5	1-5 Due to the initial intention extra ½ a point	4
Dwelling's life span	Considering positive sustainable solutions for long term benefits and effects (rather than short-term gains)	1	1.5 Due to the initial intention extra ½ a point	3
Unique context	Understanding and grasping the challenge of reaching sustainability in the uniqueness of the project	2	2.5 Due to the initial intention extra ½ a point	3.5
Networking within/unifying diversity	Promoting beneficial connections between components	5	2.5 Due to the initial intention extra ½ a point	4
TOTAL POINTS(20)		13	8	14.5

SESSION 13

OPERATIONAL FACILITIES MANAGEMENT

INTRODUCTION OF SPACE MANAGEMENT IN A HOSPITAL

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Hospitals are one of the most complex organisations which results from numerous interfaces between many departments. If those interfaces are unknown, there is a lot of uncoordinated and not goaloriented work which causes unnecessary and high operational costs. The intention of the paper is to find out how medical and nonmedical processes in a hospital can be supported in the best possible way to reduce the operational costs by implementing a space management tool. The research therefore includes a detailed analysis of the main departments of 13 hospitals examining their processes by expert interview, in order to find out their needs and to develop a space management tool that meets these needs. Based on this, within the framework of a research project in cooperation with the “Klinikum Region Hannover”, the data necessary for the management of space were defined for all relevant processes and a pilot data collection was carried out. As a result, new processes, like space benchmarking or maintenance controlling, could be established in the department of real estate management. In addition, existing processes like the accounting of the service charges for rented space could be significantly optimized. Due to these improvements it was possible to streamline existing processes and to establish new processes without increasing the total costs. On the contrary, the total operational costs could even be reduced.

Keywords: data collection, facility management, hospital, maintenance controlling, space management

INTRODUCTION

In case of the cost pressure in the health care sector in Germany, the operator of hospitals have to save more and more money. The objective of the study was to find out, how money can saved in the secondary processes without reducing the quality of the primary processes. The costs for the space owns the biggest part of the secondary costs in hospitals. Because of that, the paper describes how the management of the space could be improved.

FUNDAMENTALS

The goal of the management of space is to collect exact data about the existing space and to make data concerning a building accessible to all users of the hospital. Because the secondary costs in a hospital are largely due to costs for space, it is particular important to have detailed information about them.

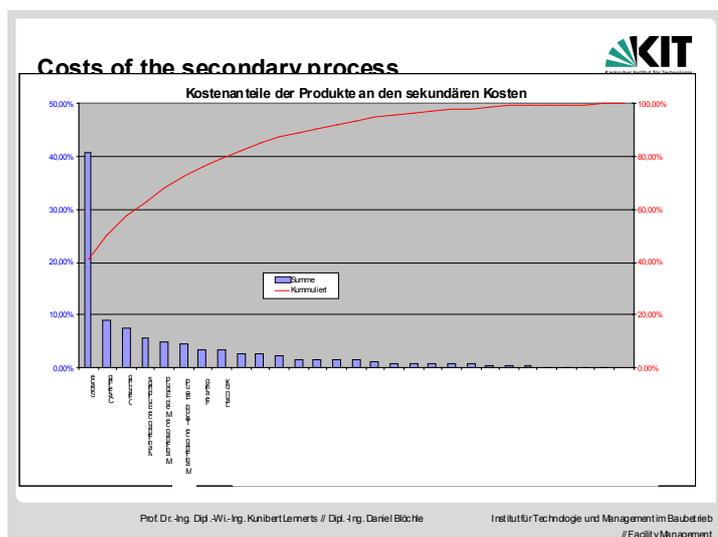


Figure 1: Costs of products in hospitals (OPIK 1, Jochen Abel, 2008)

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If there is no basic information like space or room data available, these have to be acquired. The challenge in doing so is, that the right data is collected, that all future users are included, that interfaces are reduced and a redundant data management is avoided. To accomplish this, the project has been divided in 3 phases.

DIVISION OF THE PROJECT IN 3 PHASES

The introduction is being divided in 3 phases by using a model. In phase 1, an as-is-analysis is made and a target state is defined. For this purpose, business processes are analysed interdisciplinarily and the target state is defined. In phase 2, the required data is acquired and in phase 3, the space management tool with all required data is implemented. Here, business processes are improved piece by piece in their operation or new business processes are introduced.

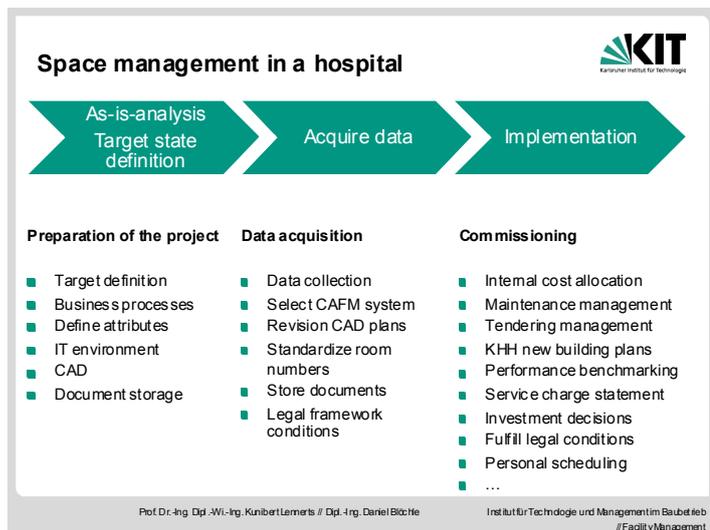


Figure 2: Space management in a hospital

ANALYSIS OF THE BUSINESS UNITS

Only by a holistic analysis of the most important business units and the corresponding processes, it is possible to accomplish the previously mentioned targets. The management of the space is traditionally placed in the domain “construction and technology”. However, many fields in a hospital are holding data which can be covered by a central management of the space. The service company, which is responsible for cleaning and preparing the food, requires data to schedule the staff requirements. For example, the space and flooring materials to be cleaned are important. The medicine- and patient management require room numbers in order to assign the patients including the number of beds to the proper rooms. The medical equipment management documents the location of medical equipment in a room book. The location of computers, copiers and other IT equipment are documented by the IT-department. In the administration, specifically the asset accounting, all depreciable equipment including their location is documented. Only if all business processes are registered and are available transparently, all interfaces can be examined and a redundant data management can be avoided. For this purpose, cooperation of the departments is very important. If departments withhold information in interviews, this leads to faults which affect all further steps and cannot be corrected. Therefore the desired optimization cannot be accomplished thoroughly. Graphically, this is clarified in Figure 2 “Holistic view of all business units”.

