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The objectives of the Working Commission are 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 and to report and liaise with relevant CIB Working Commissions and Task Groups.

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Introducing Partnering in Denmark – Lessons Learned Applying Public Private Partnerships as an Innovation Platform

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Abstract

The purpose of this paper is to review practical experiences using public private partnership as an innovation platform in the construction sector. There is a growing attention to the importance of construction innovation as a means to securing the quality of the built environment as well as sustainability and economic welfare and prosperity in society. One approach to increasing the focus and rate of innovation processes is to facilitate closer interaction between at public and private companies targeting new thinking and innovation. This strategy characterises a Plan of Action, published by the Danish Government (autumn 1998), defining ideas for changes in the building sector. The background to this initiative was stagnating productivity in combination with an unacceptable high level of defects and conflicts in construction projects. As a specific target was to develop new forms of collaboration in project coalitions a programme aimed at this overall goal was launched early 1999, and work soon focused on partnering. In dialogue with the industry a joint understanding of partnering was evolved, based on the key words dialogue, trust, openness and early involvement of all project partners. Furthermore it was decided to anchor the development work in a public private partnership, in which the state as client should collaborate with private architects, engineers, contractors and suppliers. The guidelines for this partnership interaction were prepared in accordance with the long Danish tradition for state subsidized experimental building projects.

In this paper the progress and outcome of the PPP development programme are revised. Four main stages in the development process are identified and specified: 1) transforming the idea into a proposal 2)organising the partnership 3)framing the development work and 4)dissemination and implementation. Lessons learned through the experimental cases are discussed, and the applicability of PPP as an approach to innovation in construction is evaluated.

Keywords: public private partnership, partnering, experimental projects, innovation process

1. Introduction

As the construction industry produces products as buildings for clients and users it also provides physical and social infrastructure of a much greater importance for society. Buildings constitute a basic background to the quality of varying living and working conditions and experiences in modern society, be it in the context of the open urban space, in production and commercial buildings, as a framework for social and cultural activities, and as transport facilities (European Construction Research Network 2004). This larger impact of the built environment relates to new buildings as well as renovation of existing structures.

Thus the building industry must be a key factor in society's efforts to create better living conditions. Consequently the output of the industry should represent the best possible value for money ratio at any time. To achieve this goal it has been considered necessary for society in many western countries to stimulate clients and private companies to develop new forms of collaboration thus facilitating a comprehensive sharing of different actors and professionals' knowledge and best practises. In Denmark the discussions about this integrative effort have focussed in particular on the interplay between clients, users, designers, contractors and manufacturers – and the track to explore towards better interaction was much inspired by the concept of partnering.

In order to convert the vision into a practical approach the Government in 1998 published a Plan of Action for development work concerning collaboration in the building industry. In the wake of the plan a programme was conceived based on so called public private innovation and using experiences from a long national tradition for testing new ideas in real building projects (Bang et al 2001, Clausen 2002, Olsen 2003)..

In the following this approach to innovation through collaboration between public clients and companies in the building sector will be reviewed. The model grew out of building needs in the public sector, with the first steps taken in the 1970s followed by continuing refinements based on evaluations of its practical use throughout the next decades (Olsen 2003).

An essential feature of the model is that it comprises development at three levels of an innovation process: project, company and sector. Therefore the model is especially suitable for innovations where different partners' tasks depend on one another – thus constituting the value chain in a building project from client and the users to design and production companies.

The review is illustrated by a case describing the development of a new form of collaboration between a public client and the companies in the design and the execution of a building project (By- og Boligministeriet 1999).

It should be underlined that this innovation model is fully applicable for private clients as well.

2. Public private partnership on innovation – the four steps

In Denmark the first steps into a more close – partnership-like – collaboration on innovation between public clients and private companies were taken in the 1970s. The best known example on innovation from this early period is the development of industrial building methods as an open system building concept (Olsen 2003).

The main development topics during the last decades have focused on sustainability and in particular new forms of collaboration in building projects. A partnership on innovation between client and delivery team is based on the parties' mutual interest in the development work and its result. The starting point is an idea which is conceived and tested in the so called experimental building project, which constitutes the mutual pivotal point in the partnership. In this project the testing work is carried out in parallel with the execution of the building work (Olsen 2003).

The ideas behind experimental building projects have been widely accepted as an adequate model for public-private partnerships (Erhvervs- og Byggestyrelsen 2009). Within this framework the development work is divided into four phases: 1) transforming the idea into a proposal, 2) organising the partnership, 3) development work in parallel with execution of the building project and 4) dissemination and implementation of the results. Learned experiences and final results achieved through this process are made public through reports, articles, courses and seminars. In a number of cases these results constitute decisive input to new regulatory guidelines which are then typically made compulsory to state and state supported clients.

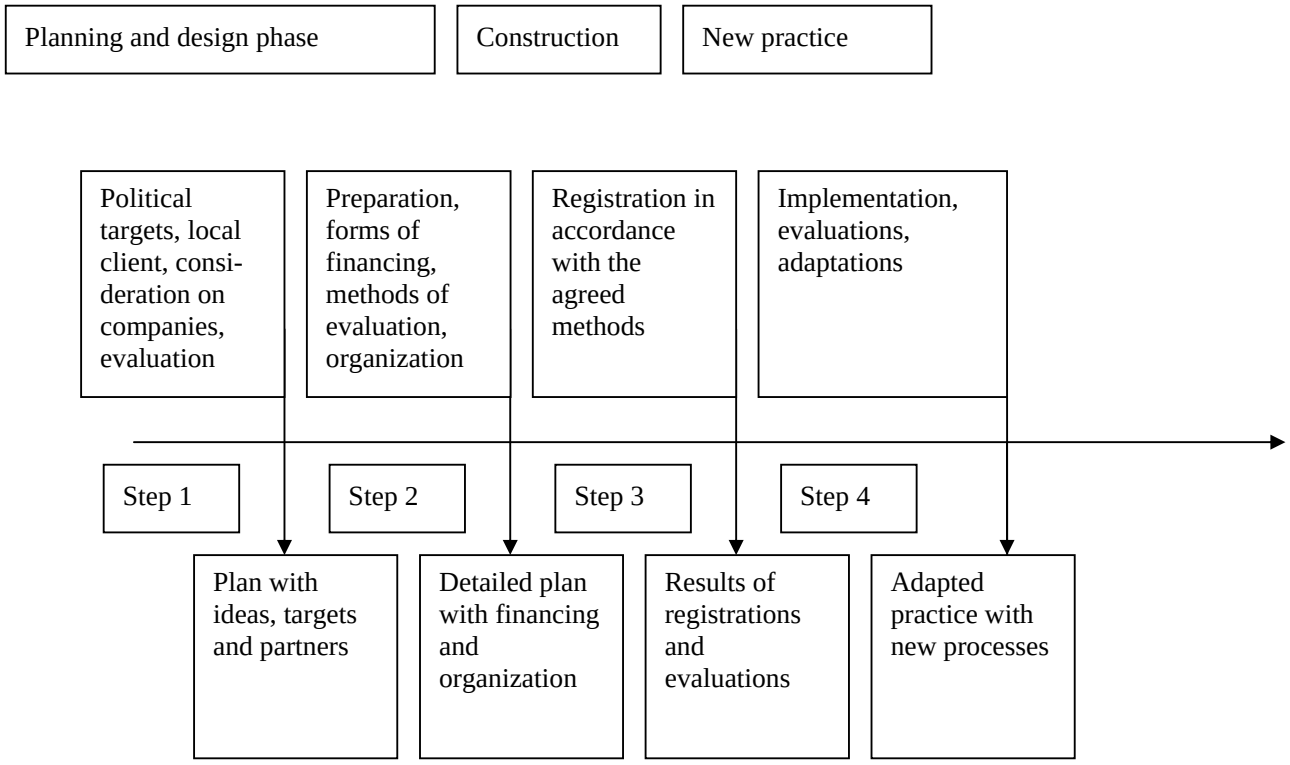

Figure 1.The four steps in public private public partnerships

In some cases a development idea will be tested in a network of clients with similar ideas to get a more firm basis for results and for guidelines.

As the four steps generally take into account topics as quality assurance, risk analysis and implementation of development work they can also serve as a checklist in a concrete project which involves alterations in traditional practice.

3. The case: Development of partnering – a new form of collaboration in building projects

As in several other countries the recent Danish construction innovation agenda has given priority to improving the level and quality of collaboration in the building sector in order to address well-known problems such as defects and low productivity growth rates. Danish endeavours have been much inspired by the partnering concept - a form of collaboration characterised by terms like dialogue, trust and early involvement in the building process.

At its core, a partnering project is realised through setting jointly formulated targets based on mutual economic interests. In practice there are a number of elements among which the partners can choose (Busk 2003, Høgsted et al 2006, Erhvervs og Byggestyrelsen 2006, Dansk Byggeri 2005). The Danish guidelines include elements like the development of common targets, the use of financial incentives, continuous monitoring of the collaboration process, open accounts, use of workshops, and procedures for handling conflicts - in total app. 15 elements .

These elements have evolved and been refined within app. 40 public-private partnerships since 1999. The starting point was a governmental Plan of Action in 1998, followed by a specific development programme aiming for a new collaboration form for building projects the year after.

In order to maintain and disseminate the overall target these partnerships were anchored in industry networks. In the subsequent 10 years period three networks have been successively organized in line with learned experiences, evaluation results and the gradually ripening of the concept. These networks were

- “New forms of collaboration” (1999-02): introduction and testing of ideas concerning basic elements in partnering
- “Clients create values” (2002-06): further testing and adding new elements
- “Partnering: learning, development and collaboration” (2006-09): final testing, analysing and summarizing on partnering elements.

These networks attended to tasks traditionally allocated to steering groups. The internal network meetings were only for clients from the participating partnerships and the independently assigned evaluators. Moreover the networks organised public seminars for a growing audience of interested parties from the building community.

The progress and results of entire development programme was evaluated in 2005 and 2006 by the independent institution "The Benchmark Centre for the Danish Construction Industry". (Byggeriets Evaluerings Center 2005, Byggeriets Evaluerings Center 2006)

4. Start-up of a partnership - transforming the idea into a proposal [step 1]

Generally speaking an idea of a partnership may come from one or more of the following parties: client or building owner, user, architect, consultant, contractor or research institution. It must be of general interest to other actors in the building sector - to users or to the community as such. Shared interests may be identified as new commercial options for the participating companies, as better 'value for money' for the client and/or functionality for the user.

In order to have development ideas flourish competitions may be organized, and accordingly a larger framework programme for several partnerships can be established on the basis of the competitive results.

Preferably a development idea must constitute some kind of a holistic/systemic approach based on knowledge from different partners in the supply chain – thus avoiding subordinated and isolated aspects. Furthermore the idea must be linked to a specific new building project with a title number in the Land Registry.

In many cases the partnership aims at testing in practice an idea for which basic research and development work has previously been carried out - where remaining questions are concerning operational perspectives. However, often also the opposite flow is experienced: the experimental testing in practice leads to new recognitions which are then made subject to research efforts (for instance in industrial PhD projects).

The partnership under consideration should be supervised by a nominated project manager, appointed particularly with reference to the specific development idea. Furthermore the draft development proposal must be scrutinised and assessed to demonstrate its capability of providing answers and results to the questions raised and goals defined. The intention behind the proposal must therefore be expressed in clear and verifiable terms.

The partnership performance should of course be accessible to the necessary observations and measurements, both during design and construction and most likely also later when the building has been put into operation.

As indicated it is considered important to establish collaboration with relevant research and development institutions. Likewise existing research based knowledge and development findings must be referred to in the proposal.

A crucial step 1 task is the selection of an independent – of the development project – evaluator, and to determine the procedures for evaluation of the testing process and its results. In doing so it has to be decided which data types can be used to examine the advantages and disadvantages of the ideas, and whether different existing benchmarks and key indicators will be of relevance.

At the end of this first step procedure the idea is converted into a draft proposal, which plays an important role as boundary object with regard to building bridge between the interested partners.

Case: Housing Estate Martins Gård, step 1

Martins Gård is a non profit housing estate in Herlev, a suburb to Copenhagen. In May 1995 the tenants decided to back up a proposal from their committee for the construction of 40 new flats on the roof of the existing buildings, new balconies on the 114 flats and renovation of bathrooms and installations for water and sanitary pipes.

The government was during the same period working on a plan of action for development of new forms of collaboration; accordingly the building industry and especially public clients was urged to take part in development projects. The finished plan was published in 1998. On background of the considerations at the ministerial level the housing committee in its role as client decided to test and evaluate some of the newly defined elements concerning collaboration in the building process in a dialogue with private companies. The chosen form was designated with the term partnering.

The following targets were agreed between the project partners: early dialogue between client, users and companies to minimize conflicts concerning quality and costs, common consultations and design, reliable cost control, responsible acting and handling in accordance with agreements, integration of competencies around the table, and supportive backup from executive officers of the companies involved.

The client decided to select an independent private consultant as evaluator and to choose the contractor through prequalification followed up by a selection based on ‘economically best offer’ procurement. The designer was chosen at an earlier stage to assist the client with the procurement procedures.

On basis of the governmental plan and further investigations of existing knowledge and experiences a plan for registration and evaluation of key elements in the building process was worked out. These elements were: collaboration, time, economy and quality. The Ministry of Housing and Building which provided financial support for the testing of the new elements, took the initiative to establish a network including other clients with similar development projects as well as research institutes.

The final result of step 1 was: a brief which outlined the target; the frameworks for the idea and main features of the execution with the principal actors, and the evaluation process.

5. Organising the partnership [step 2]

The project manager is in charge of preparing the programme for the development work into its final form. In addition the performance of the partnership must be monitored by a steering group whose members are appointed by the partners in the partnership. This group represents professional support with practical and scientific knowledge and has to ensure that the development efforts follow the programme. The group is also taking part in the evaluation and the dissemination of the results.

During some periods the government has made financial subsidies available to cover all or part of the additional costs of planning, execution and follow-up on the processes in the partnership, however excluding construction costs. But normally the client and the building companies must themselves bear the extra costs of the development activities.

Upon the completion of step 2, the partnership is ready to commence the practical work, related to the execution of the building project.

Case: Housing Estate Martins Gård, step 2

The client's project manager worked out a detailed testing programme in collaboration with the chosen evaluator. Following forms of registration were used: questionnaires and interviews concerning collaboration, realised timetable (time), realised building costs with a list for additional costs (economy) and evaluation of finished building and defects at hand over (quality).

The client and the evaluator took a joint initiative to plan meetings for the earlier mentioned network of interested stakeholders. Additionally as a first effort to disseminate the experiences and results a plan was scheduled for public seminars during the execution of the testing programme, drawing upon its preliminary results.

6. Creating space for development activities in parallel with the execution of the building project [step 3]

In the third step the building project is executed. It is the project manager's task to ensure that the intended development activities are incorporated into the planning and execution of the building project.

The project manager takes care of collecting data, which the companies themselves have to register. The evaluator takes care of collecting any other data.

On basis of progress reports, meetings and sometimes seminars the steering group will be informed about the implementation of the development programme into the building process, as well as of the testing procedures at the end of main stages. Experiences are discussed in the steering group and in the network.

Towards the end of this step, building activities have been completed, numerous observations have been made, and crucial lessons have been learned.

Case Housing Estate Martins Gård, step 3

The evaluator was responsible for organizing and collecting the agreed evaluation data. During this process the evaluator in collaboration with the client arranged meetings with participants from the network – in particular other clients and evaluators – to inform about the provisional results and discuss the plan of evaluation.

Several open seminars of a more general character was attracting a large number of interested clients, architects, consulting engineers, contractors and manufacturers from the building industry, as well as representatives of the industrial associations.

6. Dissemination and implementation of results [step 4]

Once the building project has been completed, the results must be recorded and published. Consequently, the last stage in a partnership is the drafting of a report through which the results are made available to other interested groups, such as the press, clients, users, architects, engineers, contractors, suppliers, research and teaching institutions and others.

Upon the conclusion of step four, efforts are consequently focussed on disseminating the experiences gained and the lessons learned to the benefit of the entire construction community.

Case Housing Estate Martins Gård, step 4

The results of step 3 were divided into three parts. The first part concerning more general experiences: for instance the testing of the new form of collaboration, partnering, had revealed the importance of a clear understanding of the individual roles within the partner team, likewise of the shared economic incentives.

The second part contained experiences about recommendations for future projects. As for example the importance of having the most important subcontractors on board from the very beginning of the project, as well as clear rules for communication during the design phase.

The third part raised general questions concerning normal practice. For example topics concerning competition when choosing design company and contractor and the use of the Danish General Conditions for Works.

The results were published on a governmental website and in a report which was used in workshops and post educational courses. The main results were included in a broader collection of experiences from other public private partnerships to form the basis for general guidelines.

The government took the guidelines forward and implemented them in connection with the preparation of a new directive covering state building projects and state subsidized projects (i.e. new public and social housing projects). In accordance with the directive it was made mandatory for clients in these sectors to evaluate – and document – the considerations concerning eventual use of partnering. However, it was not made a specific requirement to apply partnering.

Since the first results and the introduction of partnering several evaluations of this new form of collaboration, and thereby also of the use of public private partnerships, have been carried out.

They have shown that the partnering concept has gained a considerable diffusion in the building industry and among clients, not only in state subsidized markets, but indeed also in private market segments. They did of course pinpoint problem areas as well. Therefore the original ideas have been further tested and developed.

7. Reflections on the success of using public private partnerships in the building sector innovation

Research into innovation in the building industry has up till now mainly been focussing on development of products and processes as a result of private companies' strategic decisions. However, recognising that a characteristic feature of construction processes is a complex interaction between many actors and companies within a comprehensive set of legal rules, norms and traditions, also theories about developing and implementation of innovations need to take into account the importance of interdependence between different partners in the building projects.

As a means to bridge the organisational and systemic borderlines in innovation processes, the Danish Agency for Enterprise and Construction proposed using of public private partnerships based on experimental building projects as an innovation platform for the building industry. Within this partnership model the public client holds a main role in staging a successful collaboration.

Denmark has more than 30 years of experience with experimental building projects. This approach to innovation has successfully led to radical new as well as incremental improvements in products and processes in construction throughout the decades. Classic examples are concrete columns for multi story housing, sustainable mould toilets, energy efficient components, rainwater recycling, user

participation in design, supply chain logistics, life cycle economy and – as described in this paper – partnering.

This innovative form of collaboration, partnering, has been refined through testing and evaluations in app. 40 public private partnerships, thus adding revised and new features to the basic partnering model first introduced in the mid 90s. Till now app. 15 partnering elements have been made object to extensive testing, evaluation and improvements, for instance use of workshops, team building, collaboration agreement, selection of partners, lines of responsibility, bonus and incentive schemes, dialogue forms, development of competencies and feedback instruments.

Despite all efforts there are still barriers to the use of partnering which need to be addressed on the road towards better practises. Public reviews illustrate a quite broad variety of attitudes to the pros and cons of partnering:

In 2008 an investigation of the considerable cost overrun on the construction of a new headquarter for the Danish Broadcast Company argued that partnering in connection with design process problems was directly the cause of a DKK 30 - 40 million cost overrun out of a total of DKK 200 million. In this building project (from 2003-2007) partnering was for the first time used on a technologically very complicated concert hall.

In a 2006 survey made by The Benchmark Centre for the Danish Construction Industry, asking 35 public and private clients about their opinion of partnering, 34 responded that they preferred partnering (Byggeriets Evaluerings Center 2006).

In 2007 the number of conflicts in projects applying partnering based on collaboration was compared with traditionally organised projects (Erhvervs-og Byggestyrelsen et al 2008). The conclusion was that a wider use of partnering would considerably reduce the number of conflicts and the resources used on conflicts. At that time it was estimated that the share of partnering projects out of total construction was 10-12 %.

In 2010 the Danish weekly technical journal Ingeniøren made a series of interviews with big contractors (Ingeniøren 2009). According to these contractors their share of partnering projects were varying from 10-15 % and up to 70 %. Ingeniøren also stated that based on recent data from The Danish Benchmark Centre there is no significant difference between collaborating in partnering projects compared to more traditional projects. Finally the Danish Client Association had the opinion that “the use of partnering now is on a natural level”.

8. Conclusion

The development of innovations in construction can be intensified through establishing of public private partnerships. Thereby relevant knowledge at the public side as well as in private companies can be mobilised in joint processes towards targeting new thinking and innovation. In building projects the public client represent the public partner in the partnership.

In Denmark this form of innovative partnerships build on a long tradition of so called experimental building projects. An essential feature is that it comprises development at three levels of an innovation process: project, company and sector.

An innovation partnership is based on mutual interest in the development work and its result. The starting point is an idea which is developed and tested in parallel with the execution of a building project.

The development work is divided into four phases/steps: In *step 1* the idea is transformed into a proposal and the framework for the innovation work is agreed between the potential partners. In the *next step* the partnership is organized and a scheme and a finance plan for the development work are evolved.

During the *third phase* development work will in some cases proceed but the main task is registration of data for testing and evaluation. In the final *phase four* the evaluations are reported by an independent evaluator with proposals for putting the results into practical use. Also in this phase the public client will take initiative to publish the results in a report as well as on relevant homepages.

This Danish approach to innovative public private partnerships in the building industry is illustrated by a case concerning developing of a new form of collaboration known as partnering.

The starting point was a social housing estate where the client decided to exploit new interactive processes in connection with design and construction of a planned project. The participating companies agreed to alter traditional methods and let an independent evaluator test the results.

The final outcome represented valuable experiences concerning partnering-like collaboration, which later and after further developing and testing in other experimental building projects proved to have given substantial inputs to best practice partnering in the Danish building industry.

Innovative public private partnerships can thus be concluded to have been a main precondition to the relative strong conceptual strength partnering now holds as collaborative platform in Danish construction projects.

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Public Procurements' Qualification Requirements: The Case of Dutch Civil Work Procurements

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Abstract

Public procurement of infrastructure has been subject to a long standing debate concerning the procurements' qualification requirements. Basically, it remains unclear what determines public procurement officers to vary procurements' qualification requirements. This research serves to elaborate on public procurements' procedure design. The aim of this paper is to improve our understanding of why contracting authorities choose specific requirements prior to public procurement. What determines variation in public procurements' qualification requirements? Qualification requirements are chosen as to maximize utility of the procurements' officer. In the empirical part of the paper we consider the procurements' procedure design in greater detail. The data comes from the EIB Monitor Procurements covering public procurements in the Netherlands, and relates to public open procurements of civil work posted by municipalities in the first half of 2009. The data indicate that requirements do relate to degree of professionalism of the procurement office and to the type of work. These results suggest a rational choice among qualification requirements yet may suggest other factors at work also.

Keywords: construction industry, infrastructure, public procurement auctions, qualification requirements, municipalities

1. Introduction

Public procurement of infrastructure has been subject to a long standing debate regarding the proportionality of qualification requirements. For many public contracts, firms may submit sealed bids in which the contract is by law awarded to the lowest qualified bidder. The issue of what defines a qualified bidder is subject to much controversy. According to many small contractors, qualification requirements prevent them from bidding, reducing competition for public work. In a recent survey, about six out of ten contractors indicated that they encounter great difficulties in meeting qualification requirements preventing them from bidding, yet would be able to carry out the specified work (Hardeman and Jansen, 2009). Table 1 shows what qualification requirements civil engineering firms' consider most restrictive.