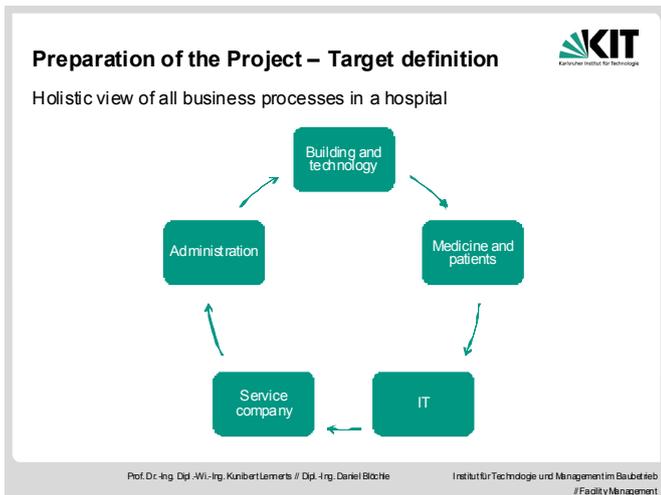


Figure 3: Holistic view of all business units

ANALYSIS OF BUSINESS PROCESSES

Using the example of the department “construction and technology”, the realization of an analysis of typical business processes is explained. Firstly, three goals of the change of business process are defined: The improvement in quality, the introduction of new business processes and the cost reduction of certain processes.

To begin with the improvement in quality, this aims at improving the quality of a business processes output. The usage benchmarking provides an example of this. The benchmarking data are to have a greater degree of detail and therefore a better quality and significance than the currently used method.

Another point which has to be examined prior to a data acquisition is the introduction of new business processes. For that purpose, users were asked for processes which are mandatory or rather are important for day-to-day operations.

The third point is the cost reduction of existing business processes. If business processes exist and are necessary, but the current operation involves a great amount of work, they fall into the point of cost reduction. Space benchmarking is taken as an example: If space data is not filed orderly and provided over a longer term, the data’s are only available for a short time after the acquisition. Consequently, for every new comparison of space, which belong to certain departments or cost units, a new acquisition of space is necessary. This results in high costs, which can be reduced by a revision of the business process “space benchmarking”. Another possibility is a combination of several goals. For example, an improvement of quality can be combined with cost reduction, so that additional benefits are achieved.

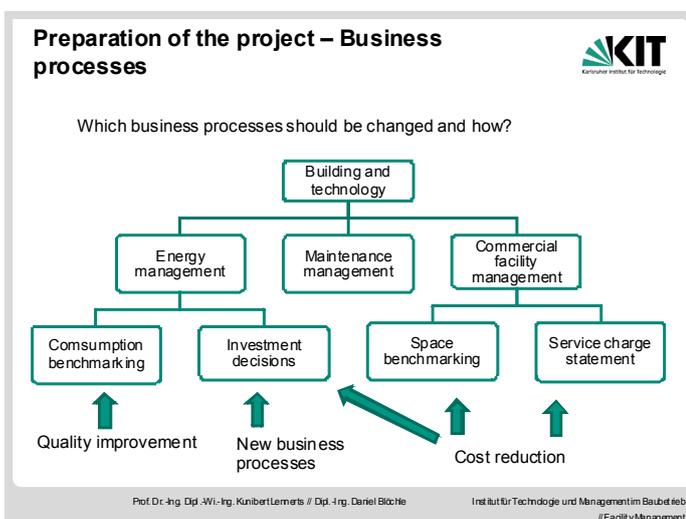


Figure 4: The three types of business process changes

IDENTIFICATION AND OPTIMIZATION OF INTERFACES BETWEEN BUSINESS UNITS

The goal is to identify existing business processes which can be assisted by a space management tool. For this purpose, those processes which need building data are investigated, for example space benchmarking, bed occupancy and the constitution of clearing areas. These processes are collected through expert interviews and are presented graphically. For the graphical presentation, the system of event-driven process chains is being used. This shows that both pre-run and post-run of all three business processes are equal. At first, the availability of all data must be verified. If no data is available, it has to be acquired. Otherwise, data quality and whether it is up to date must be verified. If all prerequisites have been established, the actual business process can be performed. The process itself will not be presented graphically detailed, since it is irrelevant for the optimization. In the post-run, all collected, verified and possibly changed data has to be saved. The last point of the operation is the continuous updating of data. This is an expensive and laborious process, which should only be performed once.

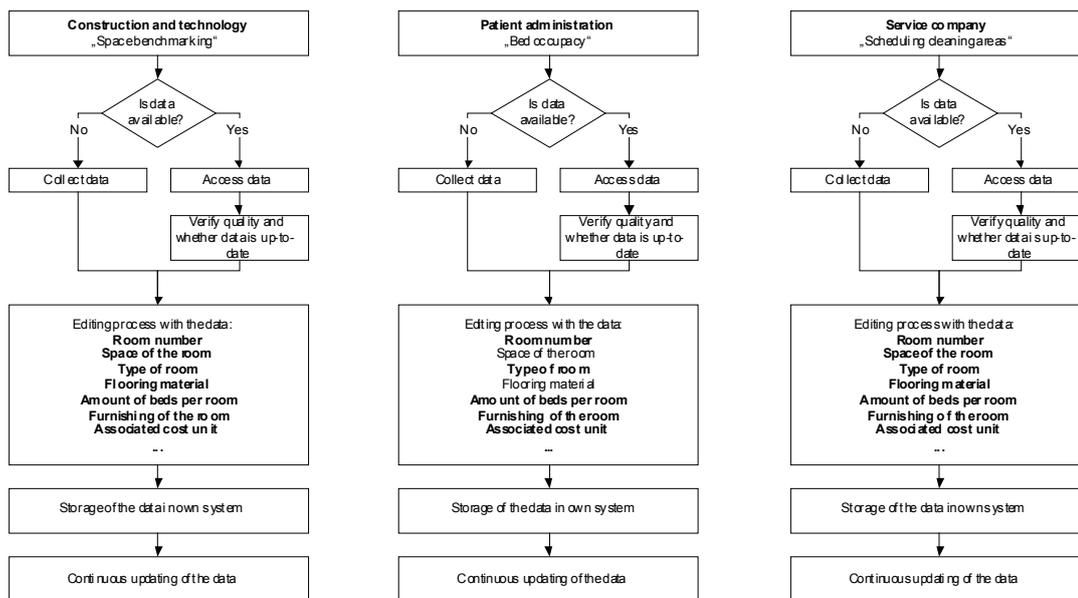


Figure 5: Presentation of previous business processes

If business processes are divided, like shown in the Figure 5, this means that every domain itself is responsible for data quality and whether data is up to date, and if necessary for the collection of data. This leads to redundant data management in many areas and resources for retention, updates and collection of data are thus used several times for identical data. The aim of a space management tool is to prepare data once and make it available in order to allow all domains to use and access necessary data.

Optimization of business processes through a space management tool

With a space management tool, data can be administrated centrally. Unnecessary work can be avoided by making the required data accessible to all users like the domain of construction and technology, the patient administration or the service enterprise. In the following example, the business processes “space benchmarking”, “bed occupancy” and “planning of cleaning areas” are not changed. Only the basis for the business processes, the data, is prepared centrally. This means the steps “verifying data availability” and “verifying whether data is up-to-date” can be avoided.

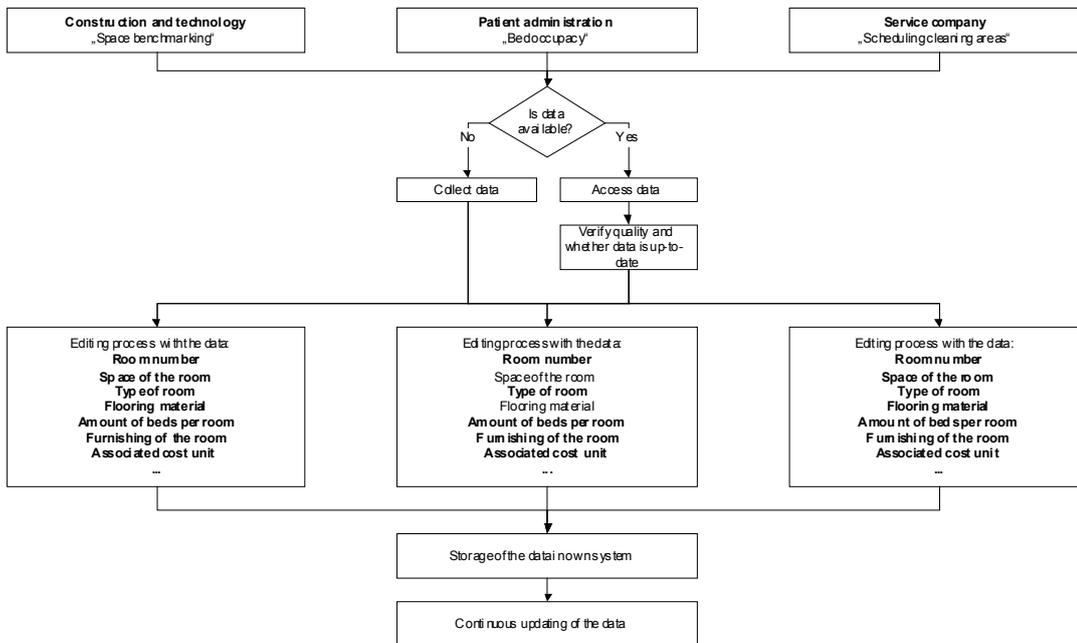


Figure 6: Presentation of optimized business processes

EXAMINATION OF EXISTING DATA AND IT SYSTEMS

Acquisition and evaluation of existing IT systems is required to evaluate and, if necessary, migrate existing data. For this purpose, all known IT systems, which were supposed to contain required data, have been collected and analyzed. Not only the large IT systems and CAFM systems play a role, but data in Excel, Word or PowerPoint files, in written form, HTML databases or as well in CAD files can be present. After the acquisition of all existing systems in a company, the data which is available in these systems is evaluated. Here, the type and quality of data and whether it is up-to-date are given special attention. By using this systematic approach, it could be worked out, which data was present and in which format and whether it could be migrated. The result of this step is a collection of data, which, ideally, suit the reality. However, this is not necessarily the case; if none of this data was kept up to date, outdated data is present in every system. Thus, no system suits the reality. In this case, the data has to be re-acquired with the aid of a data acquisition. This can only happen by local inspection and acquisition.

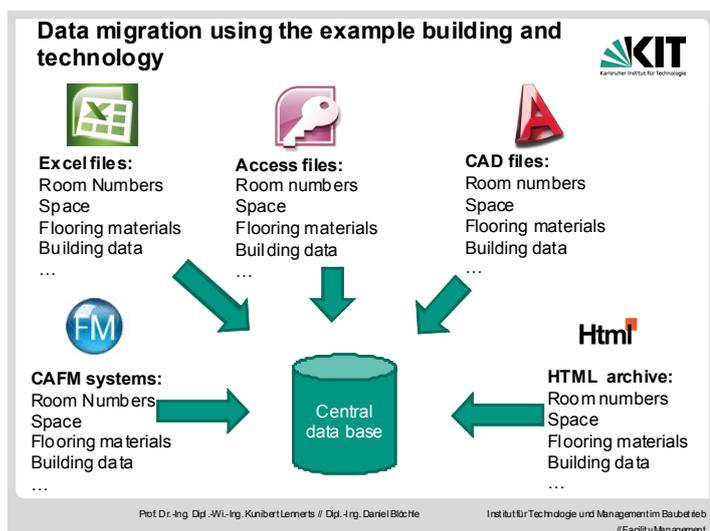


Figure 7: Data migration in a central data base

DEFINING ATTRIBUTES

If the business processes are transparent and the corresponding goals from the preceding section are determined, the data for the acquisition is defined. To define this data, every business process is examined and analyzed separately to figure out necessary data to achieve the determined goals. This is not restricted to a room book. The data includes, in particular, CAD drawings (floor plans and perspective views), legal framework conditions (examination periods, fire safety) as well as ownerships of buildings.

The business process “space benchmarking” is an important business process of a hospital. Space benchmarks are necessary for re-planning of departments or buildings as well as testing space consumption of particular departments. In order for these key figures to be compared to a large benchmarking pool, they were closely modelled to the key figures of a big benchmarking pool.

Table 1: Space benchmarking

ATTRIBUTE	VARIABLE	DETAILS
Room number		Technical room number B + T
Space according to DIN 277	m ²	DIN 277 catalogue, 2nd layer
Space according to DIN 13080	m ²	DIN 13080, 2nd layer
As-is-usage of the room	Free text	Analog to usage recording of project office “new buildings”
Amount of beds	Quantity	Per room
Amount of office workstations	Quantity	Per room
...		

The space of entire hospitals can thus be evaluated roughly. More detailed analysis can be evaluated using a kind of in-house benchmarking between the departments or functional sections. In figure 8, 9 and 10 different evaluations are shown.