Table 1: Qualification requirements to which contractors do not comply although they were able to perform.

qualification requirements	*share of civil construction companies*
Reference works	*.66*
Annual turnover	*.54*
ISO 9001- or VCA-certificate	*.05*
Bank guarantee	*.04*
Other	*.35*
Unknown/no answer	*.02*

From table 1 one observes that two out of three mentions experience with comparable works as one of the most obstructive requirements. Firms also question the proportionality of the qualification requirement on annual turnover. This paper considers these qualifications in public procurement in greater detail, elaborating on public procurements' procedure design.

The issue arises as to what determines procurement officers to vary procurements' qualification requirements. Boes and Dorée (2007) indicate that procurement officers themselves do not consider the procedure design very important. Tender strategy is ranked after issues like calculation, project management and procurement legislation. Also, most economic literature on auctions does not explicitly address the issue of what determines procurement officers to vary procurements' qualification requirements. Yet, this literature forms a relevant source to draw on in this paper. The literature indicates that the value of the auction depends inter alia on the number of bids *viz.* the degree of competition (Brannman, Klein and Weiss, 1987), with new entrants bidding more aggressively winning with significantly lower bids than incumbent bidders (De Silva, Dunne and Kosmopoulou, 2003). Furthermore, the literature indicates that procurement procedures that publicly release information concerning the value of the contract (e.g. cost estimates) result in more aggressive bidding and higher values for the contracting authority (De Silva, Dunne, Kankanamge and Kosmopoulou, 2007). This literature indicates the relevance of procurement's procedure design on the

final outcome, yet systematic analysis on the determinant of qualification in public procurements' procedure design is missing. An exception is Estache and Iimi (2008, 2009). In Estache and Iimi (2008) road, water and electricity projects in less developed countries are considered. Their results indicate that procurement design is of great importance in reducing unit costs of infrastructure. In Estache and Iimi (2009) the procurement design of those electricity projects is considered in greater detail. These results suggest interactive effects among procurements' design and competition also, yet, the small number of observations, *viz.* 21 procurements, prevents the effect being statistically significant.

In the current paper we consider what determines public procurements' procedure design to vary using a much larger dataset. How can we better understand the public procurement procedure design choices? Do procurements' procedures vary in design? What determines procedure design to vary? These questions are central in this paper. The organization of this paper is as follows. In section 2 we outline the theoretical background of the paper. Section 3 consists of a description of the civil construction public procurements' design. This analysis is based on the EIB Monitor and involves public open procurements of civil work in the Netherlands awarded in the first half of 2009. In section 4 we analyze what determines variation in public procurements' qualification requirements. Conclusions and suggestions for future work are given in Section 5.

2. Public procurement design

The aim of the contracting authority is to obtain the best value conditional on the procurements' process design. The public procurements' process design includes the choice of the type of procedure to be followed, award criteria, and qualification requirements. Figure 1 indicates the various procurement design options.

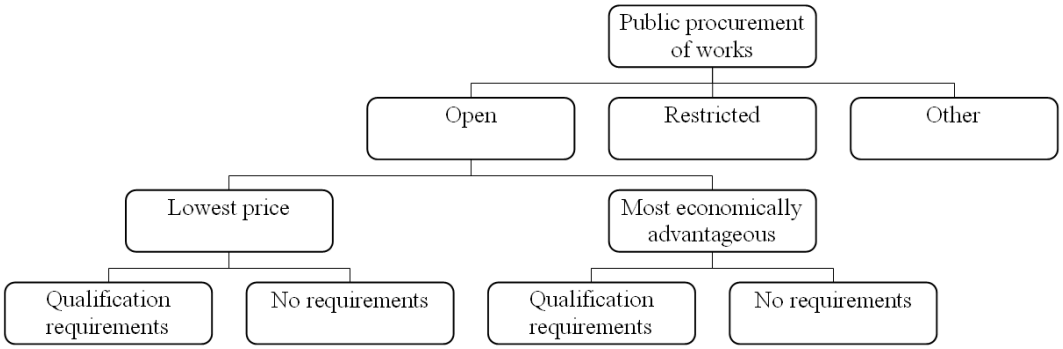

Figure 1: Public procurements' design

Figure 1 indicates that the procurements' process design starts with the choice of the type of procedure *viz.* open procurements, restricted procurements and other procurement like competitive dialogue and negotiations.

First, a choice is made between open, restricted and other procurements. Conditional on the choice of the open procurements a choice is made between award criteria *Lowest price* and *Most economically advantageous* tender. The former means that the contract will be awarded to the lowest bidder. For the latter, the contracting authority also gives a value to a number of prespecified criteria considering quality aspects like planning or pollution reduction, and the contract will be awarded to the contractor who places the most economically advantageous bid. Subsequently, qualification requirements are considered, involving both financial and technical requirements.

Financial qualification requirements - The most common financial requirement concerns the annual turnover of the company, which must be above some threshold, averaged over the last three years. In addition, bank guarantees are asked for to guarantee (partial) recovery of payment in case of a contractor's default.

Technical qualification requirements - Technical adequacy can usually be demonstrated by means of proper and timely execution of one or more similar works in the past (referred to as reference works). Other common requirements are the possession of special certificates, for example ISO 9001 (which certifies that formalized business processes are being applied) or VCA (concerning safe and healthy operation).

The procurement's process design is the choice among those alternatives. In the empirical part of the paper we consider what determines procurement officers' procedure design choice. For this we relate observed choices to observables. Before turning to the results we describe the data first. This is the topic of the next section.

3. Data

The data comes from the EIB Monitor Procurements covering public procurements of civil work in the Netherlands. The EIB Monitor Procurements includes information on the name, address and contact data of the contracting authority, the agency that may provide further information, procedural information on qualification requirements, and attributes of the civil work such as type of work, location and duration. In addition, the data includes information on the number of bidders, details of the bidders, and the associated bids. The data we use involve public open procurements of civil work posted in the first half of 2009. We have 456 procedures of 182 different contracting authorities with 4189 bids. Here, we select procurements by municipalities for which we have 289 procedures and 2820 bids for 120 of 441 municipalities. Table 2 gives information on qualification requirements, in totals and by procurement award.

Table 2: Qualification requirement by type of procurement award, shares

	Total	*Most economically advantageous*	*Lowest Price*
Technical Qualifications			
Reference works	*.98*	*.90*	*.99*
ISO 9001	*.56*	*.43*	*.58*
VCA	*.47*	*.40*	*.47*
Financial Qualifications			
Turnover	*.84*	*.87*	*.84*
Bank guarantee	*.97*	*.97*	*.97*
N	*289*	*30*	*259*

From table 2 one observes that the majority of contracts is awarded on lowest price criterion. For one out of ten procedures, the contract is awarded to the bidder who has the most economically advantageous tender. Nine out of ten procedures are on lowest price. Regarding the qualification requirements, there are no clear differences between award criteria categories. With Fisher's exact test we cannot reject the null hypothesis that the use of the qualification requirements is unrelated to the award criteria at a significance of α =0.05. Contracts typically include requirements concerning the timely and correct delivery of projects. For five out of ten procedures, technical capacities must be proved by ISO 9001 or VCA certifications. Requirements concerning the annual turnover of bidders are absent for two out of ten procedures.

In practice, procurement designs include combinations of qualification requirements. Based on table 2, we constructed four mutually exclusive packages of qualification requirements. We used requirements relating to annual turnover as the distinctive financial requirement, and requirements relating to technical certificates are used as the distinctive technical requirement. All procurement procedure designs are assigned to one of the packages. Note that, because bank guarantees and reference works are so commonly required (more than 95%), we do not use them in this classification. Table 3 gives information on qualification requirement packages.

Table 3: Packages of qualification requirements

Financial qualification requirements on annual turnover	*Technical qualification requirements on ISO 9001 and/or VCA certification*	*Package*	*Share*
No	*No*	*1*	*.06*
	Yes	*2*	*.10*
Yes	*No*	*3*	*.26*
	Yes	*4*	*.58*
N			*289*

From table 3 one observes that in one out of sixteen procurements no specific financial or technical qualifications are required. In six out of sixteen procurements either financial or technical qualifications are indicated. Most procurements request financial and technical qualifications.

These procurement procedures may vary with degree of professionalism of the procurement office, the type of work and type of bidders.

Degree of Professionalism

An important attribute in procedure design is the procurement officers' degree of professionalism. Professionalism relates to knowledge, experience and expertise be it internal, or external. The degree of professionalism can be indicated by various proxies. First, the degree of professionalism relates to the size of the organisation. Contracting authorities with more inhabitants, will on average have larger organisations with more specialised employees. We use the total length of roads as a proxy for size too. Professionalism also relates to the available budget for construction and maintenance of roads, playing fields and sewerage. The larger the budget, the larger the organisation and the more specialized the personnel. Second, the degree of professionalism relates to the degree of experience with public procurement in the organisation. We use the number and total volume of public procurements of civil engineering works by municipalities in the period 2000 to 2006, as an indication of the degree of experience with public procurement. Third, professionalism relates to experience external to the contracting authority. For this we use information on whether external professionalism is hired.

Characteristics of the work

Properties of the work itself may influence the procurements design. First, the type of work may be an indicator. Some types of work will be more complex than others, and subsequently require more expertise and knowledge from the contractor in order to be fulfilled properly. We use the CPV code (Common procurement vocabulary) given by the procurements' officer to distinguish between types of work. We consider 7 types of infrastructure work, based on the first digits of the CPV code (Common Procurement Vocabulary) as shown in table 4. Note that there might be some heterogeneity

in types as many contracts contain components that belong to multiple CPV codes. Some procurement officers therefore used the code of the most important component, others referred to the more general code (like 4500 for all types of construction) in their announcement.

Table 4: Types of work

	CPV main classification	*Type of work*
A	*45221*	*Bridges and tunnels*
B	*45220, 45222, 45223*	*Other civil engineering*
C	*45231, 45232*	*Pipes and drains*
D	*45233, 45234*	*Road construction and maintenance*
E	*45236*	*Flatwork (playing fields)*
F	*4524, 4525*	*Water projects*
G	*Other*	*Other*

Second, the procurement design relates to size of the work. The size of the project is typically indicated using engineers' cost estimates provided by the contracting authority. This information is typically not available in the Netherlands. For 30 out of 289 observations we have information on the engineers cost estimate. We therefore use the lowest bid as a proxy for project size. Third, procurement design relates to the urgency with which the work has to be performed. We use the time (expressed in a number of days) between the first announcement and the award date as a proxy for urgency. Note that this proxy for urgency is influenced by changes in plan, questions from potential bidders, or procedural mistakes and rectifications also. We define the number of days between the opening of the tender, and the date the work starts, as a second proxy for urgency.

Expectations about the number of bidders

Procurement design may depend on a procurement officer's expectation regarding the number of bidders. These expectations may be based on backward looking (where one uses information about past procurements) or forward looking. We have no knowledge about the procurement officers' expectations regarding the number of bidders. We assume perfect foresight with procurement officers having perfect information regarding the expected number of bidders. For this we use the number of bidders ex-post.

The summary statistics of the data are given in table 5. Monetary values have been deflated to 2006 values.

Table 5: Summary statistics

Variable	*Average*	*Stdev*	*min*	*max*
Professionalism				
Size of municipality (number of inhabitants)	*97,588*	*130,075*	*8,193*	*587,134*
Length of municipal roads (km)	*508*	*397*	*47*	*1803*
Municipal budget for roads, playing fields and sewerage (x € 1000 averaged over last 5 years)	*22,736*	*45,004*	*1,383*	*204,202*
Number of public procurements by authority (2000-2006)	*63*	*91*	*1*	*157*
Volume of publicly procured works (2000-2006 in 1000 €)	*36,500*	*51,100*	*58*	*208,000*
Dummy external advisor	*.38*	*.49*	*0*	*1*
Type of work				
Dummy Bridges and tunnels	*.05*	*.22*	*0*	*1*
Dummy Other civil engineering	*.44*	*.50*	*0*	*1*
Dummy Pipes and drains	*.09*	*.29*	*0*	*1*
Dummy Road construction and maintenance	*.19*	*.40*	*0*	*1*
Dummy Flatwork	*.05*	*.22*	*0*	*1*
Dummy Water projects	*.02*	*.15*	*0*	*1*
Dummy Other	*.15*	*.36*	*0*	*1*
Contract size (lowest bid, €) (ex post)	*748,466*	*933,239*	*44,700*	*7,333,000*
Announcement period (number of days between first publication and award date)	*38*	*19*	*23*	*307*
Start time (number of days between award date and start of job)	*21*	*26*	*0*	*146*
Expectations				
Number of bidders (ex-post)	*9.8*	*3.8*	*2*	*23*

One observes from table 5 that the contracting organisations are rather heterogeneous. Municipalities vary in number of inhabitants, ranging from 8 thousand to 587 thousand, and in length of roads in their jurisdiction, ranging from 47 to 1803 km. This variety is also reflected in the budget, in the number and volume of procurement procedures between 2000 and 2006, and in whether external advisors are hired. We expect this variation to be reflected in the degree of professionalism and as a result, in the procurement design.

Regarding type of work one observes that two types dominate *viz.* road construction/maintenance, and other civil engineering relating to (re)development of public space and site preparation. On average the contract size amounts nearly 750 thousand euros. Differences in complexity and size may result in different qualification requirements.

We proposed urgency as yet another characteristic of the work. From table 5 one observes that most projects are announced 20 to 40 days before the award date. In a few cases, the number of days is more than 100, indicating that the procedure may have been interrupted and later resumed. Regarding the second proxy for urgency one can observe that on average the start time is 21 days after the opening of the tenders. In 42% of the procedures the contractor may start immediately after the contract has been awarded, in 20% of the cases, the start date is between 20 and 30 days after the opening of the tenders. For the remaining 38%, the start date is more than 30 days after the tender opening.

The number of bidders varies from 2 to 23, with an average of 9. The expected number of bidders may be an important determinant in the procedure design process, as the procurement officer may use qualification requirements in an attempt to limit the number of participants.

4. Results

Table 6 gives a decomposition of the various procedures relating differences to degree of professionalism, characteristics of the work, and, expectations about the number of bidders.

Procedures without technical and financial qualification requirements are used by municipalities with more inhabitants, more roads under jurisdiction, a larger budget and more experience than average. Procedures with both technical and financial requirements are used by smaller municipalities. This suggests that professionalism is negatively related to the application of qualification requirements. The decomposition results indicate that professionalism induces decision makers to release qualification requirements, both technical and financial. Smaller municipalities design their procedures on average with more requirements. One explanation may be that experienced procurement officers are more capable of absorbing and handling risks in a later stage.

The procurement officers' choice appears to relate to type of work as well. Works concerning pipes and drains, road construction and maintenance, and flatwork are relatively often procured using package 0 (no requirements). Other civil engineering contracts are relatively often procured using both technical and financial requirements. This finding is in line with our theoretical exposition where we argued that the requirements are a rational choice and not randomly set. Road construction work may be relatively easy to manage, compared to other civil engineering projects which may be more complex. Design choice does not seem to be related to contract size or urgency (indicated by the number of days between announcement and award, or by the number of days between award and start). Furthermore, design choice does not seem to be related to expectations about the number of bidders.

Table 6: Decomposition by Procurement Design (Means, with standard deviation in parentheses)

	Pooled		*Design 0*		*Design 1*		*Design 2*		*Design 3*	
Professionalism										
Size of municipality (number of inhabitants)	*97,588*	*(130,075)*	*399,347*	*(265,648)*	*146,547*	*(210,090)*	*66,126*	*(42,195)*	*73,126*	*(61,305)*
Length of municipal roads (km)	*508*	*(397)*	*1,326*	*(678)*	*597*	*(586)*	*378*	*(210)*	*470*	*(271)*
Municipal budget for roads,playing fields,sewerage (x€1000)	*22,736*	*(45,004)*	*135,806*	*(95,798)*	*45,173*	*(75,736)*	*12,573*	*(8,733)*	*12,153*	*(10,317)*
Number of public procurements by authority (2000-2006)	*63*	*(91)*	*259*	*(179)*	*90*	*(143)*	*54*	*(48)*	*42*	*(47)*
Volume of publicly procured works (2000-2006, x€1000)	*36,500*	*(51,100)*	*140,000*	*(95,900)*	*54,600*	*(75,500)*	*25,800*	*(22,500)*	*27,500*	*(33,600)*
Dummy external advisor	*.38*	*(.49)*	*.53*	*(.51)*	*.39*	*(.50)*	*.24*	*(.43)*	*.43*	*(.50)*
Type of work										
Dummy Bridges and tunnels	*.05*	*(.22)*	*0*	*(0)*	*.04*	*(.19)*	*.11*	*(.31)*	*.04*	*(.19)*
Dummy Other civil engineering	*.45*	*(.50)*	*0*	*(0)*	*.32*	*(.48)*	*.41*	*(.50)*	*.51*	*(.50)*
Dummy Pipes and drains	*.09*	*(.29)*	*.18*	*(.39)*	*.14*	*(.36)*	*.07*	*(.25)*	*.08*	*(.28)*
Dummy Road construction and maintenance	*.19*	*(.40)*	*.41*	*(.51)*	*.25*	*(.44)*	*.20*	*(.40)*	*.16*	*(.37)*
Dummy Flatwork	*.05*	*(.22)*	*.12*	*(.33)*	*.11*	*(.31)*	*.04*	*(.20)*	*.04*	*(.19)*
Dummy Water projects	*.02*	*(.15)*	*0*	*(0)*	*0*	*(0)*	*.03*	*(.16)*	*.03*	*(.17)*
Dummy Other	*.15*	*(.36)*	*.29*	*(.47)*	*.14*	*(.36)*	*.14*	*(.35)*	*.14*	*(.34)*
Contract size (lowest bid, €) (ex post)	*748*	*(933)*	*973*	*(1,343)*	*955*	*(1,611)*	*551*	*(628)*	*781*	*(837)*
Announcement period (days between publication and award)	*38*	*(19)*	*40*	*(8)*	*48*	*(52)*	*38*	*(12)*	*36*	*(9)*
Start time (days between award date and start of job)	*21*	*(26)*	*6*	*(10)*	*22*	*(30)*	*21*	*(27)*	*23*	*(25)*
Expectations										
Number of bidders (ex-post)	*9.8*	*(3.8)*	*8.2*	*(2.8)*	*10.2*	*(4.5)*	*9.7*	*(3.6)*	*9.9*	*(3.9)*

Number of observations	*289*		*17*		*28*		*76*		*168*	

5. Conclusions

In this paper we considered what determines public procurements' procedure design to vary. We considered public procurement procedure design choices, considering whether procedures vary in design, and if so, what determines these differences among procurements. Qualification requirements are chosen by the procurements' officer. In the empirical part of the paper the design choices are considered in greater detail. The data comes from the EIB Monitor Procurements covering public procurements in the Netherlands, and relates to public open procurements of civil work posted in the first half of 2009. For this paper we selected procurements by municipalities for which we have 289 procedures for 120 municipalities.

We observed that the majority of contracts is awarded on lowest price criteria. For nine out of ten procedures, the contract is awarded to the bidder who has the lowest price. One out of ten open procedures is awarded on most economically advantageous tender. Regarding the qualification requirements, we found no clear differences between both award criteria categories. Requirements concerning the timely and correct delivery of similar projects do not vary with award criteria. For seven out of ten procedures, technical capacities must be proved by ISO 9001 or VCA certifications. Requirements concerning the annual turnover of bidders are absent for two out of ten procedures.

The decomposition indicates that requirements do relate to degree of professionalism of the procurement office and the type of work. Using the municipal budget for road construction, playing fields and sewerage as an indicator for professionalism, we showed that procurement officers in more professional organisations, in general apply less strict qualification requirements. With regard to the type of work, we showed that the procedure design differs between road construction, pipes and drainage and flatwork projects. We could not find a relation between the expected number of bidders and the qualification requirements.

These results indicate a rational choice among qualification requirements yet may suggest other factors at work also. Future research considers more formal models in which procurement design is modelled as a limited dependent variable model in which the choice of qualification requirements and the number of bidders interact.

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Relationship between Design-Build Procurement Duration and Project Success

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Abstract

In the United States, owners are frequently adopting the design-build (DB) method for delivering construction projects rather than the traditional design-bid-build (DBB) method. Benefits of adopting DB have been identified by several studies that measured performance of projects delivered with DB as opposed to DBB. The majority of these studies support the prevalent belief that an owner can achieve a schedule advantage by adopting DB for delivering its projects. However, recent studies have suggested that the owner's personnel have to spend a considerable amount of time experimenting and developing procedures under the new delivery approach. For some projects, the duration of the procurement phase was as long as 35% of the total delivery time suggesting that the complexity of DB procurement may offset part of the expected schedule advantage. While concerns involving duration of DB procurement have been raised, there is a lack of information on this topic. Though several approaches to the procurement of design-build services are available to owners, certain industry sectors have institutionalized the two-phase selection procedure. Among others, the highway sector has been affected by the 2002 Design-Build Contracting Final Rule issued by the Federal Highway Administration (FHWA). This rule strongly encourages the use of two-phase selection procedures for DB procurement. As a result, the two-phase selection procedure represents the current practice of procuring design-build services on highway projects. Being predominant in the roadway sector, the two-step approach to DB procurement made possible the task of collecting and comparing data on procurement duration. In this paper, the authors report findings from a study that analyzes duration of procurement activities for highway projects. Data on highway DB projects were collected for many DB projects, and descriptive statistics were computed for DB procurement activities. In addition, metrics on DB project success were computed and used to test relationships between DB procurement duration and success.

Keywords: project delivery, Design-Build, procurement duration

1. Introduction

Nowadays, owners have the possibility to select several methods for delivering construction projects with Design-Build (DB) being among the more popular methods. Under DB, the design and construction aspects are contracted for with a single entity. Among the many advantages offered by DB, there are single point of contact, early knowledge of costs, time savings, cost savings and enhanced communication (Allen 2001, Konchar et al. 1998, Migliaccio et al. 2009, Molenaar et al. 2004, Molenaar et al. 2001, Molenaar et al. 1999, FHWA 2009, EI Wardani et al. 2006). Design-Build can also support construction flexibility and innovation in both design and construction (Ashley et al. 1987, Chan et al. 2002, Molenaar et al. 1998, Songer and Molenaar, 1997, Naoum et al. 1994).

One of the main drivers for selecting DB is its potential for time savings. This is the main reason that many public agencies choose DB (Molenaar et al. 1998, Songer and Molenaar 1997, Naoum et al. 1994, Ndekugri et al. 1994, Songer et al. 1996, Migliaccio 2007). Design-Build by allowing design and construction activities to occur concurrently reduces the total project duration (FHWA 2009, Hale et al. 2009). The U.S. Federal Highway Administration (FHWA) found that DB can reduce the overall duration of highway projects by 14%, reduce the total cost of projects by 3%, and maintain the same level of quality as compared to Design-Bid-Build (FHWA 2009). These findings confirm what was found in other studies: DB usually reduces the cumulative duration of the design and construction phases.

However, an important issue has been left unsolved by previous studies. While the traditional bid phase disappears on a DB project, a new cumbersome procurement phase is required. During this phase, the agency initiates a complex set of activities aiming at the procurement of a contract for DB services (Migliaccio et al. 2009). The duration of this phase is significant and can hinder the overarching goal of an early delivery.