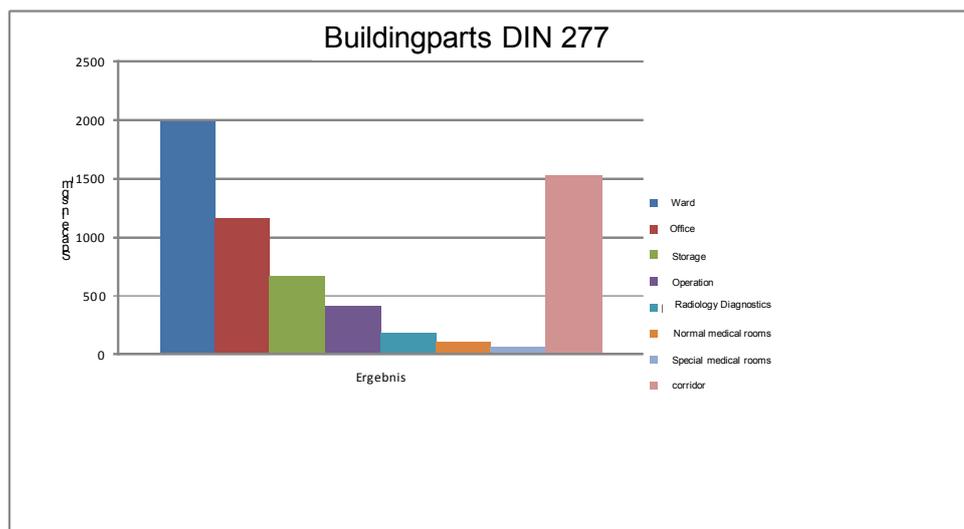


Figure 8: Analyse of a complete hospital DIN 277

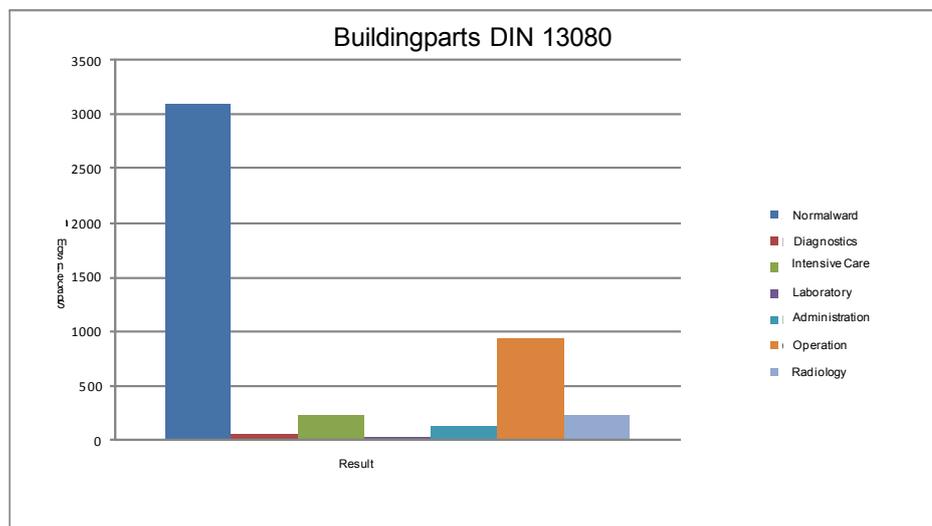


Figure 9: Analyse of a complete hospital DIN 13080

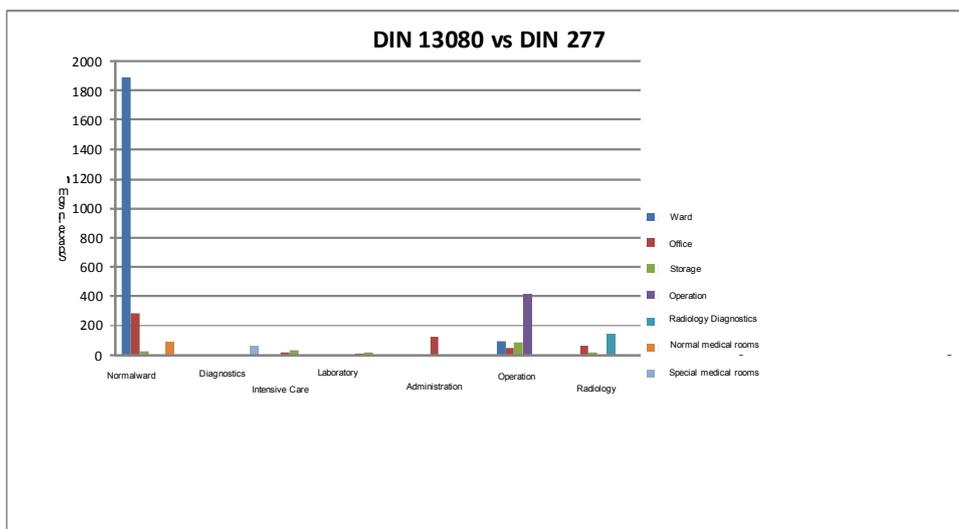


Figure 10: Analyse of a complete hospital DIN 13080 vs. DIN 277

CONCLUSIONS

Due to the increasing cost pressure in the public health sector, it becomes more and more important to examine the company as a whole and to create slim and effective business processes. The management of the space is the central management tool for all business processes in and around buildings. By introducing a space management tool, duplicate processes can be avoided and resources can be saved and shifted to other business units. Thus, an increase of quality can be achieved by improving and introducing new business processes without causing additional costs. Duplicate business processes are avoided, new processes are introduced. To make data available to the users space management is, ideally, build upon an IT platform which is accessible to all users. The three business processes which were presented only have a minimal part in all processes around buildings. Only if buildings are understood as a resource and processes are optimized, the challenges of the future can be fulfilled. The introduction of space management is an important step on the road into the future.

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THE SILENT ARMY: A STORY FROM PRACTICE

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The purpose of this paper is to develop a deeper understanding of the practices of cleaners. Cleaning can represent up to 45 % of a building's operating costs and is important for the comfort and well-being of a building's users. A lack of cleaning may result in uncomfortable and unhealthy environments for occupants in the building and, in extreme cases, the closure of a business to protect health and safety. The service providers' employees have been identified as a critical factor within service quality research. The quality and efficiency of cleaning depends on the work practices of the cleaners; thus, understanding these practices is important in order to create value to both the users and the owners of buildings. In the present study, a cleaning team was followed as they performed their daily activities. This qualitative case study of a UK local authority was performed to illustrate cleaning practices. This case is presented as a narrative describing cleaners' days at work. Data were obtained by shadowing the cleaners and are supported by interviews with their managers. The story of practice is discussed in relation to different aspects of the work, including the hours of duty; interactions with building users, managers and other service personnel; technology; routines; responsibilities; ergonomics and the building's impact on cleaning practice to identify aspects that enable or hinder the cleaning service with regard to the cleaning staff's efficiency and effectiveness. This work is part of a PhD project studying relationships between buildings, organisations, technology and cleaning practices. The results imply that the practice of cleaning can be improved and that the physical environments and technology as well as the organisational context can be optimised.

Keywords: operational research, shadowing, facility management, cleaning

INTRODUCTION

Cleaning is an essential service within facility management (FM). The longevity of buildings and the health and comfort of building users are dependent on this service. However, research on the practice of cleaning has been limited. Cleaning personnel can be seen as a "silent army," as described by an English operations manager interviewed in relation to this research. When asked about the importance of operational services, this manager responded:

"You need to know how it works. How the end user works. How the cleaner works. And understand the role they are doing, the challenges they face daily, to understand cleaning... So when you watch the cleaner working you see that people don't think twice about the cleaning. Cleaning is the silent army. Do you know what that means? I come to work at 8 o'clock in the morning and I leave at 4pm. Never see the cleaner. The cleaners. Millions of cleaners every morning and every evening go to work at 5 and 6 o'clock in the morning and then come back in the evening from 6 o'clock through to 9 o'clock in the evening. And we never see them. And there are millions of them. And they are silent to us because we never see them, but if they are not there – they don't come in – we notice straight away. So they are silent. They are the silent army. It is an army of people that just go out in the morning before people go to work or working in the evening when people have gone home. And they are working in the building when there is no one else around" (Interview Spring 2011).

The aim of this research is to describe the actual practice of cleaning. An English local authority was chosen for the case study and their army of cleaning personnel consists of more than 300 cleaners. In this case study two of these cleaners were shadowed. Their day at work is described through a narrative. The results are supplemented by interviews of their operations manager (OM) and service supervisor (SS).

The purpose of this study was to identify aspects that enable or hinder the cleaning service with regard to the cleaning staff's efficiency and effectiveness. The observations are structured to answer the following questions:

When do the cleaning personnel work?

Who do they interact with?

What kind of equipment do they use?

What are their responsibilities and routines?

What hindrances and enabling aspects do they encounter during their workday?

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Knowledge obtained by shadowing depends on the context. Thus, the case presented here is not necessarily representative of all cleaning teams in this local authority, for the United Kingdom in general or for practices in other countries. The real value lies in the richness of data that records what actually happens in the field. To understand the practice, it is important to record what the practitioners actually do and not simply what they say they do.

THEORY

Cleaning is a cost demanding service that has been estimated to represent from 20-45 % of the operations cost of buildings, depending on contextual changes such as the country of location and the building type (Strand, 2000; Bjørberg, Larsen and Øiseth, 2005; Stoy and Johrendt, 2008; Madritsch, Steixner, Ostermann and Staudinger, 2008). Mascoporrán and Tucker (1996) found that the median cost for the cleaning of Australian office buildings was 19 % of the total operating cost. This fraction is supported by Stoy and Johrendt (2008), who state that “costs of cleaning owner-operated office buildings amount to an approximate 20 per cent share of the operating costs.” The cost of cleaning in Norwegian office buildings has been estimated by Bjørberg et al. (2005) to represent 33 % of the total operating cost, whereas Madritsch et al. (2008) estimated that cleaning represented as much as 39.1 % of the operating cost in Austrian long-term-care facilities. This finding is supported by Strand (2000), who found that cleaning costs represent as much as 35-45 % of the total operations cost for buildings in 114 Norwegian local authorities. These results illustrate that the cost of cleaning should not be underestimated as it is likely to represent a large portion of the total operations cost.

In Norway, the majority of the cleaning cost is accounted for by labour. It is estimated that salary, including salary-related costs, represents as much as 85 % of the cost of cleaning (NHO Service, 2011). Therefore, the use of time is important for the efficiency of cleaning; mapping of the enabling and hindering aspects of cleaning activities is important to provide a clearer picture of how this service can become more efficient. The ease with which a physical environment can be cleaned, the equipment used and the method and frequency of cleaning all affect cleaning efficiency, effectiveness and quality (Hellstrøm et al., 1969; Schneider, Nilsen and Dahl, 1994 and Nilsen et al., 2008).

Cleaning is not only a matter of cost but also a service that helps to ensure the health of building users. Nilsen et al. (2001 and 2002) investigated the relationship between indoor-climate-related health complaints, productivity and cleaning quality over a period of one year and found that the short-term absence (up to 16 days) of workers as a result of sickness was reduced by 12.5 % until 39 % in the office floors receiving the intervention and increased by 3.9 % in the control group. These authors also concluded that there was a need to investigate the relationship between dust on surfaces, dust in the air and indoor-climate-related health complaints. This study was followed up by Skulberg et al. (2004) and Skulberg (2006), among others, who conducted intervention studies while investigating the relationship between dust levels and the health of office workers (mucosal symptoms). It was found that “infrequent cleaning was associated with an increased risk of a high general symptom score (Skulberg 2004 and 2006).” These results are supported by the findings of Frankie et al. (1997), among others, who investigated whether deep cleaning could improve indoor air quality. A decrease was found in all parameters measured, which “included fungi (61%), airborne bacteria (40%), nonfloor surface fungi (25%), nonfloor surface bacteria (29%), carpet dust fungi (40%), and carpet dust bacteria (84%).”

Cleaning not only represents a matter of health and cost but also adds value to the core business. According to Jensen, Nielsen and Balslev Nielsen (2008), the concept of adding value has an element of surprise, as it should go beyond expectations, demands and instructions. These authors describe added value as “spontaneous” and emphasise that added value does not need to be expensive, which indicates the mutual cooperation and support of humans, things and machines is insufficient for a service to add value. Cleaning is a practice; according to Czarniawska (2007), a practice is “usually performed in cooperation among humans, things, and machines.” For a service to add value, it can be argued that three aspects, i.e., humans, things, and machines, need to support each other. The addition of value at an operational level may be challenging if these three aspects are not properly coordinated.

The cleaning personnel may influence the building users’ experiences of service quality. Stershic (1990) states that employees (such as front-line staff) are “the critical link in delivering service quality and customer satisfaction.” This statement is supported by Yusoff et al. (2010), who state that understanding the perspective of the service provider is “absolutely vital” to ensure service quality. As such, the importance of front-line staff (such as cleaners) should not be underestimated.

METHODS: SHADOWING AND INTERVIEWS

This is a case study that involves an empirical investigation of a particular contemporary phenomenon within its real-life context (Yin, 2009). The study relies on several sources of evidence and focuses on understanding processes. The case presented here is from the in-house service within one of the larger local authorities in the UK. Only one part of the case study, the shadowing, is presented here. This case provides valuable insight into the ways in which cleaning services are performed and the hindering and enabling aspects encountered by the cleaners.

Shadowing is an approach that is used within management research, but it has seldom been applied when studying front-line staff such as cleaners (Czarniawska, 2007). Shadowing records what actually happens (Gillham, 2008). It is a way of observing people without participating in their work; it involves following all of their movements and asking them about their actions to understand why they do as they do (McDonald, 2005). However, the presence of a researcher may influence the actual behaviour of the person being observed (Mintzberg, 1973; Czarniawska, 2007). McDonald (2005) conducted a literature review of studies that used shadowing as a method and described two main types of shadowing: quantitative and qualitative. The studies were categorised according to three forms: 1) experimental learning, 2) recording behaviour (quantitative shadowing) and 3) understanding roles or perspectives (qualitative shadowing). This paper deals with understanding the roles of the cleaners, and the results of the shadowing are presented as a narrative that provides insight about the workdays of the cleaners.

Researchers in the social sciences occasionally use stories to provide insight into actors' circumstances and the context surrounding them (Johannessen, Tufte and Christoffersen, 2010). A narrative approach allows different aspects to be highlighted that may otherwise be difficult for the researchers to convey. As such, narratives were chosen for the present study because they more clearly illustrate the aspects of the cleaners' workdays.

New insights can be gained through observations because an observer "can see different things than actors and natives can" (Czarniawska, 2007). Some of the observations may seem obvious to the native while seeming case-specific to the observer; other observations may only truly be understood by the actor. Nevertheless, observations can only provide a snap shot of the reality and "even when extended over time it can only incorporate a narrow section..." (Gillham, 2008).