In a previous study, a group of industry experts agreed that one of the most important aspects for successful implementation of DB in the transportation sector is to make sure that an efficient procurement process is in place (Migliaccio et al. 2008). While this study concluded that “lengthy and inefficient project procurement processes may hinder agency credibility and result in lower industry competition” (pp.361), other studies suggest that firms participating in the procurement need an adequate amount of time to assess the risks associated with a not fully designed project (Migliaccio et al. 2009). It is reasonable to assume that having more time to prepare a DB proposal would produce proposals with more reliable schedules and estimates. The aim of this study is to explore the relationship between DB procurement duration and the accuracy of DB contracted schedule and price. The research was narrowed to include only public highway and bridge projects in the United States.

2. Research methodology

The focus of this research study was to determine if there is a relationship between DB procurement duration and certain dimensions of project performance. For this study, procurement is assumed to begin on the date the final Request for Proposals (RFP) is issued. The procurement is assumed to be

completed on the day that all technical and price proposals are due. The researchers used the following project performance factors to measure success: schedule growth, cost growth and total project time growth. Schedule growth is a measure of how much the actual project duration was over (or under) the original contracted duration. Cost growth is a measure of how much the actual project cost was over (or under) the original contracted cost. Lower levels of schedule and cost growth indicate greater project success as it relates to this study.

Linear correlation analysis was used to test the following research hypotheses:

- The longer the procurement duration, the lower the schedule growth.
- The longer the procurement duration, the lower the cost growth.
- Different selection methods will affect the relationship between procurement duration and project success.
- Project complexity will affect the relationship between procurement duration and project success.

A linear regression correlation analysis was used to examine the relationship between procurement duration and schedule or cost growth. In this analysis, the Pearson value is used to test the reliability level. All the analyses were conducted using the commonly-used 95% confidence level.

3. Data collection

The data sample included 146 projects across 15 states with the majority of data coming from the state of Florida. Table 1 includes descriptive statistics on the data sample. Data for most of these projects were gathered from state DOT reports and state DOT databases. However, several other sources contributed to the data sample, including surveys, published project information, previous research data (Gransberg et al. 2003, Gransberg and Molenaar 2004, Griffith et al. 1999, Herbsman 1995, Shrestha 2007), and state DOT websites. All projects used a two-step procurement model with different selection methods. The selection methods included best value, low bid, and adjusted bid with a majority of the DB contract being procured through a best value selection method. For this study, best value selection is defined as a method where both the technical and price proposals are scored separately and these scores are then combined to identify the project with the best value. The low bid selection method is where only the lowest of the price proposals is considered. The adjusted bid selection method is a type of best value selection where the technical proposal score is divided by the proposed cost to arrive at an adjusted bid.

The projects were also grouped by complexity level. There is no common metric or method to identify the complexity level of any project. For this study, complexity was determined based on total project cost. Higher cost projects were assigned a higher complexity level and vice versa. According to the opinion and feedback from several contractors, a low complexity project is defined as a project with a contract price of $10 million or less. A medium complexity project has a contract price greater than $10 million up to and including $50 million. A high complexity project has a contract price over $50 million. Most of the projects in the data set belong in the low complexity group (85 of 146 projects). Medium complexity projects (38 of 146 projects) and high complexity projects (23 of 146 projects) were not as common.

Overall, the projects represent a range of sizes and performance levels, as shown in Table 2. Procurement durations ranged from a low of 0.4 months to a high of 4.6 months with an average of 2.9 months. Project size ranged from a low of $0.15 million to a high of $1,840 million with an average of $54 million. Cost growth ranged from a low of -56% to a high of 84% with an average of 0.4%. Schedule growth ranged from a low of -58% to a high of 118% with an average of 13%.

Table 1: Descriptive Statistics by State and Selection Method

	No. of Projects			
State	***TOTAL***	***Best Value***	***Low Bid***	***Adjusted Bid***
Arizona	1	0	0	1
North Carolina	2	1	0	1
Alaska	1	0	0	1
Florida	124	70	32	22
South Dakota	1	0	0	1
Alabama	1	1	0	0
Maine	3	3	0	0
Massachusetts	1	1	0	0
New Mexico	1	1	0	0
Utah	1	1	0	0
Washington	3	3	0	0
Pennsylvania	1	0	1	0
Colorado	1	0	1	0
Virginia	1	0	1	0
Maryland	4	0	4	0
Total	146	81	39	26

Table 2: Overall Project Performance Summary

Overall Projects	***Procurement Durations (Months)***	***Project Size ($ Million)***	***Cost Growth (%)***	***Schedule Growth (%)***	***Total Project Time Growth (%)***
Max	4.6	1,840	84%	118%	99%
Min	0.4	0.15	-56%	-58%	-55%
Average	2.9	54	0.4%	13%	11%
Median	3.0	7.0	0.6%	9.2%	7.9%
Standard Deviation	0.90	205	16%	29%	24%

4. Data analysis

4.1 Performance by selection method

In all 146 projects, the average procurement time is nearly 3 months. However, when separated by selection method, low bid projects have the longest average procurement duration (3.06 month) and adjusted bid projects have the shortest average procurement duration (2.65 months). In terms of project size, low bid projects have the highest average cost ($65 million), best value projects are in the middle ($57 million), and adjusted bid projects have the lowest average cost ($28 million).

For schedule growth performance, low bid projects had the lowest average schedule growth (11%) closely followed by best value projects (12%). Adjusted bid projects had the highest average schedule growth (18%). In terms of cost growth performance, best value projects had the lowest average cost growth (-1.5%). Low bid projects had the highest cost growth on average (3.1%).

4.2 Performance by complexity level

When separated by complexity level, there was no significant difference in average procurement durations. The range of average procurement durations was 2.9 months for medium complexity projects up to 3.0 months for high complexity projects. There were, however, differences in project performance based on complexity level. In general, the high complexity projects performed better than either the medium or low complexity projects. High complexity projects had lower average schedule and cost growth (4.4% and -4.7%, respectively) compared to medium complexity (13% schedule growth and -1.2% cost growth) and low complexity (15% schedule growth and 2.6% cost growth) projects.

4.3 Procurement duration and schedule growth

Plotting procurement duration versus schedule growth (Figure 1) shows that there is a linear correlation between these two variables. The chart shows a trend that the schedule growth decreases with increasing procurement duration.

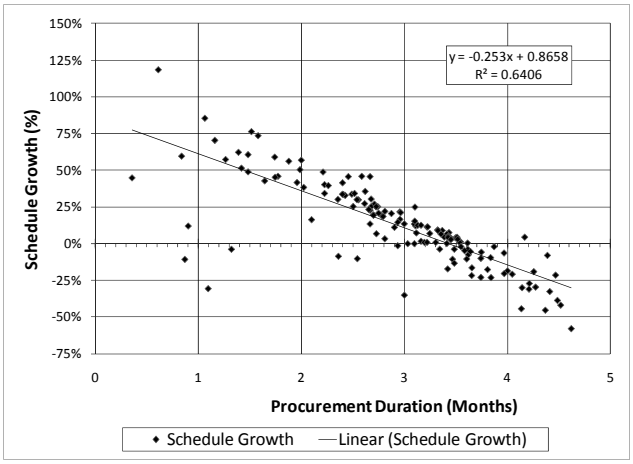

Figure 1: Schedule Growth versus Procurement Duration (All Projects)

The Pearson value for this relationship is -0.8 which is above the required confidence value and it supports that there is a strong linear relationship between procurement duration and project schedule growth. All the values indicate that this equation has a very high reliability and they have a strong linear correlation. The analysis also shows that regression line crosses the x-axis when the procurement duration is approximately 3.4 months. This is a critical value because projects using a procurement phase above this value tend to show a negative schedule growth, which means the project will be delivered earlier than the scheduled delivery time.

The regression analysis was also conducted for overall project time growth (including procurement time). The results show a similar trend to schedule growth. The chart (Figure 2) indicates that there is a very strong linear correlation between procurement duration and total project time growth. Just like the schedule growth analysis, the projects' total project time growth decreases when procurement duration increases. The critical procurement value is also approximately 3.4 months. The Pearson value of total project time growth regression analysis is -0.79 which is very close to the schedule growth Pearson value.

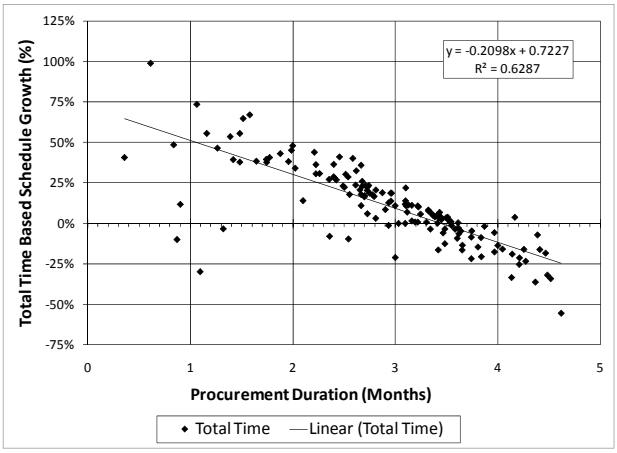

Figure 2: Procurement Duration versus Total Project Time Growth (All Projects)

The overall project sample shows a very strong relationship between procurement duration and schedule growth, and procurement duration and total project time growth. The regression analysis was repeated for different selection methods (adjusted bid, best value, and low bid) and similar results were found. Lastly, the regression analysis was performed for different project complexity levels. In this analysis, both low complexity and medium complexity projects exhibited similarly strong relationships between procurement duration and schedule growth. However, high complexity projects showed a much weaker relationship between procurement duration and schedule growth (Figure 3).

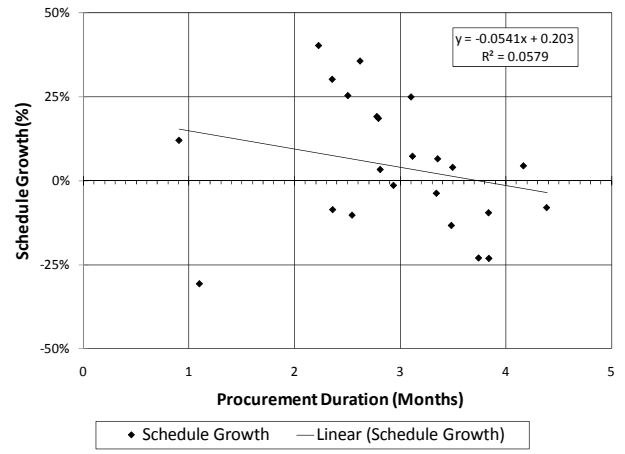

Figure 3: Procurement Duration versus Schedule Growth (High Complexity Projects)

4.4 Procurement duration and cost growth

Plotting procurement duration versus cost growth (Figure 4) illustrates that there is little relationship between these two variables. Increasing or decreasing procurement duration appears to have little influence on cost growth performance. The Pearson value for this analysis is -0.23 which means the linear correlation hypothesis is too weak to be accredited. The R square value is 0.05 for this analysis. More analyses were conducted based on the different procurement selection methods and different complexity levels. All of the analysis results show that there is little linear correlation between procurement duration and cost growth under any situation. All of the Pearson values and R square values in each analysis are too low to prove a linear correlation between procurement duration and cost growth.

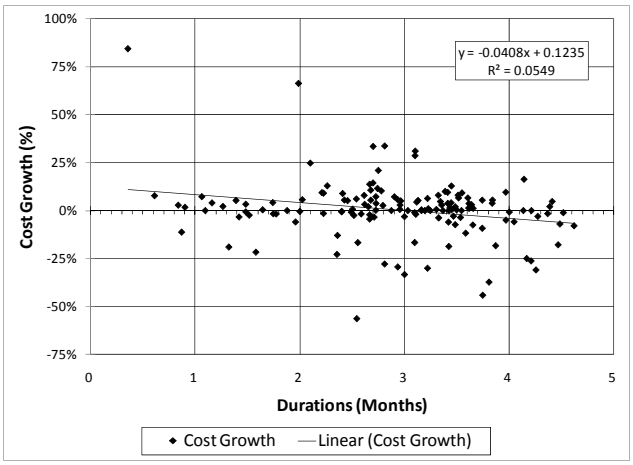

Figure 4: Procurement Duration versus Cost Growth (All Projects)

4.5 Schedule growth and cost growth analysis

Besides the main analyses, additional analysis was conducted to see if there was a relationship between the two performance indicators of schedule growth and cost growth. The correlation analysis between schedule growth and cost growth was studied in this part in order to get a broader understanding and make the main research more integrated. The linear regression analysis result shows that the Person value is 0.29 which means there is very weak linear correlation between cost growth and schedule growth. Also, the data distribution (Figure 5) shows a very weak linear trend and the R square value is 0.08 which is not strong enough to support the determination of a linear relationship.

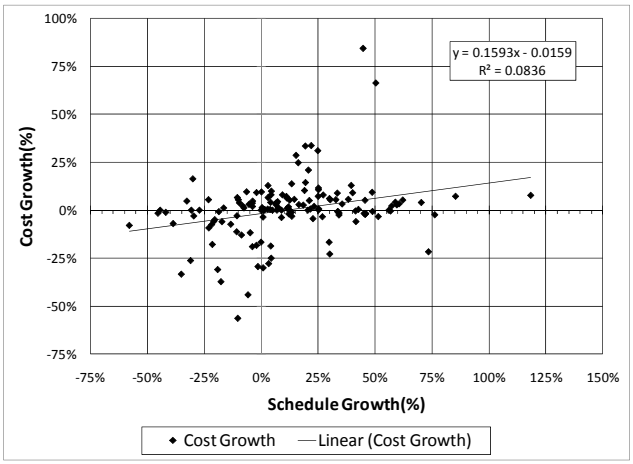

Figure 5: Cost Growth versus Schedule Growth (All Projects)

5. Conclusions

This study investigated the relationship between procurement duration and project success in DB transportation projects. Using data from 146 DB projects, cost growth and schedule growth were used

to test the research hypotheses. Results of this analysis produced several findings that are listed in the next paragraph.

First, schedule growth and procurement duration in DB transportation projects are strongly correlated with a linear relationship with the longer the procurement duration, the lower the project schedule growth. Conversely, there is no relationship between procurement duration and cost growth. Therefore, the procurement duration does not affect cost growth. Similarly, there is no relationship between cost growth and schedule growth in the DB projects. Finally, a critical procurement duration value exists. When procurement duration is below this value, the schedule growth tends to be negative (i.e., projects finish on or ahead of schedule). For all projects, the critical procurement duration value is 3.4 months. The highest critical value of 3.7 months is for the adjusted bid selection method.

This research shows that the degree of linear correlation between procurement duration and schedule growth is different with different complexity levels. While low and medium complexity projects show strong linear correlation between procurement duration and schedule growth, the same cannot be said for high complexity projects. High complexity projects show a much weaker relationship between these two variables.

When considering the study results, there are some possible explanations for the findings. Firstly, DB firms may have incentives to save on delivery time so that they can save on overhead costs, which adds to profits on lump sum projects; so that they can start other projects sooner; so that they can be eligible for bonuses; and so that they can show a high level of performance and increase their opportunity to be selected for future projects. Therefore, if they are given more time in procurement, they can focus on better scheduling (more breakdown, overlapping), better planning, and the use of advanced methods, equipment and materials. Secondly, if DB firms and DOTs do not share in the cost savings or overruns, less attention may be paid to limiting cost growth. Lastly, the DOTs generally do not have any mechanism (except cost reductive value engineering clauses) to encourage projects to come in under cost, especially for lump sum contracts.

Based on the conclusions, the recommendation is for transportation agencies to pay more attention to their procurement process and provide adequate time for the preparation of DB proposals. Such consideration can lead to improved project success, especially in terms of schedule performance.

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Comparative Procurement Methodology Analysis in Australia: A New Approach

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Abstract

A comparative review of procurement methods was undertaken for the purpose of objectively determining the relative strengths and weaknesses of the principal methods for the state procurement of economic and social infrastructures. The study concerned procurement alternatives commonly used with large or complex projects and available to government, including:

- In-house provision using a state agency or works department
- Traditional procurement
- Outsourcing
- Build own operate and related forms of asset procurement
- Alliance contracting
- Public private partnerships.

Around 90% of state procurement in the late 1980s was traditional which employs a comprehensive input specification, a lowest price tender selection process, separation of the design and construction components of the project and an adversarial approach to contractual relationships. The main measurement methods were delivery on time and within budget.

As traditional procurement is mainly concerned only with the delivery of assets, most performance measures concern the timeliness and cost of delivery and these are mainly applied at commissioning. Tender evaluation criteria may take into account the qualitative aspects of bids such as the bidder's credit strength, expertise and track record. However, these values are generally subordinated to price and few traditionally procured projects are evaluated again during their service life.

The development of a comparative procurement methodology involved a comparison of quantitative and qualitative outcomes. The evidence was sourced from the procurement outcomes of 124 economic and social infrastructure projects commissioned by governments or state agencies in Australia, Canada, New Zealand and the United Kingdom.

The findings of this work show that PPP and outsourcing models are clearly the most effective methods of large or complex project procurement although it needs to be remembered that this method of procurement has limited in application and not appropriate for the majority of projects. PPPs are a better procurement option when the state is delivering services that can benefit from risk transfer, the certainty of lifecycle costing, and the integration of design and construct services, an output specification (innovation, new technology) and efficient management. The comparison also highlights the benefits of the shift from traditional adversarial contracting principles to a more collaborative approach that aligns agency and contractor incentives, an important driver of value for money procurement outcomes.

Keywords: procurement, performance measures, public private partnerships

1. Introduction

The vast majority of state (central, regional and local government) capital spending employs *traditional* procurement methods where the government organisation internally manages or outsources design, development and project management usually as separate contracts. The most common method is an input specified asset (defined by the contract documentation) and/or a service procured by lowest price tender. There is a significant body of evidence that points to the failure of traditional procurement for complex construction and infrastructure projects (Latham, 1994, Egan, 1998). The larger and more complex the task, the greater the risk that projects will not be delivered efficiently or in a cost effective manner. This adversely affects the quantity and the quality of public service delivery. Recent evidence from Europe and Australia suggests that when governments use lowest price tender methods, around 70% of projects are late and a similar percentage are over budget. This does not necessarily mean that procurement by tender is the problem. Evidence suggests that the poor performance of traditional procurement is a consequence of government agency failure in the preparation of the business case, inter-agency friction, the separation of the design, construct and operations elements of the project and an input specification that is either incomplete at the time of tender or is subject to ongoing change during the early stages of the project (National Audit Office 2001, 2003). It is not unusual for a combination of an incomplete design and the lowest price tender for a project to end up the more costly and delayed form of procurement (Mott McDonald 2002; Allen Consulting 2007). This is evident from a long list of traditionally procured projects and Federation Square in Melbourne and the Opera House in Sydney are obvious examples. Less well known examples include the Southampton Oceanographic Laboratory, Guy's Hospital Stage III, the New British Library and Quarry House in the United Kingdom (NAO 2003, 2005). Jim – these references are wrong. Leave blank.

Poor procurement performance involves large sums of public monies and is a form of public failure. Public failure occurs when governments fail to allocate resources efficiently or the social cost of a state intervention exceeds its benefit (Winston 2007; Regan 2008). Additional contributing factors include optimism bias (the overestimation of benefits and underestimation of costs), low levels of design and construction innovation and, little regard to lifecycle costing and the risks associated with the long-term management of complex assets such as hospitals, corrective service institutions, public utilities and telecommunications systems. Steps have been, and are still being taken to improve traditional procurement and many of the improvements are flowing from lessons learnt with alternative procurement methods including alliance contracting, public private partnerships, outsourcing and the build own operate transfer arrangements. It is improvements to the science of public procurement that is the central issue here and not the benefits and disbenefits of specific procurement methods (Egan 1998; NAO, 2001; NAO, 2005).

2. Procurement study

In 2007 Bond University undertook a comparative review of procurement methods for the purpose of objectively determining the relative strengths and weaknesses of the principal methods for the state procurement of economic and social infrastructures (Regan, 2008).

The study concerned procurement alternatives commonly used with large or complex projects and available to government, including:

- In-house provision using a state agency or works department
- Traditional procurement
- Outsourcing
- Build own operate and related forms of asset procurement
- Alliance contracting
- Public private partnerships.

Around 90% of state procurement in the late 1980s was traditional which employs a comprehensive input specification, a lowest price tender selection process, separation of the design and construction components of the project and an adversarial approach to contractual relationships. The main measurement methods were delivery on time and within budget.

In the 1990s with wider use of the build own operate transfer (BOOT) group of procurement methods, three evaluation criteria became more relevant. First, lifecycle costing was central to private investment economics and a higher level of science was applied to the operation of assets over 20 and 30 year lifecycles. Second, private bidders were assuming greater levels of risk that related not only to asset delivery but to the quality of service outcomes over the investment lifecycle. Third, private sector incentives are central to long-term incomplete contracts and the marginal return on investment came to be associated with improved asset design for the lower cost and sustainable delivery of quality services.

Outsourcing contracts for both procurement and delivery of services became more common in the early 1990s especially for the delivery of non-core government services such as waste management and long-term contracts in areas such as road and rail maintenance. Incentive is central to private performance under these contracts although there is generally less contractor input to service specifications or use of private capital than exists with the BOOT configuration.

Alliance contracting came into wider use in Australia in the early 1990s and was applied to large infrastructure procurement that could be articulated into a number of multi-staged contracts. Alliances are hybrid arrangements that remove the adversarial features of traditional contracting, give effect to risk transfer and may integrate the design and construction phases of a project. However, they do not necessarily involve a lifecycle approach to investment economics, the contractor is incentivised for project and not service delivery and there is little mobilisation of private investment.

Public private partnerships (PPPs) are a combination of many of the procurement characteristics outlined above. In the UK these procurement arrangements are known as Private Finance Initiatives (PFIs). However, the competitive bid process has two distinguishing features – the service is provided to an output specification and the design and construction phases of the project are integrated into a single process. This form of procurement involves private capital and the transfer of asset and service delivery risk to the contractor. PPPs also involve full lifecycle cost; they are long-term incomplete contracts and require new approaches to relationship management. A comparison of procurement

method outcomes from the authors noted and using surveys from agencies, managers and users is set out at Table 1.

Table 1: Survey of Procurement Outcomes

SURVEY OF PROCUREMENT OUTCOMES			
	On Budget	*On Time*	*Outcomes*
Traditional Procurement 1.	*25%*	*34%*	*27%*
2.	*27%*	*30%*	*35%*
3.	*55%*	*63%*	*55%*
Gateway Programs	*69%*	*73%*	*65%*
Alliance Contracting	*72%*	*75%*	*n/a*
PFI (UK)	*78%*	*76%*	*69%*
PPP (Australia)	*79%*	*82%*	*73%*
UK Defence Contracts	*17% (14%)*	*8% (24%)*	*n/a*
NOTE			
Indicative only. Variation in sample size and evaluation criteria.			
Outcomes uses survey data from of agencies, managers and users.			
n/a indicates information not available.			
SOURCES			
Cranley and Mathias 2006; Mott McDonald 2002; KPMG BSA 2005;			
Fitzgerald 2004; Mathias and Reddington 2006; Smith 2006;			
Mathias and Smith 2007; Cranley and Mathias 2006;			
NAO 2001, 2003a, 2003b, 2005a, 2005b; 2007; Audit Commission			
2003; Allen Consulting 2007; NAO 2004, 2006 (MOD).			