The cleaners were shadowed for one morning and one evening; together, this evaluation provides a picture of the cleaners' workday in one office building. The data from the shadowing were recorded through field notes and digital photographs, which provided a vast amount of information when combined. When possible, the cleaners were also asked questions during the shadowing. The following narrative provides a brief summary of this collected material. During the shadowing, the following topics were studied in particular:

- Interactions between persons and the core business (types of contact and types of person)
- Cleaning methods/equipment/technology and performance
- Tasks, the sequence of tasks and the division of tasks among peers
- Hindering and enabling aspects
- The time of day
- Rewards for work and feedback on work
- The handling of events

The shadowing was agreed to by the operations manager (OM) and the service supervisor (SS), who asked the cleaners if they would like to be shadowed. Prior to the shadowing, the SS was also interviewed. In this interview, the SS said that she was responsible for 150 cleaners and that she tried to meet the cleaners face-to-face at least once during a three month period, which was a goal that was not always easy to achieve. Annie was the first cleaner to be shadowed. She met the researcher (R) for the first time in the evening together with her SS, who introduced R to her. The following morning, Annie was shadowed for another hour until Frank arrived. Frank was then shadowed from the time he signed in until he left the building.

"BRICK" AND THE CLEANING TEAM

The shadowing of the two English cleaners was conducted in an old English administration building, here referred to as "Brick". The building is open from 0700 until 1900 for office workers. In the evening and at night, a security guard patrols the building until the cleaners arrive in the morning. The building has a total area of 2,406 internal m², and its age is unknown, but the cleaners and their

SS estimate the building to be over 100 years old. The building is made of brick and mortar, and it has begun to crumble. Five months after the shadowing, the building was scheduled to be demolished, and the building users had already started to move to their new location.

The building's ground floor is used as offices. The basement consists of a few rooms that are used as storage, and the first-floor areas are used as a lunch room, computer training room and meeting room. The former cleaner at "Brick" retired, and the two current cleaners are temporarily employed at the building. The area to be cleaned in the building is split between the two cleaners (see Figure 1).

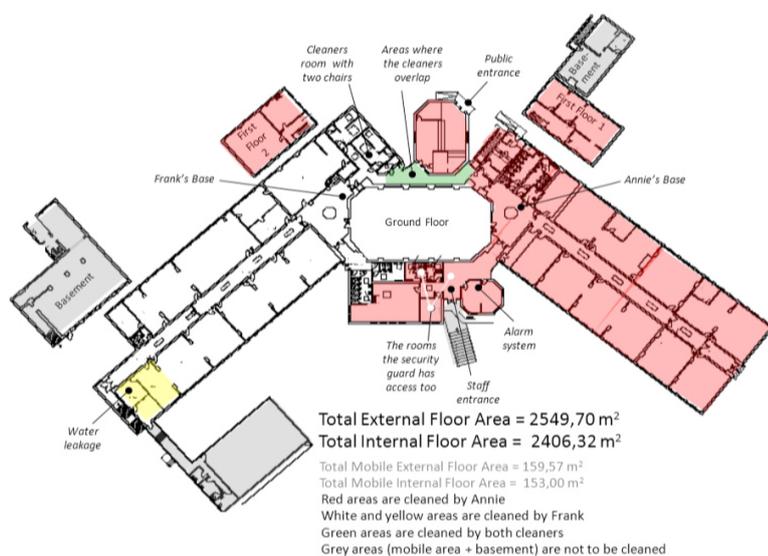


Figure 1: The floor plan of "Brick" and the cleaners' different areas

THE CLEANING TEAM AND THEIR HOURS OF DUTY

The two cleaners, Annie and Frank, have different relationships with the council's soft FM department which is responsible for cleaning, catering and school patrols. Frank, who is a semi-retired automotive engineer, is part of the council's mobile caretaking team and works (by choice) for only 3 hours in the morning from 0600 until 0900; Annie, who has been employed as a cleaner for many years within the FM department, works full-time. Annie normally arrives and leaves earlier in the morning than Frank, and she works alone in the evenings, as her job is divided into three parts. She begins by cleaning at "Brick" from 0510 until 0840 and continues to work as a caterer from 1100 until approximately 1315 after a few hours off, which enables her to eat lunch and perform chores or errands, such as ironing, at home before going to the school canteen. Finally, after a couple of hours off again, this time for a shower and dinner at home, she returns to clean at "Brick" in the evening from 1510 until 1900.

RESPONSIBILITIES

Annie's and Frank's responsibilities are divided within "Brick". Frank is responsible for one of the corridors, the large oval room and the nearby toilets. Annie has responsibility for the other corridor, the public entrance, the medium oval room, the staff entrance area, and all toilets in this area in addition to the areas at the first floor.

Annie has responsibility for the keys at "Brick". At night, a security guard is on site, but he has access only to the entrance, the toilets by the entrance hall, his own security booth and the property's external areas. Annie locks all other areas inside the building, engages the alarm system and locks the door to the room where the alarm system can be accessed when she leaves in the evenings. The security guard closes the gate in the 2-metre-tall fence surrounding the property when Annie leaves in her car. At this point, the security guard is alone on the premises, and he does not leave until Annie arrives again in the morning and disengages the alarm system.

In the morning, Annie first disengages the alarm system and then briefly greets the security guard (who seems to be ready to leave as soon as she arrives) before she begins patrolling the building to open the locked doors and turn on the lights. In the evening, Annie pays attention to who is still at work when she cleans. She tries not to bother those who are still working for as long as possible. When most of the cleaning is complete, she walks around the building and closes open windows, turns off the lights, closes or locks the doors and checks whether any office workers are still present. At the end of her shift, she sits down with a cup of coffee by the entrance and waits for the last office workers to leave the premises so that she can complete her work and lock the building up. The

office workers, the security guard, Frank, and the SS all do not have keys to the building; thus, Annie has to ensure that everything is in order before she leaves.

ROUTINES AND PACE

Annie's responsibility for the building's keys influences her routine because she has to work from early in the morning, when no one is present, until a few hours after the office workers have arrived. She also has to work from late in the afternoon, from the time when the office workers begin to leave, until the building is empty. In contrast, Frank can choose when to work, but he prefers to work early in the morning and to achieve as much as possible before the workers arrive.

The first and the last activity when arriving at or leaving "Brick" is to sign a book located at the staff entrance hall. This unsupervised book keeps a record of who is in the building at any given time. Both cleaners seem to work according to a system which can be categorized as a routine that consists of sequences of the various tasks. They begin at a specific place and work their way down their corridor and up the other side. In general, the cleaners perform one task at a time, e.g., emptying rubbish, cleaning/polishing desks, vacuuming, cleaning toilets. The cleaners do not change tasks before they are finished unless they are interrupted.

Frank seems to work task-by-task, finishing one task in all of the spaces before continuing with the next task. Annie seems to have two sets of routines: the same routine as Frank in "her" corridor but a different routine in the other areas. In the areas of the public entrance and the staff entrance and on first floor in the lunch room, Annie seems to finish all of the tasks within the different areas/rooms before she continues to the next area/room. In this routine, the sequence of the tasks seems to be the same as that for the aforementioned routine: emptying rubbish first and then cleaning/polishing desks before vacuuming the floor and cleaning areas with hard floors.

Frank, who works only during the mornings, begins with the offices and works as quickly as he can until most of the office workers have arrived. His pace slows as the building fills up. Frank expresses it as such:

"I only work in the morning from 6 o'clock till 9 o'clock. So, I tend to do the jobs I can do when there is nobody in. And a bit later on, because they tend to come in at different times. Some come in for 7, some for 8 and by 9 o'clock it is full. So, it is only certain things you can do after, cause then everybody is messing out and about."

Annie also works quickly, but because she was not shadowed while the office workers were arriving, there is no record of whether their presence had any effect on her pace. The cleaners' do not seem to have an obvious common understanding of practice. The most apparent difference between Frank's and Annie's toilet cleaning routines is that Annie uses gloves when cleaning, whereas Frank uses his bare hands. Another difference is that Annie distinguishes between the types of cloths and the types of buckets that are used for the toilets (the blue cloths and the blue bucket) and for the vanity counters and the dispensers (the pink cloths and the red bucket), whereas Frank only distinguishes between the colours of the cloths. Annie also cleans outside the toilet bowls, whereas Frank does not (this may be because of R's presence). Both Annie and Frank use a blue toilet cleaner and descaler inside the toilet/urinal bowl. Annie uses her glove-covered hand and the blue viscose cloth to clean inside the toilet bowl, whereas Frank seems to use a toilet brush (this may be a matter of personal preference).

Other differences between the routines of the two cleaners are that Frank seems to move fewer objects when he vacuums compared with Annie and that Frank vacuums and wipes the desks every other day, whereas Annie wipes half of the desks and vacuums the floors every day. Annie also changes her wiping routine every other day - one day she wipes with water and chemical while she uses a flannel cloth and wood wax spray to polish the desks the following day.

This day Annie's evening routine was interrupted by a rainwater leakage in Frank's corridor which includes that Annie and SS had to collaborate in order to provide a wet vacuum and vacuums the water. Annie's evening routine was in addition interrupted by a member of the public visiting the public entrance - consequently Annie had to change task and area to clean as she is not allowed to be at the public entrance when members of the public enquire assistance.

Listing the cleaners' routines reveals differences (see Table 1) that may be a result of personal choice, of differences in training or a natural consequence of the time of day when the tasks are conducted.

Table 1: The cleaners' routines

	ANNIE'S MORNING ROUTINE	ANNIE'S EVENING ROUTINE	FRANK'S MORNING ROUTINE
1	Opening the building	Unknown + rainwater leakage	Emptying the rubbish
2	Cleaning the desks (half of the desks)	Cleaning the toilets	Cleaning the toilets – first the furniture and then the floor
3	Vacuuming the “corridor offices”	Cleaning up the pooled rainwater with a wet vacuum	Vacuuming the floor or wiping desks (on alternate days)
4	Dusting/cleaning the glass/doors (based on observations obtained while shadowing Frank)	Cleaning the public entrance area; first rubbish, then polishing the desks before vacuuming	Refilling the paper hand towels and toilet paper in the toilets
5		Mail room; first rubbish, then polishing before vacuuming	Dusting/cleaning glass
6		Vacuuming the staff entrance and toilets	Scrubbing the urinals
7		Emptying the rubbish in “corridor offices”	Discarding the refuse bags
8		Finishing the vacuuming of the public entrance	
9		Cleaning the kitchen on the first floor	
10		Coffee break	
11		Closing the building	
12		Discarding the refuse bags	

INTERACTIONS

Annie and Frank interact with each other every day in various ways (see Image 1). They drink water together, and it seems that Annie regularly helps Frank by checking that ladies are not in the lavatory before Frank enters (because it appeared natural for her to do this, it seems likely that this is one of their routines).

The ways in which the office workers react towards the cleaners differs. Some workers do not seem to notice the cleaners, even a researcher following their movements. Others seem to give the cleaners more attention because there is someone shadowing them. The “good morning” greeting seems to be common for the cleaners and the office workers. The OM’s statement that “people don’t think twice about the cleaning” became apparent when the users in one of the offices turned off the light as they left a room that both Annie and R were still in. This may be a typical behaviour when there is no researcher present, but it may also have been a mistake.



Image 1: Annie and Frank interact in various ways with each other, SS and the building users

During the shadowing period, no negative comments regarding the cleaners were observed. The comments from the building users were that 1) dusting (in this building) is pointless and 2) these cleaners do a good job (indicating they perform better than the previous cleaner). Frank seems to meet more people during his three hours than Annie does during her hours at “Brick”, although it seems as Annie has more varied interactions than Frank. In addition to meeting building users she also interacts with other service personnel as the security guard and SS. In the evening, there was a rainwater leak at “Brick”, Annie and the SS had interactions with several building users: first with the 2-3 ladies who reported the flooding and then with 5 users of the flooded area of the building. Annie and the SS also collaborated with one of the building users when vacuuming the water from the floor. They took turns with the wet vacuum machine. This event also showed that Annie was most likely more experienced with this machine than the SS because the SS was unsure of how to empty it.

The most surprising information gained through Annie’s interaction with the building users and her SS was that neither the building users nor the service supervisor seemed to be aware that Annie had keys to the building. The SS seemed shocked when Annie noted

that she had the keys to the building and that she was also the one who had the responsibility for opening and closing the building, including all accompanying tasks, such as checking the windows, lights and doors and that the building was empty.

BUILDINGS IMPACT AND ERGONOMIC

The cleaners' equipment is located in different places around the building (see Image 2). The cleaners' storage space seems to be insufficient because it is located in several places. This aspect, combined with the time that the cleaners spend to change or find equipment, seems unnecessarily time-consuming.

The cleaners have two rooms that may be defined as theirs: the room (with the cleaners' two chairs) that is also used for storing envelopes and office supplies for the core business and a large toilet room by Annie's base, which is used as an equipment room. Aside from these areas, the cleaning equipment is stored in the spaces dedicated for the core business, including the gentlemen's room, a corner by the staircase leading to the kitchen, a kitchen sink in the ladies' room, and a corner in one of the meeting/training rooms on the first floor. The toilet room where Annie stores her equipment does not have any shelves. Therefore, her equipment is spread out on the floor, and when she begins her duties, she chooses the things that she needs and organises them on and by the edge of the plant-island (the circle at the floor plan) at her base. This practice may indicate a need for a more dedicated storage room.

The storage of equipment on the first floor seems convenient because the building does not have an elevator. Thus, it is not necessarily a direct disadvantage to have the equipment distributed throughout the building. However, such a broad distribution of the equipment may make it challenging to keep an overview of the equipment and supplies. It can also be argued that this placement of the equipment inconveniences the building users.