3. Evaluation criteria

Traditional procurement is used for most state procurement of civil works, buildings, plant and information technology. It provides the benchmark against which other procurement methods are measured and the first step in this study was to identify standard quantitative evaluation criteria. As traditional procurement is mainly concerned only with the delivery of assets, most performance measures concern the timeliness and cost of delivery and these are mainly applied (*ex ante*) at commissioning. Tender evaluation criteria may take into account the qualitative aspects of bids such as the bidder's credit strength, expertise and track record. However, these values are generally subordinated to price and few traditionally procured projects are evaluated again during their service life. It is not common in government to determine whether or not the *ex post* services being produced by the asset meet the requirements of either the state or users. The first step in this study was to identify the documented procurement outcomes for each procurement method based on quantitative

measures – delivery on time and within budget. Where available, the results of *ex-post* surveys of managers and service users were included.

The second step was to identify qualitative procurement outcomes using four widely accepted benchmarks used in the literature:

- The concept of value for money
- The effectiveness of incentives
- User and service outcomes
- Process management (level of design and delivery complexity, cost of delivery and project management and the extent to which the principal and contractor were in an adversarial relationship).

The comparative procurement methodology involved a comparison of quantitative and qualitative outcomes. The evidence was sourced from the procurement outcomes of 124 economic and social infrastructure projects commissioned by governments or state agencies in Australia, Canada, New Zealand and the United Kingdom. This review also informed the selection of category weightings. The data included a number of independent review agencies including the UK National Audit Office and Audit Commission, Australian State Government Audit Commissions and a series of reports prepared by Mott McDonald (2002), Allen Consulting (2007), Allen (2001, 2003), Cranley, G and Mathias, M (2006), Smith (2006), Mathias and Reddington, (2005), Mathias and Smith (2007), Sturgess 2003; KPMG (2005, 2008) and Fitzgerald (2004). Additional data was sourced from the annual and special reports commissioned by a number of committees, inquiries and government departments, and surveys conducted by governments, their agencies and industry associations.

4. Evaluation criteria weighting

Identifying a systematic procurement evaluation tool requires identification, measurement and weighting of each of the procurement objectives identified in the literature. These objectives were a combination of quantitative factors (value for money, delivery on time and within budget) and qualitative outcomes (including certainty, lead times, user benefits). In the final analysis, this process is a matter of judgement and the selected weightings will be influenced by subjective views about what is important and what it is not. For these purposes, the weightings used in this comparison were sourced from a review of empirical data that examined procurement performance reviews conducted by state government audit offices and independent procurement reviews commissioned by government and industry in the four countries from which the sample was sourced (See Table 1). Additionally, the analysis was tested using both weighted and non-weighted evaluation criteria.

The weightings selected for testing were value for money (60%), delivery performance (15%), quality service outcomes (10%) and process management (15%). The components of each category are set out in Table 2 with their individual and component weights.

Table 2: Procurement Efficiency Weightings

CHARACTERISTIC	*BRIEF DESCRIPTION*	*WEIGHTING*
NPV Investment	*The net present value difference between state payment for the asset on completion and deferred payment structured as an annual unitary or lease charge.*	*10*
Specification Form	*Does the contract specify all contractor inputs or is their scope for the contractor to offer design and/or construction innovation or new technology?*	*10*
Innovation & technology	*The extent to which the bid market can compete on price, expertise and capacity to adapt innovative processes to improve value for money.*	*10*
Integrate design & construct	*Is the project design team integrated with, or separated from, the project delivery and contract management processes?*	*10*
Risk transfer	*Does the contract transfer site, operational and financial risks to the contractor in addition to construction risk? Is the public sector benchmark risk-weighted?*	*10*
Certainty (lifecycle costing)	*Is the procurement fully costed for full lifecycle operation? Does the contractor or another private party carry lifecycle cost risk?*	*10*
VALUE FOR MONEY	*Aggregate of the quantitative measures of procurement*	*60*
Delivery performance	*Is the contractor incentivised for early completion or less than budget completion performance? Is the contract adversarial in nature (recourse to litigation) or does it employ alternative dispute resolution mechanisms? Is the contract standard form or hybrid? Will the procurement method add to agency costs? Private bid costs?*	*5*
Investment utility	*Does the project offer service benefits in addition to the minimum state requirement? For example, better public health or safety outcomes, third party income, improved urban amenity, superior operational performance?*	*5*
Sustainability principles	*Does the project comply with best practice sustainability principles? To what extent are sustainability principles built into the project specification and contractor remuneration framework?*	*5*
INCENTIVE	*Aggregate of quantitative and qualitative benefits of the procurement method*	*15*
Quality services	*Does the contract provide a framework for improved delivery of public services?*	*10*
OUTCOMES	*Aggregate of qualitative outcomes*	*10*
Cost	*To what extent is the contractor incentivised to deliver the project within the budget?*	*5*
Time	*To what extent is the contractor incentivised to deliver the project on time?*	*5*
Project size	*Does the project meet the value thresholds to permit cost-effective risk transfer, lifecycle costing and planned delivery schedules?*	*2*
Collaboration/ADR	*Does the contract employ non-adversarial contracting principles? What is the basis for service delivery measurement and its administration? Will the project employ an independent project manager?*	*3*
PROCESS	*Aggregate of the advantages/disadvantages of the procurement method for timely and least costly project delivery and subsequent contract administration.*	*15*
TOTAL		*100*

The weighted comparison indicates the superior procurement performance of the non-adversarial contracting forms whereby design is integrated with construction, the private contractor's incentives to meet performance benchmarks were structured in a collaborative rather than an adversarial context and the contract was delivered to a full or significantly output-based specification. PPP was the found to be the most effective procurement mechanism, followed by the build own operate transfer (BOOT) method and outsourcing. Each of these procurement methods has a significantly greater value for money score and is their economics are built around full lifecycle costing. However, the BOOT model was the outlier here because it employs an input specification, it has an asset rather than a service delivery focus, contractors are selected by lowest-price tender and there are adversarial aspects to contract formation and administration. Nevertheless, the strong incentive characteristics, contractor design input and the intervention of new technologies and innovation were drivers of its better performance. BOOT and similar arrangements are frequently described as PPPs in Asia and Europe and the formal distinctions between these two procurement methods is rapidly disappearing. Alliance contracting was also a more effective procurement method than traditional lowest price tender models and in-house provision.

5. Findings

Table 3 summarises the assessment of the analysed weighted characteristics against the various procurement methods. From this qualitative evaluation it can be seen that the PPP and outsourcing models are clearly the most effective methods of large project procurement although it needs to be remembered that neither are appropriate for all projects. PPPs are a better procurement option when the state is delivering services that can benefit from risk transfer, the certainty of lifecycle costing, and the integration of design and construct services, an output specification (innovation, new technology) and efficient management. The model is based on an *ex ante* evaluation of procurement methods which does not capture *ex post* improvements in service delivery. However, a number of studies in Britain and Australia in recent years point to the significant benefits in health, education and justice user outcomes from services delivered by PPP, BOOT and alliance contracting methods that are not being achieved with the traditional model.

Two further findings were identified in this comparative analysis. The first is the important role that incentive plays in procurement outcomes. The three most effective methods of project procurement are those that create a strong incentive for private performance over the life of the contract. In this context, incentive operates at two levels - the alignment of contractor payment mechanisms to delivery performance and creation of mechanism that create a high marginal return on investment for private investors. The top three performers in this comparison scored highly in the evaluation areas of certainty (lifecycle costing), private investment and strong private incentive.

Table 3: Weighted Procurement Effectiveness Results

	PROCUREMENT EFFECTIVENESS INDEX
	Nominal Ratings

Characteristic Analysed	*Weight*	*In-House*	*Traditional*	*Alliances*	*Outsourcing*	*BOOT*	*PPP*
NPV Investment	*10*	*0.0*	*1.0*	*0.0*	*7.5*	*10.0*	*9.0*
Specification Form	*10*	*0.0*	*1.0*	*5.0*	*10.0*	*7.5*	*10.0*
Innovation & technology	*10*	*0.0*	*2.0*	*5.0*	*8.0*	*6.5*	*10.0*
Integrate design & construct	*10*	*0.0*	*0.0*	*7.5*	*7.5*	*10.0*	*10.0*
Risk transfer	*10*	*2.5*	*2.5*	*5.0*	*10.0*	*10.0*	*10.0*
Certainty (lifecycle costing)	*10*	*0.0*	*0.0*	*2.0*	*8.0*	*8.0*	*10.0*
Value for Money	*60*	*2.5*	*6.6*	*24.5*	*51.0*	*52.0*	*59.0*
Delivery performance	*5*	*1.5*	*1.5*	*4.0*	*5.0*	*5.0*	*5.0*
Investment utility	*5*	*0.0*	*0.0*	*1.0*	*5.0*	*5.0*	*5.0*
Sustainability principles	*5*	*5.0*	*5.0*	*4.0*	*2.0*	*2.0*	*4.0*
Incentive	*15*	*6.5*	*6.5*	*9.0*	*12.0*	*12.0*	*14.0*
Quality services	*10*	*3.0*	*2.5*	*2.5*	*5.0*	*7.5*	*10.0*
Outcomes	*10*	*3.0*	*2.5*	*2.5*	*5.0*	*7.5*	*10.0*
Cost	*5*	*3.0*	*3.0*	*1.5*	*4.0*	*2.5*	*1.5*
Time	*5*	*3.0*	*3.0*	*2.0*	*2.5*	*2.5*	*1.5*
Project size	*2*	*2.0*	*1.0*	*0.0*	*2.0*	*1.0*	*0.0*
Collaboration/ADR	*3*	*0.0*	*0.0*	*3.0*	*0.0*	*0.0*	*3.0*
Process	*15*	*8.0*	*7.0*	*6.5*	*8.5*	*6.0*	*6.0*
Total Rating	*100*	*20.0*	*22.5*	*42.5*	*76.5*	*77.5*	*89.0*
Source: Regan, 2008							

The second finding is the strong association between qualitative procurement outcomes and the use of output as opposed to input service specifications. The evidence for this association has only recently come to light and follows 15 years of broader procurement experience in the United Kingdom and Australia. It also requires new approaches to the measurement of government service delivery and outcomes which are now being implemented such as user surveys and public value (Moore, 1995). Both of these relationships are the object of further research activity at Bond University in 2009 and 2010.

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Procurement Method Selection in Practice: A Journey to Discover the Optimal

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Abstract

Determining the optimal procurement approach for capital works is a challenging task considering the array of procurement methods available and criteria that must be assessed. To assist a public sector client with this complicated decision making process, a procurement method selection process was developed. A focus group compromising of key stakeholders involved with an educational capital works project used the developed approach to determine an appropriate solution for their needs. Overwhelmingly, participants supported the outcome albeit, a small minority who had limited wider exposure to alternative methods initially perceived their bastion (i.e. a default Traditional Lump Sum (TLS), to be a credible option. Indeed, those participants with limited knowledge procured almost 95% of capital works projects using a TLS and did not adopt a formal approach to procurement method selection. As a clear indicator of demonstrable impact, it can be reported that the approach presented in this paper is now being used by the public sector agency responsible for capital works. The pragmatic approach developed enabled decision-makers to constantly re-evaluate outcomes during each stage of the process in the form of recommendations that were grounded in practice, reflection and detailed evaluation.

Keywords: Capital works, outsourcing, procurement, public sector, risk

1. Introduction

A plethora of techniques have evolved to assist decision-makers in reaching an informed decision about the various procurement method options when delivering a supply chain solution. Deciding which procurement method to adopt has become a complex and challenging task for decision-makers not least because the number of methods available has proliferated in recent years, and their characteristics have become a major field of study in their own right (Morledge *et al*., 2006). While such techniques have their merits, they tend to be prescriptive and fail to recognize the inherent complexity associated with the selection process. Numerous stakeholders are often involved in the selection process and decisions are dependent upon the interaction of several variables that incorporate a high degree of subjectivity and intuitive judgement. To assist clients with their decision making, a procurement method selection process is hence developed and tested by a public sector agency.

2. Procurement systems

Procurement systems can be broadly classified as *traditional*, *design and construct*, *management* or *collaborative* methods; albeit, sub-classifications of these systems proliferate within the Australian industry (Love *et al*., 1998). Whilst not exhaustive, novation, design and manage, and alliancing are but a few examples. It is common for procurement systems, contract forms and price determination mechanisms to be regarded as synonymous or inextricably related. Procurement systems have become increasingly flexible and the interchange that exists between them has made it essential to distinguish the procurement system from its subsystem.

A subsystem can be used interchangeably to enable the procurement system to be finetuned to the clients' circumstances and requirements (Love *et al*., 1998). Kurmaraswamy and Dissanayaka (1998) identified several sub-systems of a typical procurement system including work packaging, type of contract (functional groupings and payment modalities) and selection methodologies. The packaging of work is vital to achieving economies of scale in a project and so work must be allocated appropriately. Parties can be selected using an array of methods, for example, prequalification, selective tendering, and negotiation.

2.1 Procurement selection criteria

Public agency satisfaction with buildings and the procurement path taken are a primary issue that is often raised when considering the delivery of a capital works. Consequently, it is important to evaluate the clients' criteria, their importance and then seek performance to match the criteria. All public sector agencies require their buildings to be completed on time, within budget and to the highest quality. Some public sector agencies, however, stress that certain criteria are more important than others (Rowlinson, 1999). While such criteria can be broadly used as a guide to assist decision-makers with an initial understanding of the basic attributes of a particular procurement system they should not be used as the sole basis for

selection. This is because of the underlying complexity associated with matching client needs and priorities with a particular method (Kumaraswamy and Dissanayaka, 1998). The National Economic Development Organisation (NEDO, 1985) identified nine generic criteria that public sector agencies could use to select their priorities for projects. These are:

1. *Time*: is early completion required?

2. *Certainty of time*: to what extent is project completion of importance?

3. *Certainty of cost*: is a firm price needed before any commitment to construction is given?

4. *Price competition*: is the selection of the construction team by price competition important?

5. *Flexibility*: are variations necessary after work has begun on-site?

6. *Complexity*: does the building need to be highly specialised, technologically advanced or highly serviced?

7. *Quality*: is high quality of the product, in terms of material and workmanship and design concept, important?

8. *Responsibility*: is single point of responsibility the client's after the briefing stage or is direct responsibility to the client from the designers and cost consultants desired?

9. *Risk*: is the transfer of the risk of cost and time slippage from the client important?

In addition, several studies have used modified versions of the NEDO criteria in an attempt to develop a procurement selection framework (e.g., Skitmore and Marsden, 1988; Love *et al*., 1998; Ambrose and Tucker, 2000). Luu *et al*. (2003) state that the use of a limited number of factors, such as those identified by NEDO (1985), may inadvertently give rise to the selection of a sub-optimal procurement system. Since the selection of a procurement system is influenced by *client characteristics* (Moshini and Botros, 1990), *project characteristics* (Ambrose and Tucker, 2000), and the *external environment* (Alhamzi and McCaffer, 2000), selection criteria representing the constraints imposed on the project should be considered before a decision is made. Identifying the project criteria is the major challenge facing public sector clients when selecting a procurement method. However, if projects are different in nature and their needs are constantly changing due to internal and external demands, would the same criteria be applicable for all projects? The weighting for criteria invariably changes as the needs and requirements for capital work projects change. Yet, Love *et al*. (2008) revealed that public sector agencies eschew from using extensive lists of selection criteria such as those identified by Luu *et al*. (2003), inasmuch as they are cumbersome to use in practice, and purport that *generic* criteria are required because they provide consistency throughout the decision making process.

2.2 Selection tools and techniques

Despite these aforementioned difficulties associated with procurement method selection, a number of structured methodologies, tools and models have been developed. The approaches developed range from weighted models (Franks, 1990) and the use of multi-attribute utility analysis (MAUA) (e.g., Skitmore and Marsden, 1988; Love *et al*., 1998) to highly complex decision support systems founded upon case based reasoning and fuzzy logic (e.g., Kurmaraswamy and Dissanayka, 1998; Luu *et al*., 2003). It is important, however, that method selection is done logically, systematically and in a disciplined manner by the key stakeholders in the capital works project (Love *et al*., 1998). The range of choice of procurement systems is now so wide, and capital works projects are becoming so complex, that the selection process must be disciplined, objective and carried out within the framework of the client's overall strategic project objectives.

Many of the procurement selection systems developed (e.g., NEDO, 1985; Skitmore and Marsden, 1988, Moshini and Botros, 1990; Ambrose and Tucker, 2000) ignore an array of factors, are limited in the options available for consideration, are conditional and not widely applicable, and are simply not user friendly (Alhazmi and McCaffer, 2000). It seems to be a ubiquitous failing of the academic community to exploit complex models and systems developed via the patenting of commercially robust products that have significant and demonstrable impact. One notable exception being Al-Tabtabi (2002) who broke through the standard academic *modus operandi* to actually produce work that was tried and tested in practice over a period of time. The major difficulties associated with procurement selection include:

- no single person or knowledge 'czar' has been found who is familiar with all primary procurement methods (Hamilton, 1987);
- no consensus has been found between experts which easily systemises procurement selection; and
- no mutually exclusive sets of criteria uniquely and completely determine the appropriate procurement method for a specific project (Love *et al*., 1998).

Each of the tools and techniques identified in Table 3 attempts to cross-reference project variables with existing procurement systems that are available in the marketplace. As a result, Sidwell *et al*. (2001) suggest that this 'shoe-horns' one-off projects and their particular parameters, priorities and external conditions into off-the-shelf delivery systems, which can lead to a sub-optimal solution being used.

2.3 Procurement selection process

Tools and techniques that have been developed to date have their merits but almost all fail to account for the dynamic nature of procurement public sector needs as well as provide practical application. Recognising the need to select an optimal procurement system for delivering an effective supply chain solution, a systematic procurement toolkit was developed that encompasses both quantitative and qualitative considerations. The approach to procurement selection being proposed in this paper encompasses six steps and is presented in Figure 1. Noteworthy, it is deemed that the business case

for the capital works project is undertaken before the procurement system is selected. Steps to be undertaken prior to the selection of the procurement system include the:

- identification and quantification of the need and demand for a new facility;
- identification of options to meet the needs of stakeholders and undertaking of preliminary risk analysis;
- justification of preferred option(s) and undertaking of financial and economical appraisals; and
- selection of an ideal project option/brief, conducting of a risk/benefits analysis, business case and obtaining the client's authority to proceed.

The determination of project objectives and constraints is pivotal to the selection process. At the end of each step identified in Figure 1, the actions undertaken should be compared with the project objectives and constraints to ensure that they are being considered appropriately. After each step is completed and key decisions are made, the justification for these decisions should be carefully documented so as to aid the process of transparency and provide a learning tool for future capital works projects. Before the procurement method can be chosen, all relevant project information (e.g. business case and risk assessment) should be reviewed and summarised by the project team members and stakeholders to assist with the selection process. Information derived from these documents should be used to inform the procurement method selection process. There are essentially *two* distinct stages to the procurement selection process that is proposed:

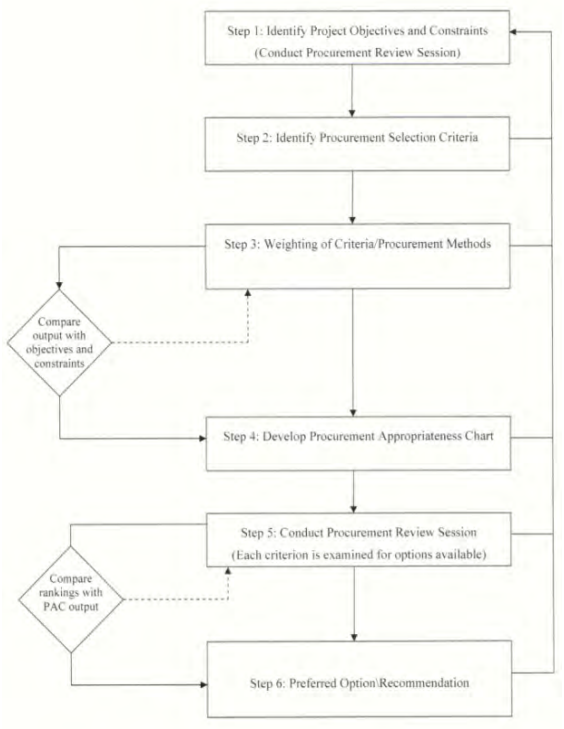

Figure 1. Procurement method selection process

Stage 1 encompasses steps 1 to 4. During these steps the procurement methods are identified and evaluated during a 'Procurement Review Session' with project team members/stakeholders. Once completed a number of procurement options are identified and evaluated using a quantitative weighting approach and a qualitative review process, both of which are described hereinafter in the real-life case example.

Stage 2 encompasses steps 5 and 6. Each of these steps should commence with a review of what has been undertaken and the re-examination of the procurement choices made in the context of the project objectives and constraints.

3. Research approach

In testing the proposed approach, a major Western Australian public client was approached and the process that was developed explained. The agency agreed to test the procurement selection process on a real-life project where the procurement method was about to be determined. In evaluating the process key stakeholders were invited to join in the process to select and evaluate procurement options using focus group approach. The focus group was used to elicit viewpoints and examine the application of the proposed approach for a real-life capital works project. Unlike conducting multiple individual interviews, participants in the focus group can listen to and comment on each other's original responses, discussing their perceptions and ideas with each other in an often enjoyable and comfortable shared environment (Patton 2002). Construction work is also notably managed by teams and therefore the team response in many ways has more meaningful value and credibility than an individual's view. All too often construction researchers fail to acknowledge this critical fact when assessing organisational performance and instead rely heavily upon feedback from individually completed interviews and questionnaires (Patton, 2002).

The focus group was used to gather information relating to the views and opinions of stakeholders in a non-threatening environment. As a common method of selecting stakeholders for focus groups, convenience sampling was used. Essentially, participants for the public works department were selected for their familiarity with the project procurement selection process of their organisation. All project team members and key stakeholders were invited to attend a focus group. The workshop comprised of 12 stakeholders that included the project director, finance manager, project managers, client, architect, quantity surveyor, and users of the project. Ideally focus groups should contain between 6 and 12 participants (Stewart and Shamdasani, 1990). While the focus group progressed, participants were given freedom to discuss issues, listen to fellow participants, provide reflective comment and arrive at a shared understanding of collective experiences regarding the procurement selection process proposed. Whilst working with the group, the facilitator appeared to be 'genuinely naïve' and avoided leading questions so as to allow corroboration to naturally occur.

4. Real-Life case example

The procurement selection process explained below is performed in congruence with a real-life example to demonstrate the decision-making process that was addressed by a public sector agency. The agency required a new school for children with disabilities. The achievement of these criteria did not necessarily require the agency to retain design control and risk throughout the supply chain. Achieving the desired quality on the development was not anticipated to be onerous and could be delivered *via* the agency's professional team setting the design parameters for a contractor to achieve. The project's budget has not yet been fully established but it is envisaged that the final cost would vary significantly to the budgeted cost as stakeholders requirements may change. Cost certainty would be required prior to commencement of the production process on-site and all works had to be competitively tendered. The data presented below and Tables 1 to 5 were derived from the focus group participants and the initial outline brief provided to the researchers.

Step 1: Identification of project objectives and constraints

Before the project team members and stakeholders commenced the initial 'Procurement Review Session' they were asked to familiarise themselves with the different types of procurement methods available within the marketplace, the project objectives and constraints. Key *project objectives* should address:

- *Programme and phasing* – key milestone dates should be specified such as the target date for the facility to be operational.

- *Design criteria* – is a whole life cycle solution required? Is an attractive architectural statement required reflecting the facility's status in the community? Is there sufficient space to meet the client's immediate and possible future space requirements? Is the site potential being maximized?

- *Cost certainty* – has the budget for the project been finalised? Would the final cost of the project expect to vary from the budget cost? Do all works have to be tendered?

- *Other objectives* – in addition to the foregoing project, specific objectives should be highlighted and addressed.

Identification of key *project constraints* should address:

- *Programme constraints* – a master programme should be developed for the whole project to review the achievability of the key milestones.

- *Planning* – is the design sympathetic to the needs of the planning authority and local stakeholders?

- *Site condition* – what type of site is required? How will contractors price for any risks associated with the site conditions? Have extensive reviews of the site been undertaken as part of the design development process? Is the client willing to retain full control of the design and accept the potential unknown risks?

- *State Government procurement procedures* – the procurement strategy should comply with Western Australian procurement regulations. How will the project be tendered?

- *Risk allocation* – is the agency risk averse? What degree of risk are they prepared to accept?

- *Degree of client involvement* – what degree of involvement would the agency like to have?

- *Flexibility for change during design and construction* – is cost certainty required? How early in the project will cost certainty need to be fixed? Does the procurement strategy need to be responsive to change and integrate key supply chain participants?

- *Market interest* – will the procurement method solicit a good response from contractors?

- *Other constraints* – in addition to the foregoing project specific constraints should be highlighted and addressed.

Table 1. Project constraints and key issues for an educational capital works project

Programme Constraints: Key programme dates as noted above. A master programme should be developed for the whole project, to review the achievability of the key milestone dates.
Planning: The design proposals should be sympathetic to the needs of the planning authorities and local stakeholders in the development.
Site Availability: The site should become available in line with the date to be defined on the master programme
Site Condition: The site is a Greenfield site that will require standard site investigations at an early stage. Contractors will price for the risk of any residual unknown site conditions. The following options are available: • Undertake extensive surveys as part of design development prior to entering into the construction contract. • Retain full design control and accept the risk of potential unknown risks.
State Government Procurement Procedures: The procurement strategy must comply with State Government procurement regulations. The construction works will have to be advertised through the GEM Website with competitive tenders invited on a restricted basis (i.e. prequalification), unless an alternative suitable and compliant framework is available to the Department of Education.
Risk Allocation: The Department of Education is a publicly accountable body and is risk adverse. It is limited by the risks that it can accept. The procurement strategy must ensure that risk is placed with those best suited to managing those risks, whilst ensuring that no significant premium is unduly paid to attempting to pass risk to another party. Early constructability and logistics advice would be beneficial to ensuring that the most appropriate construction forms are selected and site co-ordination activities are pre-planned. The financial risk implications of alternative procurement methods, as a separate exercise, could be undertaken to assess whether this would affect the preferred procurement method identified by this 'Procurement Method Assessment' process.
Degree of Client Involvement: Department of Education wished to limit its direct involvement in the management of construction contracts.
Flexibility for Change during Design and Construction: Whilst the design of the finished facility will need to be capable of accommodating future changes in response to changing education needs and demand, in order to obtain cost certainty the design will need to be fixed at an early stage. It is therefore not anticipated that the procurement strategy will need to be responsive to changing client requirements during the detail design and construction phases.
Market Interest: A key consideration in the current construction market is the selection of a procurement method that will elicit a good response from contractors. This is essential to maximise the competitiveness of the tender process and to secure an appropriately experience and resourced contractor for the project.

Once the objectives and constraints were identified by stakeholders (Table 1) it became apparent to experienced practitioners which principle procurement methods *could* be considered appropriate. The advantages and disadvantages of the procurement options identified in the *context of the specific capital works project* were listed. If more than *four* options were identified then this list would be reduced prior to commencing Step 3 by ranking the options in order of preference. In the case of the new school project, four procurement options were identified from an examination of the project objectives and constraints identified in Table 1 from preliminary discussions. The options identified were: design and construct (D&C) single stage, D&C two stage, traditional lump sum (TLS) single stage, TLS two stage. During a two stage process the contractor would be appointed earlier to assist in the pre-planning and design of the project.

Step 2: Identify procurement assessment criteria

Despite criticism from Luu *et al*. (2005), it is suggested that the generic criteria identified by NEDO (1985) should be considered as they represent the underlying issues considered by public sector agencies (Love *et al*. 2008). If this list of procurement assessment criteria is *not* deemed to be appropriate for the specific capital works project, and do not specifically marry with the project objectives and constraints they can be amended accordingly. During discussions with the focus group members the criteria identified were deemed to be appropriate and to encapsulate the essence of the decision-making process for the identified capital works project. However, for more complex projects such as hospitals, it was noted that more specific criteria could be identified that specifically address aspects of risk apportionment. Noteworthy, this procurement selection process does not consider PPP type arrangements as the decision to use this route is typically recommended by the Department of Treasury after extensive economic modelling.

Step 3: Weighting of client criteria and procurement methods

Once the procurement assessment criteria are identified they are given weightings by workshop participants. In this instance, the importance of each criterion for the agency was determined and entered into Table 2. The procurement methods identified should be listed and then evaluated according to their suitability using the 'procurement ranking method', which is described below. This ranking method enables an objective assessment to be made against pre-defined procurement assessment criteria. The output of this ranking process should not be treated as indicative, but rather as a guide for the project team to make informed decisions.

A weighted score method is used to evaluate the procurement options that have been initially identified from Step 2. Each criterion for the client is weighted depending upon their relative importance, and the *most* important is awarded the highest weighting. A score was also assigned to each procurement method under consideration (Table 3). The product of the criterion weightings identified and the procurement method scores was calculated. The method with the highest final score is considered as a possible supply chain solution.

The first stage considers the relative importance of identified criteria impinging upon the new school project. A score for each criterion is weighted (*W*) using a scale of 1 (low) to 5 (extreme) to reflect their importance to the project was undertaken. In addition, each criterion was weighted according to its degree of importance and related to the score (*P*) of each procurement method using a scale of 1 (poor) to 5 (excellent). The process used to determine the overall weighting for procurement methods is as follows:

1. The procurement assessment criteria shown in Table 2 were weighted according to their *degree of importance* for the educational project to be undertaken on a scale of 1 to 5 (*low, moderate, high, very high, extreme*).

2. The score, on, a scale 1 to 5 (*poor, acceptable, good, very good, excellent*) was awarded to each criterion for each of the available procurement methods in Table 3.

3. The product of the agency criterion weightings and scores were calculated (shown in column 3) in Table 4.

4. The sum of the products for each of the procurement methods was calculated (shown in the total score row) in Table 4.

5. The preferred procurement method was that with the highest total score.

During this step, a detailed case addressing advantages and disadvantages of using the identified procurement methods was made and documented. In the case of the educational project the comments from participants were summarised documented for each of the procurement methods identified below:

- *Traditional lump sum contracting/BoQ:* This approach has been the most prevalent procurement method choice by state government, although its popularity is waning within the industry due to the 'adversarial' approach it can engender. This route requires all agency/user decisions to be made and surveys/investigations and design to be fully completed and recorded prior to the award of any contract.

- *Two stage lump sum contracting:* The two-stage approach maintains all of the principles for the traditional lump sum approach, but accelerates the process through overlapping the design and tendering period. Design is still completed prior to construction, but the contractor is appointed in two stages. The 1st stage tender is typically awarded on the basis of tenders for preliminaries, management/site supervision staff, overheads and profit and approximate quantities or schedules of rates for the major sections of work that have been designed to outline or scheme design stage. Provisional sums are inserted for work not designed at the first stage. The 2nd stage involves works packaging, tendering (by the contractor using competitive sub-contract procedures) and formalising of costs of the works themselves based on the pre agreed schedule of rates or on an open book basis, for example. An updated risk analysis should be used to calculate the contingencies required.

- *Design and construct:* D&C is a procurement method that has been used before by the agency for procuring schools. The overlap of design and construction phases can enable significant programme advantages to be taken, whilst transferring risk ownership to the contractor in a measured and sustainable manner. Issues relating to the delivering of a quality product can be a disadvantage of this route; however a detailed client's requirement document will mitigate this risk to some extent.

- *Two stage design and construct:* A *two-stage* form of procurement is particularly suitable for fast track, large and complicated projects, whereby a contractor's practical construction expertise may be fully exploited and a single stage design and construct route would not be appropriate.

Table 2. Importance of agency criteria for educational capital works project

Procurement Assessment Criteria	Weighting (W)
Time: Is early completion required?	2
Certainty of time: Is project completion of time important?	5
Certainty of cost: Is a firm price needed before any commitment to construction is given?	5
Price competition: Is the selection of the construction team by price competition important?	5
Flexibility: Are variations necessary after work has begun on-site?	4
Complexity: Does the building need to be highly specialised, technologically advanced or highly serviced?	1
Quality: Is high quality of the product, in terms of material and workmanship and design concept, important?	3
Responsibility: Is single point of responsibility the client's after the briefing stage or is direct responsibility to the client from the designers and cost consultants desired?	5
Risk: Is the transfer of the risk of cost and time slippage from the client important?	3

The *Two Stage* approach maintains all of the principles for the single design and build route, but creates a defined pre-construction period during which the design can be developed in conjunction with the contractor and the site can be fully surveyed and residual risks ascertained. Design is still completed prior to construction, but the contractor is appointed in two stages. The 1st stage tender is awarded on the typical basis of tenders for preliminaries design fees, management/site supervision staff, overheads and profit. Works tenders (including robust schedules of rates) for the major sections of work that have been designed can also be produced. The 2nd stage involves works packaging, tendering (by the contractor using competitive sub-contract procedures) and formalising of costs of the works themselves based on the pre-agreed schedule of rates or on an

open book basis, for example. An updated risk analysis should be used to calculate the contingencies required.

Lump sum cost certainty is achieved at the end of the 2nd stage when all surveys/investigations are complete, the vast majority of sub-contract tenders are obtained and all risks quantified. The 2nd stage appointment is concluded following ratification of the final price with contract documents executed as if under a single stage arrangement. The stage one / stage two arrangement acts as a break-clause. In the unlikely event of the parties failing to agree lump sum agreement at the 2nd stage, the client can tender the fully designed project in competition but will suffer programme consequences as a result.

Table 3. Scoring of criteria against procurement method

Procurement Assessment Criteria	TLS single stage (*P*)	TLS two stage (*P*)	D&C single stage (*P*)	D&C two stage (*P*)
Time: Is early completion required?	2	2	3	5
Certainty of time: Is project completion of time important?	2	2	3	5
Certainty of cost: Is a firm price needed before any commitment to construction is given?	2	2	3	4
Price competition: Is the selection of the construction team by price competition important?	4	5	2	2
Flexibility: Are variations necessary after work has begun on-site?	2	2	2	2
Complexity: Does the building need to be highly specialised, technologically advanced or highly serviced?	2	2	2	2
Quality: Is high quality of the product, in terms of material and workmanship and design concept important?	4	3	2	3
Responsibility: Is single point of responsibility the client's after the briefing stage or is direct responsibility to the client from the designers and cost consultants desired?	2	2	5	5
Risk: Is the transfer of the risk of cost and time slippage from the client important?	2	2	5	5

Step 4: Procurement appropriateness chart

Each of the procurement methods identified in the 'Weighted Procurement Method Scoring' Table 4 were examined in greater detail against factors within the context of *time*, *cost* and *quality* or factors that have not been previously identified so as to obtain a balanced view of selection using the 'procurement appropriateness chart' identified in Table 5. Note the inherent simplicity of this chart and the potential to easily transfer the calculations and outputs in user-friendly software packages to enhance user experience. This particular attribute goes some way to addressing concerns raised about the complexity of previous systems developed (by doing this, the output can be evaluated with some contextual meaning, specifically with regard to the prevailing market conditions). Table 5 identifies the qualitative descriptors to be used during this step. The educational project used demonstrates how the process and the comments for each of the procurement methods were identified. This not only

improves transparency in the decision-making process, but also enables learning for future procurement method selection decisions.

Table 4. Weighted procurement method scoring table for the educational capital works project

Procurement Assessment Criteria	Weighting (*W*)	TLS single stage *W* x *P* =	TLS two stage *W* x *P* =	D&C single stage *W* x *P* =	D&C two stage *W* x *P* =
Time: Is early completion required?	2	4	4	6	10
Certainty of time: Is project completion of time important?	5	10	10	15	25
Certainty of cost Is a firm price needed before any commitment to construction is given?	5	10	10	15	20
Price competition: Is the selection of the construction team by price competition important?	5	20	25	10	10
Flexibility: Are variations necessary after work has begun on-site?	4	8	8	8	8
Complexity: Does the building need to be highly specialised, technologically advanced or highly serviced?	1	2	2	2	2
Quality: Is high quality of the product, in terms of material and workmanship and design concept important?	3	12	9	6	9
Responsibility: Is single point of responsibility the client's after the briefing stage or is direct responsibility to the client from the designers and cost consultants desired?	5	10	10	25	25
Risk: Is the transfer of the risk of cost and time slippage from the client important?	3	6	6	15	15
$\sum$ = *Rank*		**82 (4)**	**84 (3)**	**103 (2)**	**124 (1)**

Each aspect from Table 5 was discussed by the project team and stakeholders in the second *Procurement Review* session. The following points were reviewed in relation to the alternative procurement methods available for the educational project and summarised as follows:

- *Agency will be financially risk averse* - a D&C, particularly Two Stage D&C, would give greatest cost certainty at each key decision stage.

- *Agency will discourage late changes* – D&C is less flexible to late change and would therefore be preferred. A clear and thorough briefing process and the agency's requirements to an appropriate level of detail would be required.

- *Programme is important*; (as early a finish as possible is sought) – D&C would offer the greatest programme advantages.

- *Quality is important* – the traditional approach provides the best ongoing opportunity for design quality control, but at an increased cost risk compared to D&C. D&C can provide an adequate level of design quality control and that direct control of design quality passes to the contractor under D&C at the novation date of the design team.

- *Market conditions* – an early approach to, and early involvement of, the contractor would be beneficial in current market conditions. Two stage would therefore be most appropriate in this respect.

- *Partnering* – the agency favours partnering arrangements, but it is unlikely that a suitable contractor framework would be available in time to support this project. Two stage would bring early contractor involvement and therefore offer the best alternative to partnering that can be achieved through the Government Electronic Marketplace (GEM) process.

- *Potential for phased completion* – given the overall programme pressures, the potential need for phased completion was discussed. Early involvement of the contractor would allow the most efficient and economical introduction of phased completion if required.

Table 5. Procurement appropriateness charts for school project.

Key	Good	Average	Poor

Time	Traditional Single	Traditional 2 Stage	D&C Single	D&C 2 Stage
Completion date certainty (once let)				
	Introducing a 2nd stage produces a potential extra risk of delay to overall completion.			
Ability to meet current programme				
	In order to obtain full design prior to tendering, traditional routes require a significant lead in as no overlap occurs between design and construction, which may be difficult to achieve. Whilst the D&C contractor can overlap their design and construction the programme must reflect sufficient time for defining the client's Requirements. A Two-Stage form of procurement is particularly suitable for fast track, large and complicated projects, whereby a contractor's practical construction expertise may be fully exploited.			
Facility to phase construction				
	A 2 stage process provides an opportunity for contractor input into pre-planning for phased delivery.			

Cost	Traditional Single	Traditional 2 Stage	D&C Single	D&C 2 Stage
Cost certainty prior to major commitment.				
	This single traditional route provides a high degree of cost certainty providing that full detailed design is produced prior to tendering. As with D&C provides a high degree of cost certainty providing the client's requirements are fully defined up to performance stage. Lump sum cost certainty is achieved at the end of the 2nd stage when all surveys/investigations are complete, the vast majority of sub-contract tenders are obtained and all risks quantified. Two Stage options require payment during the 1st phase without certainty.			
Transfer of cost risk				
	The transference of risk to the contractor is an obvious benefit of the D&C procurement method, but the passing on of these risks will have an effect on the contractor's price, which reduces the benefit of this transference. Design risk will however stay with the client via the design team. Under traditional systems risk of design is retained by the client. Transference of cost and programme risk to the contractor under a D&C procurement method to enable the client to establish a robust risk profile before entering into any significant financial commitment with the contractor. The downside is the transference of ownership of detailed design responsibility to the contractor, unless this is done in a measured and informed way the end product may not meet the design criteria expected or demanded.			
Competitive tendering in current market conditions				
	The D&C 2 stage route appears to be the most attractive option for the current market situation. All options provide for competitive tendering.			

Quality	Traditional Single	Traditional 2 Stage	D&C Single	D&C 2 Stage
Ability for contractor to add value in design development				
	Traditional – Due to design being retained by the client's appointed designers a greater level of design quality may be anticipated. However, this means that the contractor is not involved with the design, which could cause some problems in terms of areas such as constructability. Two Stage tendering can bring significant quality and constructability advantages. D&C – D&C routes provide maximum ability for contractors to add value in design. Because the design responsibility is transferred to the contractor's team the client loses direct control over design development. However, production of comprehensive documentation clearly defining quality standards and effective design checking procedures can mitigate this.			
Flexible to accommodate change orders				
	Construction stage changes should be avoided when adopting D&C.			
Single point responsibility for design & construction				
	Under traditional the design and construction responsibilities are split.			
Ability to control / respond to unknowns site conditions				
	2 Stage process can provide the opportunity for contractors to investigate the site conditions fully, prior to site start.			
Client retains control over development of design				
	Under 2 Stage D&C the client has greater influence on design development later in the process.			

Step 6: Recommendation

The consensus preferred option at this stage was a *two stage D&C* procurement method. The key consideration in reaching this conclusion was the potential overall advantages with respect to programme, cost risk/certainty and the potential for phasing.

5. Conclusions

A six step approach to procurement method selection was developed and tested using a real-life capital works project. The proposed approach (and system used) was well received by the focus group participants and all were satisfied with the solution identified within a three hour period. The process was considered to be transparent and reflective and at no point was the choice of procurement method deemed to be *fait accompli.* While participants were satisfied with the outcome, there were moments when public agencies argued in favour of *bastion*, (that is, the default traditional lump sum) most notably when they admitted having only experience with this method. The public agency procured almost 95% of its capital works projects using a TLS and had no formal approach to procurement method selection in place (Love *et al*., 2008). A major limitation identified by participants was the inability of the proposed procurement selection process to account for PPP forms. These forms of procurement method are recent phenomena to the public sector in WA and so for this they were excluded from the process. Consideration will be made to include additional criteria so PPP options can be included.

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Partnering for Dispute Resolution and Mitigation – A Reality or Myth?

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Abstract

Partnering is a process of establishing good working relationships based on mutual trust and dedication to common goals between project team members for the purpose of achieving specific business objectives. It is a proactive approach to conflict and dispute resolution that provides a way for project partners to anticipate potential problems with mutually satisfactory solutions. However, traditional dispute resolution techniques such as mediation, arbitration and litigation, which can be both expensive and time-consuming, tend to be confrontational and fail to reach a win-win situation, hence ultimately posing a threat for the industry in the long term. Unlike many western countries,

partnering was not adopted within the Hong Kong construction industry until 1994 for a public hospital project, yet has proved to be no less an effective procurement means in improving the traditional adversarial working culture and reducing intractable construction disputes and conflicts over the past 16 years. This paper presents a timely and in-depth review of the implementation and effectiveness of project partnering in reducing disputes within the Hong Kong construction industry through planned structured interviews, case studies and an empirical questionnaire survey, and seeks further improvements to the application of partnering and dispute resolution. The research study will identify the causes of construction disputes and analyze their importance; examine whether and how partnering can minimize the occurrence of construction disputes; evaluate the satisfaction level of various project team members on dispute resolution via partnering; and conclude by suggesting recommendations for avoiding and mitigating construction disputes and claims using the partnering approach.

Keywords: project partnering, construction disputes, construction conflicts, Hong Kong

1. Introduction

The Hong Kong construction industry is characterized by fragmentation and traditional adversarial working relationship. This contributes to mistrust, lack of open communication, and ultimately, conflicts and disputes (Appel 1993). The Report of the Construction Industry Review Committee published by the Hong Kong Special Administrative Region in January 2001 encouraged a wider application of a partnering arrangement so that all project participants will work as a team to achieve shared project objectives rather than in competition with each other (Construction Industry Review Committee 2001). Since the resolution of disputes can be both expensive and time-consuming, a proactive approach to resolving claims and disputes should be adopted by employers, consultants and contractors. Partnering has been demonstrated to be an effective procurement means in improving the adversarial culture and reducing construction disputes and conflicts within the industry worldwide (Construction Industry Institute 1991; Construction Industry Institute 1996; Gransberg et al 1999; Chan et al 2003a). Project partnering has been adopted within the Hong Kong construction industry for more than 16 years since 1994 and brought many perceived benefits to all project participants. Thus there is a strong need for an in-depth research with focus on examining the effectiveness of partnering in dispute resolution and mitigation in local construction.

Partnering is not a new concept in western countries but it was not introduced in Hong Kong until 1994 for a public hospital project (Chan et al 2003a). Partnering is a simple process of establishing good working relationships between contracting parties. More directly, partnering is the building of "trust" among the interested parties of a contract. This helps avoid problems with the project that, in recent times, more often than not leading to litigation (Moore et al 1992).

Disputes can be resolved by traditional means such as mediation, arbitration and litigation; however, those techniques are operated by legal processes under an adversarial atmosphere (Construction Industry Review Committee 2001). Consequently, a rational, non-adversarial and cost-effective approach to resolving construction disputes is desired (Pinnell 1999). Partnering is a proactive approach to resolving disputes far more effectively than adversarial approaches (Construction Industry Institute 1991; Pinnell 1999). Partnering opens a process to have parties engaged in open communication with mutual trust and respect, and to share risks and liabilities responsibly for the attainment of common goals (Fisher 2004). During the partnering process, problems can be identified and resolved at proper level, thus partnering is also regarded as a dispute prevention procurement method.

In order to improve the overall performance of the construction industry, construction disputes should be minimized or even avoided. This research will provide the project participants with an in-depth vision of whether and how disputes can be prevented and resolved via partnering, and with an effective approach to reducing construction disputes so as to improve cost-effectiveness, working relationships among contracting parties as well as overall project performance.

2. Definitions of partnering

It is difficult to provide a single definition towards partnering (Bresnen and Marshall 2000; Cheung et al 2003; Chan et al 2004). Various definitions are sought from published literature and they are defined according to different visions of authors. Indeed, partnering is a process of establishing a moral contract or charter among the project team members, which will bind each party to act in the best interest of the project and the project team members.

Both the Construction Industry Institute (1991) based in the United States and the Construction Industry Board (1997) in the United Kingdom conducted some well-known researches into partnering. They had developed their own definitions of partnering below.

The Construction Industry Institute (1991) defined partnering as:

"A long-term commitment between two or more organizations for the purposes of achieving specific business objectives by maximizing the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based on mutual trust, dedication to common goals, and an understanding of each other's individual expectations and values."

The Construction Industry Board (1997) defined partnering as:

"A structured management approach to facilitate team working across contractual boundaries… it should not be confused with other good project management practice, or with long-standing relationships, negotiated contracts, or preferred supplier arrangements, all of which lack the structure and objective measures that must support a partnering relationship."