Image 2: Frank's and Annie's bases, storage rooms and water refilling possibilities

The lack of door sills and the presence of swinging doors made it easy for the cleaners to pull their tub vacuums. Power outlets high on the walls (above hip height) were also useful because the cleaners could stand upright when plugging in their tub vacuums. In the toilets each lavatory was separated with an interior partition having a 5 - 10 centimetres gap from the floors allowing the cleaners' string mop to manoeuvre easily without also mopping the wall. However, the cleaners had difficulties accessing the floor area around the back of the toilet as the space left between the wall and the lavatory was too narrow to allow appropriate access. The cleaners also experience difficulties reaching windowsills when dusting and had to use the tub vacuum to reach the sills.

The distance between the power outlets in this building seems to be appropriate for the length of the power cords; in the only observed incident in which a tub vacuum's electrical wire was stretched taut, the cleaner was able to change to another power outlet.

TECHNOLOGY AND COLOUR CODES

The cleaners' equipment can be categorised as follows: a) Cloths and string mops, b) Buckets and mop handles, c) Fluid and spray chemicals, d) Vacuum cleaner, e) Refuse bags and paper refills.

The cleaners' equipment (see Image 2) is listed according to its location (see Table 2), and it is apparent that colour coding is important in cleaning. Some colour codes seem to have a purpose (mops, cloths and buckets), whereas others seem to be random (spray bottles and tub vacuums):

- Yellow: cloths for tables, mops for food service areas such as dining areas
- Pink/red: cloths for sinks, buckets for tables, mops for unknown
- Blue: cloths for lavatories, string mops for toilets and buckets for toilets

Frank was the one who indicated that colour had a meaning through telling the soft FM department had a saying for remembering which cloth to use: "The rime is: Pink for sinks. Blue for loos."

Table 2: The cleaners' equipment according to storage space

STORAGE ROOM	EQUIPMENT
By Frank's base	Two chairs, primary stores of toilet paper rolls and paper towels, two yellow tub vacuums, yellow flannel cloths, wood wax sprays, air freshener, black refuse bags and refill bags for the tub vacuums, among other items.
Gentlemen's room	A blue string mop bucket with a blue string mop in it, a green vinyl pad, some used and dried cloths of various colours on top of 5-litre chemical containers, a black bucket (used to catch the rain water leaking through the roof above the urinal), some unmarked spray bottles (marked with coloured plastic parts: green; blue, containing the blue glass-cleaning chemical; white, containing the red toilet-cleaning solution; and yellow, containing a blue solution), a 1-litre bottle of blue toilet cleaner and descaler and two different chemical containers (one with a green chemical and a green label and one with pink chemicals and a red label), which can be attached to a flexible tube connected to the utility sink's mixing battery
By Annie's base	A complete toilet room containing a ladder, a trolley (which she does not use), a cardboard box containing twelve 1-litre chemical bottles, a red and a blue string mop bucket (both containing a yellow string mop), a red and a blue (approx. 10-litre) bucket with a handle (and Annie's name written on with permanent ink), two yellow caution-wet-floor signs, a red tub vacuum and two 5-liter containers on the floor. The trolley itself contained a great amount of equipment: refuse bags, wood wax sprays, air freshener sprays, two porcelain coffee cups (most likely her private cups), two transparent spray bottles containing solutions, new unused and unpacked viscose cloths of various colours (yellow, blue and pink) and some hand towel paper refills inside a red, square bucket hanging where a refuse bag is supposed to be.
First floor 1	One yellow tub vacuum
First floor 2	One yellow tub vacuum, one blue string mop bucket and one yellow string mop

DISCUSSION

The aim of this research was to describe the actual practice of cleaning with the purpose of identifying enabling and hindering aspects for cleaning services with regard to efficiency and effectiveness.

The results illustrate that the cleaners interact with various people; building users, persons visiting the building, security guard, SS and other cleaners. The majority of the cleaners' work is performed outside of core business hours; thus, there is not necessarily any loss of efficiency from interruptions by building users. However, mingling with building users might increase the effectiveness of cleaners because their work would automatically receive feedback, such as when a building user commented that they were more satisfied with Annie's and Frank's work than with the previous cleaners' work.

The results show that the cleaners perform differently within the same organisation: the sequence of tasks, the types of equipment used and some aspects of the performance are similar, still the tasks seem to be performed differently. One of the cleaners seems to be more thorough (or experienced) than the other. Despite this the available trolley remains unused. The use of a trolley may have saved time and made the service more efficient without reducing its effectiveness. Increased efficiency may generate additional time to ensure the effectiveness of cleaning tasks.

The narrative illustrated two different cleaning routines; 1) one-task-in-all-spaces and 2) all-tasks-in-one-space-at-the-time. The first routine seem effective when no one else are around as it demands less thinking and as it possibly is more efficient as the cleaner don't use time on changing equipment. On contrary, if this routine is conducted when building users are present the users will be disturbed repeatedly. Such a routine would then be rather disturbing and not add value to the core business. The second routine

where all tasks are performed in the specific space before moving to the next may reduce the efficiency as time is spent on changing equipment. However, this routine might increase the effectiveness as the cleaner can concentrate on a smaller area at the time which gives more time to (unconsciously) check the already conducted work before leaving the room. This is also a routine which seems to be less disturbing for the core business, a routine which may increase the building users satisfaction as they see the work being done (thereby knows it is performed) and a routine that would be easier to coordinate with the routine of the core business, especially if conducted at the same time on a daily basis.

The results also indicate that it may be challenging for one manager to keep track of the responsibilities for 150 frontline staff as SS in this case did not know the complete responsibility for the cleaners. The results show that the cleaners mostly use manual equipment in their daily work and that the only used machine is tub vacuums. The efficiency and the effectiveness may be increase by using trolley allowing all necessary equipment to be transported at once. A cordless vacuum could add to the efficiency, if the battery could manage minimum one hour vacuum before the battery discharges.

The building supports the cleaners through swinging doors, a lack of door sills, power outlets high on the wall (above waist height) and interior partitions with 5 - 10 centimetre gaps above hard floor (allowing string mop access underneath it), but it hinders the cleaners because it lacks adequate storage rooms or a common base with a suitable storage system. Ensuring effectiveness and efficiency seems also to be challenging for the cleaners in the toilets as the available space between lavatories and walls seems to hinder the cleaners in their work since the space beside and behind lavatories is difficult to access.

The lack of an elevator contributes to the inefficiency because of the time spent moving in stairs and corridors and because of the need to purchase extra equipment to be stored on the first floor. It can be argued that this extra equipment may have been unnecessary because the cleaners could have carried the equipment up and down the stairs. However, this practice would have cost the cleaners extra effort and time and most likely would have been disadvantageous to their health because some of the equipment is heavy.

CONCLUSION

This illustrate there may be a potential to improve efficiency and effectiveness in relation to building, technology and organisation when it comes to:

- ergonomic
- accessibility
- training of staff
- ease of cleaning
- adequate storage
- coordination with core business
- arrangements for effective operation
- keeping an overview of whom actually does what
- individual responsibility for defining routines with no obvious common understanding of practice

This research is part of a PhD project on cleaning services in local authorities. The aim of the project is to understand the work practices of these services and the impact that buildings, technology and organisation have on their work. A next step for this research could be to develop a framework which further explains the studied aspects in this paper and coming research on this particular topic.

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