3. Partnering development in Hong Kong

The earliest formal partnering arrangements recorded within the Hong Kong construction industry were exclusively applied to hospital projects in 1994 (Skues 1996). The two pioneering proponents were the Hospital Authority and Hsin Chong Construction Co Ltd, a Hong Kong-based leading contractor. The two design-and-build hospitals being managed by the Hospital Authority have embarked on partnering. The first project, the North District Hospital located in Sheung Shui, introduced partnering through the initiative of the employer (Skues 1996). The initial partnering workshop was conducted after tender out but before contract award. The second project, the Tseung Kwan O Hospital, set out a partnering provision in the contract and therefore the partnering workshop was launched by the contractor "Hip Hing-Laing Joint Venture". Leighton Contractors (Asia) Ltd, a prominent Australian-based contractor, successfully adopted partnering for the contracts of the Haven of Hope Hospital in 1995 and the United Christian Hospital in 1997 respectively (Skues 1996).

In recent years, the application of partnering principles is not limited to hospital projects. The mass transportation service providers, Kowloon-Canton Railway Corporation (KCRC) and Mass Transit

Railway Corporation Ltd (MTRCL) which have merged together as the MTRCL since December 2007, have introduced partnering for their development projects such as the West Rail and Tseung Kwan O Railway Extension respectively (Bayliss 2002). Moreover, a focus on reducing construction disputes via partnering has been placed in the public sector. Apart from the infrastructure developments, the Hong Kong Housing Authority (HKHA) and the Hong Kong Housing Society (HKHS) are also actively nurturing a partnering culture in the public and quasi-public sector residential developments (Chan et al 2006). The major private property developers implementing partnering concepts include Hongkong Land Ltd, Swire Properties Ltd, Yieldway International Ltd, Glorious Sun Properties Ltd, Gammon Skanska Ltd (currently Gammon Construction Ltd), and Tradeport Hong Kong Ltd (Chan et al 2006).

4. Partnering application in reducing disputes

Under the partnering arrangement, the problems of disputes, claims or litigations are greatly mitigated through open communication and improved working relationship (Cook and Hancher 1990; Construction Industry Institute 1991; Abudayyeh 1994; Construction Industry Institute 1996). Whilst Gransberg et al (1999) advocated that dispute and claim cost on partnering projects was relatively low, similar conclusion can be found in the research of Li et al (2000) and Ruff et al (1996). In fact, the Army Corps of Engineers of the United States and the oil industry of the United Kingdom have applied partnering on large and small contracts since 1980s, and Bayliss (2002) reported that not a single dispute had escalated to litigation in these partnering projects. This is in stark contrast to the number of disputes received on non-partnered contracts of similar scale (Schultzel 1996; Bloom 1997). Ranco and Ranco (1996) put forward a table exploring the partnering impacts on construction projects which explains how partnering reduces the exposure to litigation (Table 1).

Table 1: How partnering reduces the exposure to litigation (Ranco and Ranco 1996)

Typical project without partnering	*Typical project with partnering*
No easy opportunity is provided to resolve conflicts quickly. Small conflicts snowball.	*Partnering workshops provide forum, structure and skills to resolve conflicts promptly.*
People who must work together have limited vehicles to get to know each other so they can build up mutual trust.	*Partnering workshops enable project participants to connect at a deeper level. If conflicts arise, it is easier to pick up the phone and discuss the issues.*
There are limited means for project team members to resolve their own conflicts.	*Partnering models the individuals taking responsibility for resolving their own conflicts.*
Everyday tone of communications evolves at random, takes on a life of its own.	*Partnering workshops provide a vehicle to manage the appropriate tone of communication.*

Partnering is a proactive approach to preventing and reducing disputes, claims and even litigation. It provides a way to develop a control and resolution mechanism for dealing with problems (Cowan et al 1992; Woodrich 1993; Pena-Mora and Harpoth 2001). The partners anticipate potential problems and

devise an action plan addressing how those problems are jointly identified and resolved. The partnering agreement allows each party the opportunity of learning and using the other's problem resolution methods (Cook and Hancher 1990; Bates 1994; Hellard 1996; Stephenson 1996; Conley and Gregory 1999). Sanders and Moore (1992) concluded that partnering helped eliminate many personal conflicts. Partnering ensures problem identification and resolution at the lowest possible level of authority on-site before leading to claims and litigation by means of "issue resolution mechanism" (Chan et al 2004). Reactions to conflict such as coercion and confrontation are counter-productive and fail to reach a win-win situation (Lazar 2000). In fact, the conflicting parties look for a mutually satisfactory solution and this can be achieved by joint problem solving to seek alternatives for the problematic issues.

5. Research methodology

5.1 Overall research approach

Four research tools, i.e. literature review, in-depth interview, case study and questionnaire survey will be used in collecting appropriate and sufficient information and data of projects using partnering approach based in Hong Kong. Figure 1 demonstrates the overall research framework with reference to the concept of Walker (1997)'s model.

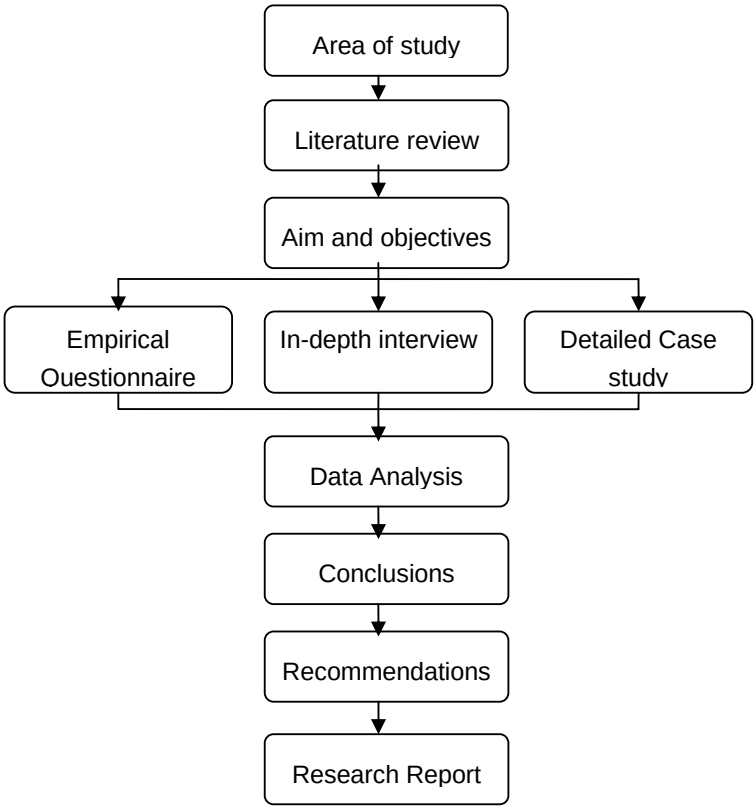

Figure 2: Overall research framework for the research study

5.2 Literature Review

An extensive review of related literature from textbooks, professional journals, conference proceedings, academic journals, research monographs, previous dissertations, workshop seminars, magazines, newsletters and internet materials will be launched to capture background knowledge about the causes of construction disputes, together with partnering practices and implementation processes across different countries, e.g. United Kingdom, United States, Australia and Hong Kong. Past and current implementation practices, whether locally or overseas, on partnering approach will be documented. The review exercise aims to develop an overall research framework and to prepare an appropriate template for the structured interview, questionnaire survey and case study. It is crucial to understand and investigate the development and application of partnering approach in the Hong Kong construction industry, especially in the area of dispute resolution.

5.3 In-depth interview

In-depth face-to-face interviews with senior industrial practitioners with abundant hands-on experience in partnering projects will be conducted to identify the prevailing practices, application and future development of partnering in the construction sector. Potential interviewees include the key project team members of related government departments, private property developers, mass transportation service providers, project consultants and main contractors. The purpose of face-to-face interviews was to acquire the first-hand information and opinions on the causes of construction disputes, reasons for minimizing the occurrence of construction disputes via partnering, satisfaction level on dispute resolution, together with recommendations for improvement to dispute mitigation from interviewees with sound experience in implementing partnering approach. Their opinions, feedback and comments are vital for the contribution to the contents of the empirical survey questionnaire as well as the development of the conclusions and recommendations. Interview dialogues will be fully documented, analyzed and compared using content analysis in order to seek similarities and differences of the various partnering attributes under study for cross-comparison.

5.4 Case study

Data on the relevant real-life case study projects will be collected through face-to-face interviews and retrieval from collaborating firms. In-depth investigation on some case study projects is not only used to enhance the real understanding of the partnering practices and implementation, but also it is vital to the validate the research findings. All the cases will be analyzed on both an individual basis and collectively in order to draw valid, representative conclusions.

5.5 Questionnaire survey

An empirical research survey questionnaire will solicit the perceptions of the key project stakeholders on applying partnering approach in terms of the causes leading to construction disputes, reasons why partnering can minimize the occurrence of construction disputes, degree of satisfaction on dispute resolution, accompanied by recommendations for improving the current state of dispute mitigation via partnering. Key participants in those partnering projects will be the targets of the survey. Self-administered questionnaires will be distributed to target respondents and they include Project Managers, Architects, Engineers, Quantity Surveyors and other related professionals in the organizations of related government departments, private property developers, mass transportation service providers, project consultants and main contractors with abundant hands-on experience in participating in partnering projects. In addition, the data collected will also be used to compare the opinions between client organizations, project consultants and main contractors in applying partnering approach.

Results of the questionnaire survey will be analyzed to investigate the participants' views and opinions on partnering by using different statistical techniques. First, the mean score will be used to analyze the data collected from the questionnaire survey. The mean score of each partnering attribute

under study will be calculated and used to determine the relative ranking by comparing each individual mean score. Then the relative rankings will be used to cross-compare the relative significance or importance of those partnering attributes between the groups of respondents, i.e. client vs consultant vs contractor. The mean score of each item will be computed by the following formula (Chan et al 2003a):

$$\text{Mean Score} = \frac{\sum(f \times s)}{N} \quad \text{where} \quad (1 \leq \text{Mean Score} \leq 5)$$

where f = Frequency of response to each rating (1-5); s = Score given by respondents and ranging from 1 to 5; N = Total number of responses

After computing the mean score, the Kendall's Coefficient of Concordance (W) Test will be applied to check whether the respondents were consistent with others in ranking the attributes under study based on mean values within a particular survey group. A high or significant value of W represents that different respondents respond in a consistent manner, and vice versa (Chan et al 2003a).

Third, the Spearman's Rank Correlation Coefficient (r_s) will also be used to measure the level of agreement on their rankings of the attributes under study between any two survey groups. The range of r_s is between –1 and +1. A value of +1 indicates that a perfect positive linear correlation between the two parties, –1 implies perfect negative linear correlation and there is no linear association if the value is equal to 0 (Chan and Kumaraswamy 1996).

All the quantitative data collected from the empirical survey will be inputted and handled using the Statistical Package for Social Sciences (SPSS) to facilitate further analysis of the survey responses.

5.6 Validation of research findings

Triangulation from multiple sources will be employed to reinforce the credibility of the findings obtained from the research data and subsequent analyses. Results derived from the questionnaire survey and case studies will be cross-referenced to the published literature as well as with each other. Appropriate workshop discussions with prominent industrial practitioners who have acquired extensive hands-on experience in undertaking partnering projects will be organized to generate relevant information and to supplement and/or confirm the outcomes of the analyses, and a set of proposed recommendations for improving the prevailing partnering practices in relation to dispute resolution. A meeting will be scheduled via discussions and moderations to validate the research findings and explanations with practitioners involved in the research study.

6. Conclusion

Although reduction in disputes is recognized as one of the perceived benefits of partnering, there is few or no published literature which has focused on this area. This research study will launch an in-

depth investigation of implementing partnering projects within the Hong Kong construction industry with particular attention to dispute prevention and resolution. It will provide a critical analysis of the current application, causes of construction disputes, reasons for minimizing the occurrence of construction disputes via partnering, satisfaction level on dispute resolution, together with improvement measures for successful resolution of disputes and claims using the partnering approach. Moreover, the research results are expected to lay foundation for a positive environment on future development of issue resolution mechanism through the partnering dance. This would encourage more local industrial practitioners to implement the partnering approach for achieving effective prevention and efficient resolution of construction disputes and claims in the near future.

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Transparency in UK Public Construction Procurement

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Abstract

Transparency in public construction and infrastructure procurement has long been considered as a priority for national and international procurement systems. The UN, World Trade Organisation, World Bank, OECD, regional multilateral organisations (like the European Union) and individual countries have all developed procurement policies and regulations that when implemented seek to increase transparency in public procurement. This paper reports on preliminary findings of an applied research project undertaken as part of the international Construction Sector Transparency (CoST) initiative. The goal of the research project is to establish a baseline of transparency in contemporary public construction procurement in the UK. The research project involved analysis of UK procurement regulations and use of the case study methodology to examine release of project information into the public domain on a selective sample of recently completed public construction projects. The research reveals that UK procurement regulations and sample projects mainly focus on transparency during the competitive elements of procurement (e.g. prequalification and tendering) as oppose to transparency during the initial project identification and later post-completion project review phases.

Keywords: construction, public procurement, transparency

1 Introduction

Transparency in public construction and infrastructure procurement has long been considered as a priority for national and international procurement systems. The UN, World Trade Organisation, World Bank, OECD, regional multilateral organisations (like the European Union) and individual countries have all developed procurement policies and regulations that when implemented seek to increase transparency in public procurement.

This paper reports on an applied research project undertaken as part of the Construction Sector Transparency (CoST) initiative. CoST is an international multi-stakeholder initiative funded by the UK Government's Department for International Development (DFID) and the World Bank to increase transparency and accountability in the construction sector. CoST aims to enhance the accountability of procuring bodies and construction companies for the cost and quality of public-sector construction through the disclosure of material project information on construction projects. Material in this context is intended to indicate that sufficient information is provided to enable stakeholders to make informed judgements about the cost and quality of the infrastructure concerned. The disclosures include for example a description of the project, its purpose and location and, at the project implementation stage, summary details of the original and final project specifications, project costs and completion dates, and details of the contractor, designer and project supervisor.

The CoST initiative is currently being piloted over a two-year period until October 2010 in seven countries: Ethiopia; Malawi; Philippines; Tanzania; Vietnam; Zambia and United Kingdom. In each country a multi-stakeholder group has been formed and a number of activities have been undertaken including a public consultation exercise, a retrospective baseline review of completed projects and an assurance process ensuring full release of information on a sample of ongoing projects.

The goal of the applied research project reported in this paper was to establish a baseline of transparency in contemporary public construction procurement in the UK as part of the CoST initiative's implementation in the UK.

The main objectives of the study were:

1. To identify which items of project information are currently legally required to be released into the public domain in the UK by procuring entities;

2. To assess, from a sample set of procuring entities, which items of project information are currently being released into the public domain;

3. To assess (from the same sample set of procuring entities) the barriers to the release of this information;

4. To provide information on other on-going initiatives affecting the procurement and management of construction contracts and how these might complement and support the CoST Initiative.

This paper provides an overview of the preliminary findings related to each objective and is structured as follows: in the next section of the paper a concise review of the research context for transparency in public construction procurement is presented. A methodology section then includes an outline of the scope of work and tasks involved in completing the study, including procedures to select a sample set of construction projects. The findings section is divided into four sub-sections to include a brief discussion of the preliminary findings related to each of the main study objectives listed above. The paper concludes with a summary section.

2 Research context

Despite the long term interest in transparency in public construction procurement from the likes of the UN, World Trade Organisation, World Bank, OECD and individual countries the subject remains relatively under-explored from a research perspective. One explanation for this might be that although transparency and the release of information into the public domain about public construction projects are important issues they are not necessarily considered outcomes in themselves. Rather transparency can be argued to be a means to meet other procurement objectives including integrity, accountability and fighting of corruption.

Although there are notable exceptions the majority of research that has focused on the transparency of what and how government's procure construction has done so from the point of view of fighting corruption in construction (e.g. Kenny, 2006; Sohail and Cavill 2006a; 2006b; 2008; Fewings and Henjewele 2008). Exceptions include construction transparency research from a legal perspective (Shorland, 2001; Brown and Ramphul, 2009) and a contract cost / penalty viewpoint (Deng et al., 2003; Ohashi, H. 2009). The research reported in this paper focuses specifically on transparency and although the research recognises that release of information can help to serve other procurement objectives the research does not make any explicit attempt to relate itself directly to any anti-corruption, procurement accountability or value for money agendas.

3 Methodology

Researchers from The Salford Centre for Research and Innovation and The Centre for Construction Innovation at The University of Salford were appointed to undertake this applied research project into transparency in UK public construction procurement following a competitive tendering process. The appointment involved working in close collaboration with the Construction Sector Transparency (CoST) initiative's UK Multi-Stakeholder Group (MSG) whose members included representatives from The UK Department for International Development, Transparency International UK, The Royal Institute of Charted Surveyors, with Secretariat duties undertaken by the UK Institute of Civil Engineers.

The study began with detailed examination of UK procurement laws and regulations related in particular to the procurement of publicly financed works in order to address Objective 1 of the study. This process identified the legal requirements for the release of material project information and barriers preventing its release. At the same time to tackle Objective 4 a desk-based review of other

on-going or planned transparency/anti-corruption/good governance initiatives that affect the construction sector was undertaken alongside analysis of how they relate to the CoST initiative.

The next stage of the study was to use the case study methodology to address Objectives 2 and 3 by examining the release of project information into the public domain on a selective sample of twelve recently complete public construction projects. The UK MSG led on the identification of a sample set of procuring entities (or public clients) to act as research collaborators in the UK baseline survey. Four different procuring entities were chosen to represent a cross-section of public sector organisations in the UK: an Executive Agency of a Central Government Department; a Non-Departmental Public Body of a Government Department, a local government council, and; a not-for-profit association operating with public money. The procuring entities also provided a diverse range of project types across construction sectors from housing to education and major infrastructure.

Agreement was reached with each of the four procuring entities that they would cooperate in each providing three sample projects for investigation. The projects were required to have been completed (although no earlier than December 2006) to ensure that the release of project information could be assessed against complete project lifecycles and so that the release of post-completion information at the end of projects in particular could be assessed.

Each of the 12 sample projects (3 from each procuring entity) were then investigated in turn to identify the actual release of project information into the public domain on each project and identify procurement statistics including tendering data (like the number of construction firms bidding to undertake the project) and project changes (like differences between contract start and actual prices and programmes).

In order to collect data on each project in a consistent manner a series of spreadsheets and project summary templates were developed. Following interviews with project managers and key staff involved in each case study project the spreadsheets were used to record the scope of each project, the procurement strategy and contract types used, and list which project information from the standard list of material project information shown in Table 1 was:

1. Stored by the procuring entity or not, indicating whether it is

    - Available in a hard copy file
    - Available in hard copy but would need to be searched out; and/or
    - Stored electronically.

2. Forwarded from the procuring entity and stored by others (e.g. project implementation agency, procurement oversight authority);

3. Released into the public domain (e.g. on website) (indicated on a sliding scale of always/majority of cases/minority of cases/never);

4. Made available to the public on demand (indicated on a sliding scale of always/majority of cases/ minority of cases/never);

5. Required by law to be made available to the public.

6. Prevented by law from being made available to the public.

7. Prevented by other factors (political, cultural, managerial, and administrative) from being made available to the public.

A process of verification and analysis was then undertaken to identify and correct gaps and potential erroneous data and compare the practice of releasing information in different projects and procuring entities against the legal and regulatory procurement framework in the UK.

Table 1: Standard list of Material Project Information (MPI

Project Activity / Phase	*Item of Project Information*
Project identification	*Project specification*
	Purpose
	Location
	Intended beneficiary
	Feasibility study
Project funding	*Financing agreement*
	budget
	Project cost estimate
Tender process for the contract for project design	*Tender procedure*
	Name of main consultant
Tender process for the contract for project supervision	*Tender procedure*
	Name of main consultant
Tender process for the main contract for works	*Tender procedure*
	List of tenderers
	Tender evaluation report
Details of the contract for project supervision	*Contract price*
	Contract scope of work
	Contract programme
Details of the main contract for works	*Contractor name*
	Contract price
	Contract scope of work
	Contract programme

Execution of the contract for project supervision	*Significant changes to contract price, programme, scope with reasons*
Execution of the main contract for works	*Individual changes to the contract which affect the price and reasons for those changes*
	Individual changes to the contract which affect the programme and the reasons for those changes
	Details of any re-award of main contract
Post contract completion details of the main contract for works	*Actual contract price*
	Total payments made
	Actual contract scope
	Actual contract programme
	Project evaluation and audit reports

4 Findings

4.1 Objective 1: Identify which items of project information are currently legally required to be released into the public domain

Table 2 below shows the items of project information that are currently legally required to be released into the public domain. The legal framework for Public Procurement in the UK is derived from UK, European Union (EU) (also referred to as EC - European Community) and World Trade Organisation (WTO) procurement laws and regulations.

The EC Treaty and EU Procurement Directives form the main regulatory framework for public procurement in the UK and have been implemented in national law through statutory UK public contract regulations. All public procurement in the UK has to comply with the rules and principles of the Treaty establishing the European Community including:

- the free movement of goods (Article 28 of the EC Treaty);
- the right of establishment (Article 43);
- the freedom to provide services (Article 49);
- non-discrimination and equal treatment;
- transparency;
- proportionality; and

- mutual recognition.

The rules are enforced through Member States' courts, and the European Court of Justice (ECJ). According to ECJ case-law the principles of equal treatment and non-discrimination on grounds of nationality imply an obligation of transparency which, "*consists in ensuring, for the benefit of any potential tenderer, a degree of advertising sufficient to enable the market to be opened up to competition and the impartiality of the procedures to be reviewed*"[1] . And it is through the advertising of contract opportunities with the intention to open up the public procurement markets of EU member states (to ensure the free movement of supplies, services and works within the region) where there is most transparency in public construction procurement projects. Analysis of the current EC Works Procurement Directive (2004/18/EC) shown in Table 2 reveals that information on the purpose and location of projects and the tender procedures have to be legally released into the public domain on all projects above certain thresholds (currently £3,927,260) – which provides transparency and opens up public contract opportunities to the whole of EU market. After contracts have been awarded procuring entities must name the successful bidder, the agreed price, programme and scope of work – thus giving transparency in the outcome of tendering processes.

As highlighted in Table 2 legal requirements for the release of information do however not go much further than the requirements already pointed out. For example, at the beginning of a project a procuring entity does not have to release a business case, list of intended beneficiaries or feasibility study to justify why certain public projects have been approved and are being funded. Similarly at the end of the construction process there are no legal requirements for transparency on the actual contract price, scope and programme or any provision of project evaluation and review reports. This is a major finding with interesting implications. For example, the lack of transparency at the end of the construction process suggests that there might be an 'accountability gap' if procuring entities do not have a legal requirement to release information into the public domain relating to actual project performance.

Table 2: Legal requirements for the release items of project information

Project Activity / Phase	*Item of Project Information*	*Required to be Released*
Project identification	*Project specification*	*NO*
	Purpose	*YES*
	Location	*YES*
	Intended beneficiary	*NO*
	Feasibility study	*NO*
Project funding	*Financing agreement*	*NO*
	budget	*NO*
	Project cost estimate	*YES*
Tender process for the contract	*Tender procedure*	*YES*

[1] ECJ Cases C-324/98, Telaustria, [2000] ECR I-10745, paragraph 62, C-231/03, Coname, judgment of 21.7.2005, paragraphs 16 to 19 and C-458/03, Parking Brixen, judgment of 13.10.2005, paragraph 49.

for project design	*Name of main consultant*	*YES*
Tender process for the contract for project supervision	*Tender procedure*	*YES*
	Name of main consultant	*YES*
Tender process for the main contract for works	*Tender procedure*	*YES*
	List of tenderers	*NO*
	Tender evaluation report	*NO*
Details of the contract for project supervision	*Contract price*	*YES*
	Contract scope of work	*YES*
	Contract programme	*YES*
Details of the main contract for works	*Contractor name*	*YES*
	Contract price	*YES*
	Contract scope of work	*YES*
	Contract programme	*YES*
Execution of the contract for project supervision	*Significant changes to contract price, programme, scope with reasons*	*NO*
Execution of the main contract for works	*Individual changes to the contract which affect the price and reasons for those changes*	*NO*
	Individual changes to the contract which affect the programme and the reasons for those changes	*NO*
	Details of any re-award of main contract	*YES*
Post contract completion details of the main contract for works	*Actual contract price*	*NO*
	Total payments made	*NO*
	Actual contract scope	*NO*
	Actual contract programme	*NO*
	Project evaluation and audit reports	*NO*

4.2 Objective 2: Which items of project information are currently being released into the public domain

Analysis of the twelve sample projects in the UK reveals the general pattern that the different procuring entities do release the project information they are legally required to. The procuring entities do release the project information associated with the requirements of the EU procurement directives (e.g. project purpose, location and tender procedure) into the public domain. The procuring entities do not release the post-completion project information (i.e. changes to the contract, actual contract price, scope and programme) into the public domain.

In terms of the post-completion project information the research process identified that the procuring entities do not feel that they are prevented from releasing this information by any legal, administrative or political barriers but because they are not legally required to disclose it – they choose not to. It is

interesting to note that procuring entities would release this information on demand following requests made through Freedom of Information legislation. The only items of project information that procuring entities state they would not be released on demand relate to potentially commercial sensitive information (like tender evaluation reports which might contain confidential or trade secrets).

The research process identified that all of the standard project information investigated is stored by the procuring entities surveyed and it was found to be most frequently stored electronically. In addition, project information was found to be disclosed in a variety of ways, including: the Internet (the most frequent method of disclosure because all tendering opportunities above the EU thresholds are uploaded on to an EU website); public consultation meetings and newspaper notices; site boards; agency / departmental executive reports, and project newsletters.

4.3 Objective 3: Identify barriers to the release of project information

During face-to-face and telephone interviews with project managers associated with the sample projects the following barriers emerged:

- The release of project information requires time and resources and could distract from the main objective of delivering projects;

- The anticipated benefits of releasing more project information are "ambitious" and the general public are probably not interested in the vast majority of the information so release of more project information might be of little benefit and whilst costing significant time and money;

- Confidentiality and commercial sensitivity concerns on behalf of private sector partners;

- Concerns that increased release of MPI and association with transparency initiatives can damage the reputation of organisations because they might be perceived as having done something wrong or hiding things previously.

In addition to the above barriers the EU public works Procurement Directive 2004/18/EC can be examined to determine legal barriers that could prevent the release of project information. A major barrier is potentially commercial confidentiality which prevents procuring entities from disclosing information forwarded to it by firms which they have designated as confidential; such information includes, in particular, technical or trade secrets and the confidential aspects of tenders[2]. Articles 10 and 14 of the Directive 2004/18/EC also clarify that the Directives shall not apply to services or works which are declared secret or the execution of which must be accompanied by special security

[2] Article 6, EC Directive 2004/18/EC

measures in accordance with the laws, regulations or administrative provisions in force in the Member State concerned[3].

4.4 Objective 4: On-going initiatives affecting the procurement and management of construction contracts

Table 3 below provides information on a selection of some of the other on-going initiatives affecting the procurement and management of construction contracts in the UK.

Table 3: Ongoing initiatives affecting the procurement and management of construction contracts

Theme	*Initiative*	*Overview of Initiative*
Public Procurement Policy	*Transforming Government Procurement (TGP)*	*Set up to improve the efficiency of government procurement and ensure wider implementation of the Office of Government Commerce's best practice procurement guidance.*
	Achieving Excellence in Construction (AEC)	*The AEC initiative is the government's construction client improvement programme and the response to the construction industry's Rethinking Construction improvement initiative.*
	Public Sector Construction Clients' Forum (PSCCF)	*The PSCCF's purpose is to strengthen the leadership and co-ordination of public sector construction activity. The work of the Forum is supported by a number of limited-life working groups that are developing proposals on specific themes, including: public sector demand and industry capacity to deliver; fair payment; and improved embedding of best practice.*
Enforcement	*The UK Government's Anti-Corruption Unit (ACU)*	*Provides guidance to UK business on bribery law and in managing the risks of international corruption and working on country-specific issues.*
	Office of Fair Trading and Serious Fraud Office	*The Office of Fair Trade (OFT) has undertaken several major investigations into the construction industry to ensure transparent and effective competition*
	Public Audit National Audit Office (NAO) and Audit Commission (AC)	*The two major public audit bodies that will investigate public construction. The NAO remit includes central government and public agencies. The AC remit includes local government and housing organisations.*
Industry Led	*The Construction Commitments from the Strategic Forum for Construction*	*The Commitments are divided into six themes that explicitly mention transparency: procurement and integration; client leadership; design quality; commitment to people; sustainability; and health and safety.*
	The Construction Clients' Charter	*Signatories to the Charter are expected to exhibit a number of best practice behaviours, defined under the broad themes of leadership and a focus on the client; working in integrated teams; whole life quality; and having a respect for people.*
	The development of new contract types	*An example is the development of the NEC suite of standard contracts, which have aimed to promote better relationships and transparency between the parties by*

[3] Articles 10 and 14, EC Directive 2004/18/EC

		means of a clear and simple documentation.
Civil Society	*Transparency International (TI) UK*	*The UK Chapter of the world's leading non-governmental anti-corruption organisation produces business tools, reports, and information to help prevent corruption on construction projects.*
	UK Anti-Corruption Forum	*Forum bringing together UK companies, professional institutions, trade associations and NGO with a common interest in curbing corruption in international and UK construction.*
	Global Infrastructure Anti-Corruption Centre (GIACC)	*GIACC is an independent, not-for-profit organisation which provides resources and services for the purpose of preventing and dealing with corruption in the infrastructure, construction and engineering sectors.*

5 Summary

This paper has reported on preliminary findings of an applied research project undertaken as part of the international Construction Sector Transparency (CoST) initiative. The goal of the research project is to establish a baseline of transparency in contemporary public construction procurement in the UK. Preliminary findings related to the four main objectives of the research project were presented in the paper including a sample of ongoing initiatives relating to the procurement and management of construction contracts in the UK and a list of potential barriers to the release of project information by procuring entities into the public domain.

In terms of legal requirements for the release of project information into the public domain the EU procurement directives that govern public procurement in the UK require most transparency at the competitive stages of procurement (i.e. location of contracts, tender procedures and outcomes of tender processes). This focus is derived from the EU Treaty goals of the free movement of goods, services and works and the opening up public procurement markets across member states. At the beginning of construction projects the legal framework for public procurement does not require procuring entities to release a business case, list intended beneficiaries or release a feasibility study to justify why certain public projects have been approved and are being funded. Similarly at the end of the construction process there are no legal requirements for transparency on the actual contract price, scope and programme or any provision of project evaluation and review reports. However, procuring entities are also not prevented by any legal barriers from releasing this information should they wish.

Analysis of the twelve sample projects in the UK reveals the general pattern that the different procuring entities examined do release the project information into the public domain that they are legally required to (e.g. information associated with the requirements of the EU procurement directives project purpose, location, tender procedure), and as a general rule the procuring entities tend not to voluntarily disclose information they are not legally required to, although most of the information would be released on demand if requested through use of freedom of information legislation.

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Towards the Development of a Construction Supply Chain Transaction Cost Economic Model for Strategic Infrastructure Procurement Evaluation

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Abstract

Australia has adopted public-private partnership (PPP) as a major strategy for procuring infrastructure for decades. However, even though considered to be a mature and sophisticated market, several major failures have occurred resulting in increasing financial burdens on taxpayers. Failures have typically been traced back to economic evaluation and, in particular, value-for-money across the supply chain in the original proposal. However, the literature review identified that there was no economic model that evaluated holistically the transaction costs of PPPs across the supply chain. In this paper, theories of transaction cost economics and construction supply chain economics are critiqued and analysed in order to develop a strategic infrastructure procurement evaluation model. The model will offer decision makers with an insight into project life cycle economic outcomes needed to successfully deliver PPPs.

Keywords: infrastructure, public-private partnership, transaction cost economics, supply chain economics, Australia

1. Introduction

An increasingly high demand for investment in infrastructure has been caused by rapid urbanization in many countries (The World Bank, 2008). To solve the problems of conventional provision of infrastructure funded by governments, including governmental inefficacies and shortage of governmental funds, a range of Public-Private Partnership (PPP) arrangements have become the preferred way to provide public services in many countries, including Australia (Jin, 2010; Jin and London, 2009; London and Jin, 2009).

The core principle for PPPs is *value-for-money* (DTF, 2000). Risk transfer, whole-of-life costing, innovation, and asset utilisation are usually stated as the *value-for-money* drivers for PPPs (Hayford, 2006). However, the significant levels of investment required, the complexity of the arrangements, and the incomplete contracting nature have led to increased risk exposure for all the parties involved (London and Jin, 2009). The recent global financial crisis has further heightened the examination of past PPP performance and promoted the discussion about whether PPP should remain one of the government procurement strategies in the future (Jin and Doloi, 2009). In Australia, the impact of the global financial crisis is expected to allow evolution of the PPP model in use. The PPP participants and researchers are at a crossroads because, although there is significant infrastructure investment about to take place, especially under the current Australian infrastructure stimulus package, many problems still beset this complex procurement strategy. The critical question being asked tends to focus on how *value-for-money* will be achieved by adopting PPPs.

Surprisingly few efforts have been made to identify the critical success factors for managing the process of designing a procurement strategy, such as PPP, particularly the public economic infrastructure project (Jin and Doloi, 2009; London and Jin, 2009). Therefore, the research aim of this study is to:

Identify and evaluate the critical success factors that should receive focal attention to ensure the achievement of value-for-money if PPP is the preferred procurement strategy for a public infrastructure project.

Based on the research aim, three research questions are raised as follows:

- How to integrate relevant theories such as the transaction cost economics and the supply chain economics so that they can be used to holistically identify the critical success factors for managing the process of designing a procurement strategy for a public infrastructure project and logically interpret the mechanism underlying this process?

- What are the factors, based on the relevant theories, that should receive focal attention to ensure the achievement of *value-for-money* if PPP is the preferred procurement strategy?

- In which conditions do the identified factors lead to the achievement of *value-for-money* in PPP projects?

Corresponding to the research questions, the research objectives of this research include:

- Explore the way in which relevant theories can be integrated into each other and used to holistically and logically identify the critical success factors that have impact on designing efficient infrastructure procurement strategies and can ensure the achievement of *value-for-money* when adopting PPP strategies;

- Identify and evaluate the critical success factors drawing upon the relevant theories;

- Evaluate the particular conditions in which the identified factors lead to the achievement of value-for-money in PPP projects

This research project is part of a three-phase project. Within the one-year timeframe, the current project will allow the researchers to develop the theoretical framework and collect a small amount of empirical data to validate and refine their work. The future research, which comprises the rest part of the three-phase project, will extend the current project and establish and quantitatively validate a model for designing efficient procurement strategies for infrastructure projects by using large-scale industry-wide survey and adopting cutting-edge artificial intelligence techniques.

2. Literature review

Although the PPP model has been recognized by many governments as an important procurement strategy, a number of PPP projects have been conducted in a problematic and controversial way. One of the major reasons is that some decisions on adopting the PPP model to procure a project turned out to be inappropriate although governments have devised various measures to show the value-for-money to be achieved. As such, there must be some critical factors having been neglected when the PPP procurement strategies were formed. Such factors are so vital that, without taking them into consideration, achieving *value-for-money* for PPP projects would still remain highly problematic. Therefore, the exploration into these critical factors is vital for achieving government procurement efficiency and the resultant value-for-money.

Furthermore, it is without any doubt that infrastructure projects adopting the PPP strategy will incur various transaction costs. Because costs of this type are quite difficult to measure and quantify, it has remained untouched regarding how to dexterously and reliably address the cost issue inherent in a project transaction. Therefore, the search for suitable theories to address the problem is of critical significance to the PPP sector. Without this, efficient procurement and transaction would remain colloquial.

Therefore, it is firmly believed that the means used to evaluate and adjust the PPP model needs to be revisited, revised, and refined, as stated in a recent review of PPP infrastructure projects in Victoria (Fitzgerald, 2004). Succinctly, specific research on the critical factors that should receive focal attention and can ensure the achievement of *value-for-money* if PPP is the preferred procurement strategy is timely, theoretically valid, and practically worthwhile.

Although devising strategies to achieve value-for-money for PPPs is always beneficial, at a certain point the costs of gaining further control over a PPP project will exceed the extra value that can be created and thereby negative return occurs. Thus the design of the ultimate procurement strategy must be judged on a cost-benefit basis (Miller and Lessard, 2001). However, research has been concerned mainly with process and technique (Walker and Chau, 1999). While both process and technique aspects aim at increasing efficacy, neither is successful in understanding which kind of existing governance structures best suits a particular construction project in terms of efficiency and why. Transaction cost economics (TCE) can contribute to this. From a TCE perspective, the process of designing a procurement strategy for a public infrastructure project could actually be viewed as the process of deciding the proportion of responsibility on the project between government and private partners based on a series of characteristics of the transaction in question (Jin and Doloi, 2008).

Nonetheless, TCE has its limitations. Theorists have found it difficult to explain contractual relationships between firms where clearly the transaction costs were high and yet firms did not vertically integrate (Richardson, 1996). TCE also tends to focus upon individual contractual relationships *per se* and overlook the characteristics of the commodity/product *per se* and the industry and market that the commodity/product exists in. Theories associated with supply chain economics, particularly the industrial organization economics approach, can be adopted to address this problem (London, 2008, 2009). This is because construction supply chain economics aims to understand many interdependent relationships as the unit of analysis within the context of the economic market structural and behavioural characteristics (London and Kenley, 2001). As London and Kenley (2001) advocated, there is potential for future research relating transaction cost economics to the supply chain movement for the construction industry.

Based on the construction supply chain economics theory (London, 2008), the PPP transaction can be deemed as a complex core commodity supply chain. A *complex commodity chain* is one where the nexus of contracts to the project contract is complex in either technology or managerial complexity; i.e. requiring unique, specialist and innovative design and/or construction solutions or a high level of integrative managerial capacity (London, 2008). These types of supply chains can be characterized by innovative design, new materials, juxtapositions of new materials, numerous different types of suppliers, and a requirement to source and integrate suppliers not typically managed previously (London, 2009). The PPP transactions fall exactly in this category.

3. Research significance

It is anticipated that the findings of this study shall serve as a decision aid for decision-makers involved in PPP projects to overcome the shortcomings in current decision-making process, which include the lack of clarity in critical success factors and the lack of a link between the critical success factors and economic contextual responsiveness. These shortcomings may baffle the decision-makers in choosing an appropriate procurement strategy. This study is expected to make the following contributions to the knowledge body of construction management and economics:

- The transaction cost economics (TCE) and the supply chain economics (SCE), which have been identified as suitable theories, are used to holistically and logically identify the critical success factors that can ensure the achievement of *value-for-money* if PPP is the preferred procurement strategy. In particular, by adopting the institutional comparative way of the TCE theory, the puzzle of how to address the 'cost minimization' problem without quantitatively measuring the associated costs can be solved. Furthermore, the contribution of construction SCE is to assist in providing the framework for understanding the specific differences that occur in relation to vertical integration and industry fragmentation in the construction sector that have not hitherto been explained adequately by TCE.

- The theoretical components of the TCE and construction SCE theories will be operationalized into measurable variables/factors that have practical meanings.

- The critical success factors that can ensure the achievement of *value-for-money* in PPP projects will be identified.

Meanwhile, the findings and achievements of this study are expected to be of interest to decision-makers involved in PPP projects from both public and private sectors. The guidelines to be established in this study will make it much easier for decision-makers to understand why some factors deserve their attention of the first priority to the others in order to ensure an efficient procurement and transaction.

This research aims to develop frontier technologies for building and transforming Australian building and construction industry and to identify and understand the factors that lead to highly efficient PPP procurement strategy through a creative and innovative combination of contemporary management theories. The findings of the research project will provide Australia with the momentum to continually play the leading role in the research area of PPP projects. The established guidelines will lead Australia to be one of the most efficient and innovative nations in dealing with public infrastructure development.

The following figure conceptualises the framework for this study (see Figure 1).

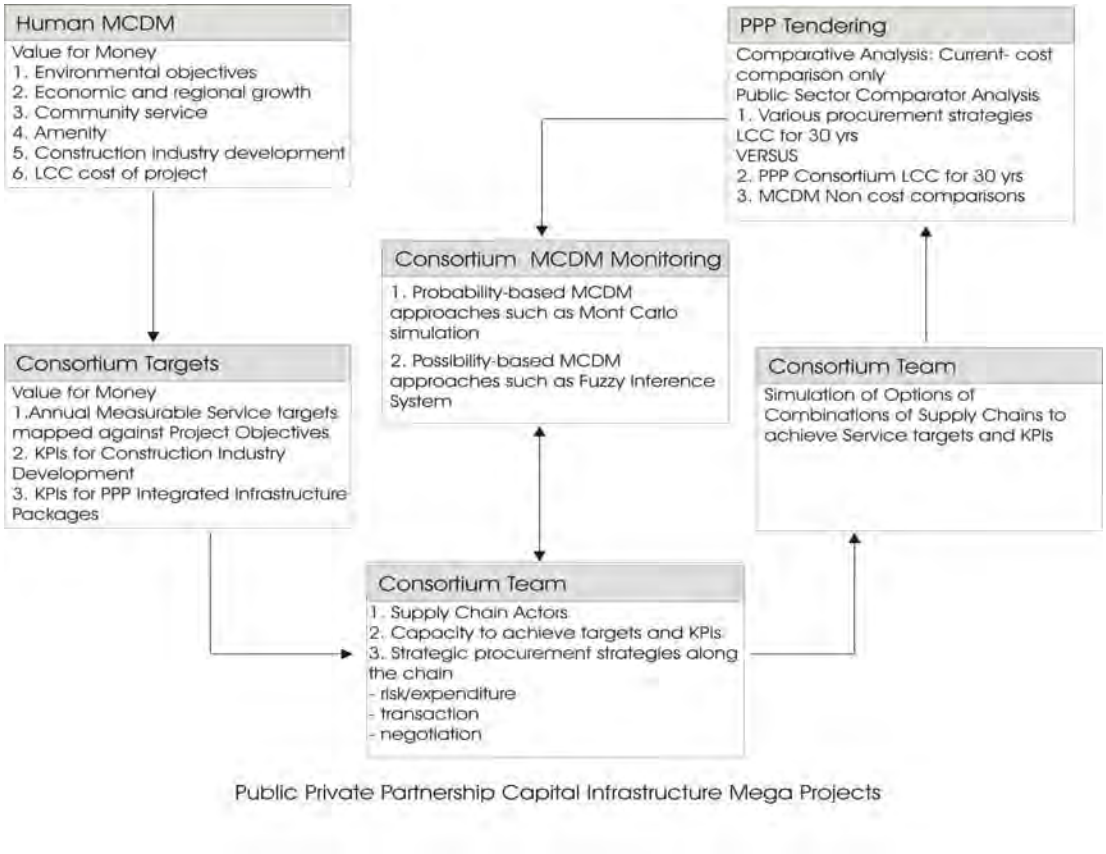

Figure 1: Theoretical framework

4. Research methodology

4.1 Research purposes

Research can be *exploratory*, *descriptive*, or *explanatory*. The purpose of this study is a combination of exploration, description, and explanation. The TCE and SCM theories, in particular the industrial organization economics approach, will be identified as, when integrated, suitable theories to holistically and logically identify the critical factors that should receive focal attention and can ensure the achievement of *value-for-money* if PPP is the preferred procurement strategy. The detailed characteristics of the identified critical factors will be explored and described for further enquiry. By using data collected through interviews, the impact of these critical factors on the achievement of value-for-money will be established and explained.

4.2 Research methodological strategies

Theory and research are linked through methodological strategies of deductive and inductive reasoning (Babbie, 2004). The deductive and inductive approaches can be used in combination in a research project (Saunders *et al.*, 2003). In this study, both deductive and inductive reasoning will be used. The TCE and SCE theories will be validated using empirical data to see if the real world works as these theories predict. By combining these two theories, this study will also generate new ways in which efficient procurement and transaction strategies can be formed.

The entire study will be carried out in two phases. Phase One mainly involves identifying candidate factors through an extensive literature review on transaction management in PPP projects and the theories of TCE and SCE. These factors are expected to be able to ensure the achievement of value-for-money in PPP projects. Accordingly, the identified factors and their hypothetical impacts will be proposed for validation. Research questions 1 and 2 are thus addressed and research aims 1 and 2 fulfilled in Phase One.

Phase Two seeks to verify the hypothetical impacts of the identified factors. Required data will be collected in a series of interviews based on two real PPP projects in Australia. By using the collected data, the critical success factors will finally be established. Findings generated through the verification process will be subject to detailed analysis and discussion. Guidelines will be established based on the findings. Accordingly, research question 3 is addressed and research aim 3 fulfilled in Phase Two.

4.3 Case study and data analysis

Case study is the preferred technique when questions of '*how*' and '*why*' are considered and when the focus is on a contemporary phenomenon in a real-life context (Yin, 2003). Case studies are increasingly being used as a research tool and involve either single or multiple cases and numerous levels of analysis (Yin, 2003). In this study, multiple case study will be used, in which two PPP projects in Australia will be under scrutiny from the perspective of procurement and transaction efficiencies. Multiple cases were considered to achieve replication of the same study in different contexts (Tan, 2004).

For each project, data will be collected by interviewing more than three experts involved in decision-making process. Such design follows Hammersley and Atkinson's (2007) triangulation concept. The triangulation concept states that information about a single phenomenon should be collected from at least three different sources. This is because if verification is done by only one expert, there may be a problem with data validity, and bias may be introduced due to self-justification or post-rationalization (Walker, 1997).

Analysis can be conducted in a quantitative or qualitative way. In this study, qualitative methods will be used to analyse the collected data and verify the hypothetical impacts of the identified factors.

4.4 Questionnaire design

Based on the factors that are identified in the literature review, a two-section questionnaire will be designed in this study. Section 1 is designed to gather the interviewees' personal and institutional profile. Questions are asked about interviewees' experience in the construction industry and in PPP projects, their job level within their institution, the role of their institution, and their institution's involvement in PPP projects. These questions are specifically designed to double-check whether the interviewees have appropriate knowledge and experience in PPP projects in Australia, and whether they hold appropriate position as decision-makers, which would give credence to collected data (Conant *et al.*, 1990; Phillips, 1981).

Section 2 of the questionnaire is project-based and is designed to gather the information about PPP projects that is required for establishing the critical success factors from the identified factors. Firstly, interviewees are requested to provide general information about the project they specified, such as project value, construction duration, concession duration, infrastructure sector that the project is categorized in, and partners' cooperation history. Secondly, interviewees will be requested to assess the criticality/importance level of a number of identified factors. Description of the factor is presented in the questionnaire, followed by a list of 'Strongly Disagree', 'Disagree', 'Neutral', 'Agree', 'Strongly Agree', and 'Not Applicable'. The first five items correspond to 1, 2, 3, 4, and 5 on a five-point Likert scale, respectively.

The questions are of 'closed' type where typical features are identified and listed for interviewees to evaluate. According to Nkado (1995), the 'closed' type question is easier to respond to. Moreover, the terminologies used to describe the issues are limited, which greatly simplifies subsequent analysis of the response. Nonetheless, due to the nature of this research, 'open' type questions will also be created, which require interviewees to enumerate and subsequently evaluate the features.

5. The way forward

For more than two decades, from the mid 1980s through to now, governments worldwide have made attempts at construction industry policy development related to the concept of supply chains. Understanding industries in terms of chains, clusters and networks had becoming increasingly important in economies around the world. It is even now more important than ever before given the free flowing trade movement practiced by firms through the effects of globalisation, the growth of various international markets – particularly construction, increased development of reciprocal agreements between professional Boards and associations and the creation of various international trade agreements. Governments worldwide are seeking to improve the construction industry. National plans are being adopted that work towards this and which consider the supply chain concept, an important part of their

plan. Understanding and improving the industry through the supply chain lens has clearly been on the agenda for many countries.

A critique of key international policy documents that described government approaches towards improving the performance of their construction industry has shown that the question of performance tends to be interpreted as either one of an industry fragmentation problem or a firm specialisation industry attribute. Those who consider it a fragmentation problem espouse normative models of integration at the project level to solve the productivity and performance problems. Those who consider it a firm specialisation industry attribute tend to accept the industry as it is and espouse positive models of cooperation and competition at the firm level. The trend in recent years has been towards more positive models whereby governments intervene with policies that appreciate firm profitability, specialisation and competitiveness as the way to achieve improved industry productivity. In many of these models the constraints of the industry are viewed in a different light; for example, the growth of SMEs is viewed as a healthy indicator of economic growth within a sector and one that should be managed, rather than as a problem that should be solved.

Key overarching themes in construction industry policy development in recent years have been environmental sustainability, information technology and then productivity and innovation. More recently of course sustainability has been widened to include social and economic sustainability. This move towards integrating holistically various systems is laudable as it represents a realistic acceptance that optimisation is about choices between resource systems objectives. The construction industry operates in clusters, chains and networks – the links between firms and projects is fluid and dynamic and ever evolving and indeed complex. Yet, we still do not have ways to understand how our decisions are impacting upon performance in an integrated manner even though we espouse holistic objectives. We still do not see the construction industry as a dynamic ecological integrated system.

It is suspected that the whole scale change of an industry can really only be initiated through significant government intervention triggers that will enable diffusion of the adoption of different processes and practices. It is well understood that governments have three major roles to play in the construction industry: as controller of the regulatory framework, as a major client, and as policy maker. Construction industry plans often suggest various strategies that aim to change the behaviour of firms operating in the industry without knowing how to evaluate, monitor and measure that change. Extremely large infrastructure projects can play a key role in changing firm conduct and overall market behaviour and thus performance but only if performance measures are put in place to close the loop . We have consistently for many decades bemoaned that it is the structure of the industry inhibits our ability to make productivity and performance improvements. The two major impediments have always been that it is a project based industry and that there are far too many players along the supply chain that is a fragmented industry of small to medium sized enterprises. However there are very few models or even examples of practical implementation whereby the major projects have been monitored for their role in creating different supply chain scenarios that seek to improve industry performance, innovation or profitability. PPPs because they can have such a

widescale impact upon the very structural and behavioural characteristics of construction economies at the local, regional and even national level provide at least a mechanism to develop supply chain measures as indicators of project success rather than the usual simplistic time, cost and quality indicators and this project is aimed at exploring the key performance indicators for construction industry development through interdependencies in the supply chain.

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The Effect of Public Procurement Act on Budget Appropriation on Project Delivery in Nigeria and its Subsequent Effects on the Supply Chain

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Abstract

The Nigerian economy is presently driven by the national budget with average capital procurement content between 60-65% while the balance covers recurrent and minor procurement. This is based on projected income from sources which depend largely on the global performance of product export which are driven by international market forces. In Nigeria, our major sources of income remain oil and gas which constitute about 70-85%. The oil and gas global market remains fragile, unstable and fluctuating due to the cyclical nature of market. Consequently the national budget is running in deficit and vicariously all other sectors of the economy suffer setbacks. The aim of this study is to examine the effect of poor or low level of implementation of government budget appropriation on contracting entities based on two case studies under the government procurement policies and budget appropriation with overall disruptive effect on supply chain. The study will be based on literature review and two case studies in educational settings. In addition, a series of national construction companies' practitioner's experience on this public procurement policy were conducted using in-depth interviews in order to determine the effect on supply chain members. Results show the need for wider awareness on principle and effect of time in the adaptation of the new procurement act as reliable bases of national budgetary appropriation, project costs overrun and performance motivation to improve anxiety among supply chain members. The study will argue for better strategies on time management for government procurement policies towards better budget appropriation. This study will be beneficial for developing economies to understand the effect of better budget planning and appropriation in an era of public procurement act and its effects on project delivery and supply chain members.

Keywords: Nigeria, national budget appropriation, public procurement act 2007, project delivery, supply chain

1. Introduction

This paper attempt to research into the effects of government budgetary appropriation using national procurement act 2007 on project delivery and the rest of supply chain. The annual budget are premised on projected income from oil sources which depend largely on peaceful exploration environment of host income generating/source communities (e.g Niger Delta, etc) and the global performance of product export which are driven by international market forces. In Nigeria, our major sources of income remain oil and gas which constitute about 70-85%.

Notwithstanding whatever might have delayed processes or actual utilization of the fund earmarked for any commenced procurement exercise, the balance not utilized within the year are returned to the treasury that year. Although the request for re-budget for the balance outstanding could be included in the succeeding year's budget request, it is not automatic that such request will be approved. Even if it is approved, there is no guaranty of timeliness of release to avoid break in progress of the procurement process that started in the preceding year. These are some of the reasons we have scores of abandoned government projects scattered all over Nigeria, collapsed businesses that depended on anticipated revenue accruable from such failed or abandoned projects.

2. Nigerian economy and the national budget

Nigeria being a developing country with a population of 140million people is driven economically by government spending through national budget appropriation. The country is endowed with several economic resources untapped, but relied mostly on oil and gas resources whose prices are determined by the performance of international market forces. Due to recent recession in the global market, especially in the oil market the government spending organ can no longer meet their financial obligation as planned thereby transferring the ripple effect on other sectors respectively. The procurement activities that commenced by the government early in the year could not be managed due to inconsistent cash flow and in adequate planning at budgeting stage. This leads to project abandonment, delay penalty on payment due and expiration of time at the end of procurement year which leads to extension of time with financial consequences

3. Nigerian budget: the capital procurement delivery and recurrent and minor procurement (with their value and share)

Government expenditure generally are sourced mainly from annual budgetary appropriation and donor agencies while any unspent fund before the end of the year are returned to the national treasury in accordance with the Procurement Act 2007. The annual national budget in Nigeria includes capital intensive developmental construction projects which constitute about 60-65% of the total value of the annual budget while the balance goes for recurrent expenditure. These capital projects are governed

by act of parliament called national procurement act 2007 which stipulates guidelines and procedures to be observed to procure any appropriated project.

4.0 Public Procurement Act 2007:

4.1 Capital procurement and Abandoned Capital Projects

According to North Tipperary County Council Procurement Plan 2008-2009, Public procurement is defined as the acquisition, whether under formal contract or otherwise, of works, supplies and services by public bodies. It ranges from the purchase of routine supplies or services to formal tendering and placing contracts for large infrastructural projects. Public procurement policy is concerned with obtaining the best goods and services, supplies and construction to meet the demands of service users with a commitment to achieve value for money. Public Procurement Act 2007: Oyebode and Fayokun (2009) observed that the Federal Government of Nigeria is making concerted efforts to ensure that the principles of transparency, competition and accountability are adhered to by all stakeholders involved in public procurement. It is to this end that the Federal Government of Nigeria promulgated the Public Procurement Act 2007 on 4th June 2007 with the stated objective of harmonising existing government policies and practices by regulating, setting standards and developing the legal framework and professional capacity for public procurement in Nigeria. An enforcement culture of due process in public procurement is slowly developing in Nigeria.

The Act covers any private sector entity that derives at least 35% of the funds appropriated or proposed to be appropriated for the procurement of goods, services or works from the Federation share of the Consolidated Revenue Fund.

The Consolidated Revenue Fund which was established by the 1999 Constitution of the Federal Republic of Nigeria holds all revenues and other monies raised or received by the Federation for the purposes prescribed by the National Assembly.

4.2 Key features on the provisions of public procurement act, 2007 and stakeholders responsibilities

Ekweme (2010), observed the key features of this legislation as it relate to what a player in the procurement sector must know and do in seeking award of a government contract includes the qualities of a valid contractor; as well as the formal pre-qualification process. Apart from the standard process, other processes contained in the Act (The Public Procurement Act, 2007) include: The Two-Stage Tendering Process; the Restricted Tendering Process; Request For Quotations for Direct Procurements; Emergency Procurements and two-stage tendering process.

The Act provides that a procuring entity shall engage in procurement by two-stage tendering in the following cases:- where it is not feasible for the procuring entity to formulate detailed specifications for the goods or works involved in the procurement; where the procuring entity seeks tenders, proposals or offers on various means of meeting its needs in order to obtain the most satisfactory solution to its procurement needs; or where the character of the goods or works are subject to rapid technological advances; or where the procuring entity seeks to enter into a contract for research, experiment, study or development; or where the procuring entity applies the Act to procurement concerned with national security and determines that the selected method is the most appropriate method of procurement; or, finally where the standard tender proceedings have been utilised but were not successful or the tenders were rejected by the procuring entity and the procuring entity considers that engaging in new tendering proceedings will not result in a procurement contract (Section 39 of the Act).

Most of these instances are self-obvious and need little comment. However, it is clear that the last instance is to prevent a situation where a needed procurement is not actualized because the contracting community, aware of the failure of an earlier process, is unwilling to engage the
procuring entity in a fresh round, after a future advertisement is made. In this and any of the above scenarios, a two-stage process is the legislated antidote. In the two-stage process, the invitation documents shall call upon suppliers or contractors to submit, in the first stage of the tendering proceedings, initial tenders which contain their proposals without a tender price. The procuring entity may also solicit proposals that relate to technical, quality or other characteristics of the goods, works or services as well as contractual terms and conditions of supply. Finally, the invitation documents may stipulate the professional competence and technical qualifications of the suppliers or contractors.
Again, in the first stage of the two-stage tendering process, the procuring entity may engage in negotiations with any supplier or contractor whose tender has not been rejected under an open competitive bidding procedure. In the second stage of the process, the procuring entity invites suppliers or contractors whose tenders have not been rejected to submit final tenders with prices on a single set of specifications. It would thus appear that the two-stage process enables the procuring entity to feel the market and establish a sense of what the right price and quality of the procurement should be. This is particularly useful where the procurement is relatively new in the country, or involves uncommon technology.

The restricted tendering process requires the procuring entity to obtain the approval of the BPP. The process applies if:- (a) the goods, works or services are available only from a limited number of suppliers or contractors; (b) the time and cost required to examine and evaluate a large number of tenders is disproportionate to the value of the goods, works or services to be procured; or (c) the procedure is used as an exception rather than a norm Again, in the case of (a), similar to the basis for the two-stage process, the restricted tendering process is useful where the procurement is relatively new in the country, or involves common technology. At the same time, while scenario (b) allows the entity to adopt economic or cost/benefit justifications for adopting this process, scenario (c) is really a matter of the entity's discretion. As the term implies, the process involves only a limited number of contractors being invited to bid. If scenario (a) is the situation in question, all contractors who can possibly provide the goods or services, must be invited by virtue of section 40(2)(a) of the Act. This suggests that the procuring entity should have a way of ascertaining who all the available suppliers

and contractors are and, in our view, may be impracticable. A judgment call, it appears, would be required on the part of the government agency involved.

Where scenario (b) is the situation giving rise to restricted tendering, the procuring entity must still find a way of involving in a non-discriminatory manner a number of contractors in the process, so as to ensure effective competition. It is worthy of note that restricted tendering does not place a figure on the number of contractors the procuring entity invites to bid.

Request for quotations: the procuring entity requests for quotations from at least three unrelated suppliers or contractors. The procuring entity does not enter into negotiations with these third parties on the amount quoted, but proceeds to award the contract. Requests for quotations may be employed only where the value of the goods or works to be procured does not exceed a sum that shall be set in the procurement regulation. The Bureau's approval is not required where the total value of the procurement is not more than a sum that shall be set in the regulation.

Direct procurements, the procuring entity may procure the goods, works, or services by inviting a proposal or price quotation from a single supplier or contractor. In such a case, the government agency involved shall include in the record of procurement proceedings forwarded to the BPP, a statement of the grounds for its decision and the circumstances in justification of single source procurement, which must be one of the following:- (a) the goods, works or services in question are only available from that particular supplier or contractor, or that supplier or contractor has exclusive rights in respect of them; or (b) there is an urgent need for the goods, works or services and engaging in tender proceedings or any other method of procurement is impractical due to unforeseeable circumstances giving rise to the urgency; or (c) owing to a catastrophic event, there is an urgent need for the goods, works or services, making it impractical to use other methods of procurement because of the time involved; or (d) the procuring entity, which had already procured goods, equipment, technology or services from that supplier or contractor, determines that –

i) additional supplies need to be procured from that supplier or contractor because of standardisation;

ii) there is a need for compatibility with existing goods, equipment, technology or services, taking into account the effectiveness of the original procurement in meeting the needs of the procurement entity;

iii) the limited size of the proposed procurement in relation to the original procurement provides justification;

iv) the reasonableness of the price and the unsuitability of alternatives to the goods or services in question merits the decision;

v) the procuring entity seeks to enter into a contract with the supplier or contractor for research, experiment, study or development.

Emergency procurements Section 43 of the Act provides that a procuring entity may carry out an emergency procurement where –

(a) the country is either seriously threatened by or actually on fronted with a disaster, catastrophe, war, insurrection or Act of God;

(b) the condition or quality of goods, equipment, building or publicly owned capital goods may seriously deteriorate unless action is urgently and necessarily taken to maintain them in their actual value or usefulness; or

(c) a public project may be seriously delayed for want of an item of a minor value. The section provides that, in such an emergency situation, the procuring entity may engage in direct contracting of goods, works and services.

Who gets awarded the contract? Having considered and, to some extent, analysed the various processes for procuring goods, works and services, the crucial question for the private sector participant is – what are the determinants of success? In the standard process, the contract will be awarded to "the lowest evaluated responsive bid from the bidders substantially responsive to the bid solicitation" (Section 16(17)). Also, see section 24(3) which provides that, in procurement for goods and services, "the winning bid shall be that which is the lowest evaluated responsive bid which has been responsive to the bid with regards to work specification and standard". Price therefore appears to be the primary concern although the latter section has a reference to the standard and work specification.

Notwithstanding the provision of section 16(17), however, the BPP may refuse to issue a Certificate of No Objection to contract awarded on the grounds that the price is excessive. Thus, even offering the lowest price will not guarantee that a bidder gets the contract. In fact, the Bureau may either direct that the procurement proceedings be entirely cancelled or that the procuring entity conduct a re-tender where it feels that the price is excessive.

In addition to price, other relevant factors may be considered: - . Costs of transportation and insurance, Payment schedule, Delivery time, Operating costs, efficiency, Compatibility of the equipment, availability of services and spare parts, related training, safety, environmental benefits or losses by damages; if time is a critical factor, the value of early completion of works.

Thus, in addition to bidding a reasonable price as a foundation for success, a contractor should examine the above checklist (derived from relevant sections of the Act), to ascertain whether some other advantages arising from his competitive position would hold him in good stead in obtaining an-award.

Summarily, the essence of the system contained in the Public Procurement Act, is to ensure fairness and a level playing field in the procurement process. The overarching authority structure provided by the NCPP and BPP is, effectively, a shadow over the key players in the process – that is private sector contractors and the government procuring entity. This will hopefully ensure that the game is played according to the rules. Ultimately, the law seeks that the process would result in the lowest priced and highest quality procurement. Risks inherent in the system, however, include the fact that the process can consume a lot of man-hours and result in a fruitless effort, not because the contractor did not

follow the rules or even submit a qualifying bid, but because the procuring entity decided to reject all bids or cancel the procurement proceedings in the public interest. Also, the prices submitted must be stated in naira and fixed for a minimum of 180 days. In light of the current global economic uncertainties and the likelihood of sourcing major inputs internationally, negative currency fluctuations would not play in a contractor's favour, leading to possible high bids to mitigate this risk; in such a case, a player may end up not getting an award – and those that do succeed will face the prospect of their margins eroded by currency changes.

Judicial review of particular procurement proceedings is a possibility but, it would seem, not quite tested as yet in Nigeria. In conclusion, contractors would do well to seek counsel in understanding the intricacies of the procurement rules and the overall system, to enhance their chances of success.

4.3 General construction procurement route

To manage project procurement efficiency from a diverse number of firms and construction work activities, Oyegoke (2004), agreed that procurement strategies are used as a contractual framework to manage/coordinate inter-firm activities. Construction procurement can be classified as integrated or fragmented depending on the nature of the contractual and functional relationships that exist among the players. The design and build route is referred to as integrated because it allows for a single point of responsibility for design and construction. The contracting processes of design-bid–build, otherwise known as traditional/conventional method, and management routes allow for separate responsibility and risk between the players, thus are referred to as fragmented. According to Bresnen and Marshall (2002), vertical integration will diminish; as it relates to traditional procurement planning where design teams (namely, Architects, Structural and Services Engineers, and Quantity Surveyors) exchange information in successive order. While horizontal integration, often achieved by alliances and partnership, will flourish.

Research Questions

Can public procurement act facilitate efficient procurement delivery in Nigeria construction industry and adaptable to professionals and stakeholders around the world?

Research Methods

Desk and field studies were conducted of two construction companies awarded construction contract having same design and specification; same negotiated contract sum and completion period; same site location and the contract based on public procurement act 2007 requirement. Also in-depth interviews and observation techniques administered upon the general respondents of the stakeholders/ project team involved. The targeted respondents were professionals in the construction industry who are decision makers namely, client representatives, consultants, contractors. The sample size of project team as respondents though seemingly small is a true representation of the particular population

segment of the industry that have faced one complexity or the other as regards adaptation of the new public procurement act 2007 within Abuja, the base of the research.

The main focus is the measurement of the effect of public procurement act on budget appropriation on project delivery in Nigeria and its subsequent effects on the supply chain among the respondents. The procurement routes adopted are two-staged traditional/conventional system packaged by team of consultant respectively.

The assessment of the effects of inefficiencies caused by the use of public procurement act on the amount of budget appropriated for the project was based on the practices as follows: the level of transparency, the timing of client's response to basic site constraints between the period award was made and time the contractors was actually granted access to site; the actual period payment were honoured (from the time valuation/certificate were issued/delivered to client and payment made by it); Response time on the complaint made and recommendation thereof presented to the client and the pro-active measure taken to mitigate or avoid the appropriated fund meant for the project from being returned un-utilized.

5. Case studies: Case study of university X in Abuja principal officers' residence 2no contractors: general background to the contract procurement

The contractors were pre-qualified based on their respective previous annual turn-over/ range of single project previous contract sum in an open competitive bidding guided by the new public procurement act (PPA) 2007 which recognizes the 'lowest responsive bid' to win. The public procurement act (PPA) 2007 was barely a year old when the tender was invited mid year 2008 and in accordance with the Act all procurement and disbursement for same must be done before the end of any fiscal procurement.

There were 5 buildings to be constructed whose appropriation was approved but only three contractors were pre-qualified based on the range mentioned. Although the contractors quoted individually and differently as expected and their respective tender analysis/recommendation sent to the client (University of Abuja) but it decision was subjected to approval of the supervising Federal Ministry of Works, Housing and Urban Development's Tender Board. Interestingly, this tender board made the client to negotiate a uniform but lower sum than any of the competing bidders who accepted same before award letter were issued simultaneously.

The public procurement act (PPA) 2007 has provision for maximum of 15% material advance payment to the contractors based on approved bank guarantee bond, all the contractors benefited. Although, all the bidders were advised to visit the proposed site before completing their bids to ascertain other salient features that might help them in completing their tenders. After receiving the advance payment, the contractors were expected to mobilise to site but complained of in-accessibility to site due to virgin and bushy nature of the farmland area proposed for the project.

Initially the client tried to insist that the contractors has their preliminaries to cater for such things as provision of access to site without the client's involvement based on their preliminaries cost, with the analysis and amount provided by them (contractors) it was proved to the client that it is client's responsibility as the client itself could not reach the site as well. This effort took about 8week before actual mobilisation to site. This delay has eaten up the contractor's time in the current procurement year as the amount appropriated for them in the fiscal year running if not drawn before the year runs out must be return to the federal treasury. Then a fresh request is included for the balance in the successive procurement year.

Considering a project scheduled to be completed in 12weeks that suffered 8weeks delay at the beginning attributable to the client in an environment of statutory limitation (procurement year period/expiration) on a lump sum contract which professionally does qualify for fluctuation normally. The contract though got appropriation in the succeeding procurement year but continue to drag.

5.1 Case No1:

PROJECT:	DEVELOPMENT OF PRINCIPAL OFFICERS RESIDENCES
PROJECT SATUS:	ABANDONED REGISTRAR'S RESIDENCE AS AT NOVEMBER 2009
CONTRACTOR:	ABC INVESTMENT LIMITED
CONTRACT SUM:	N25, 280,230.241
CONTRACT PERIOD:	12 WEEKS

COMMENCEMENT DATE:30TH NOVEMBER, 2008

ADVANCE PAYMENT:	N3, 792,034.54 (15% OF CONTRACT SUM)
CONSULTANTS:	MESSRS A (ARCHITECTS)
	MESSRS B (QUANTITY SURVEYORS)
	MESSRS C (STRUCTURAL ENGINEERS)
	MESSRS D (SERVICES ENGINEERS)

5.1.1 Project case brief

The Management of University X in Abuja desirous of accommodating its Principal Officers within the permanent site in its efforts to move to the permanent site by constructing 5-Bedroom duplex as residence. The 12 weeks duration contract was awarded to and accepted by Messrs ABC INVESTMENT LTD in the negotiated sum of N25, 280,230.24 on the 7th October, 2008. The contractor could not mobilize to site until 29th Nov. 2008 due to inaccessibility to the site; this problem was later solved by the client. On mobilization, the contractor was granted material advance of 15% in accordance with National Procurement Act 2007 based on advance payment bond.

5.1.2 Progress achieved

The over all progress of work achieved at contract determination was at substructure ground floor slab stage.

5.1.3 Valuations issued to date

Valuations issued to date reflect the following:

- ADVANCE PAYMENT (Oct'08) N3,792,034.54(Paid)
- Interim Valuation No 1 (19/12/'08) N1,124,013.93 (not paid by the Client)
- Interim Valuation No 2A(19/02/'09) N499,393.47 (Paid)
- Interim Valuation No 3(17/04/'09) N0.00(NIL)
- Retention Money(with the Client) N215,109.17(not yet released to contractor)
- Gross valuation to date: N4,302,183.47

5.1.4 Challenges on the project

This contractor clamoured for upward review of the contract and deliberately slowed down its pace of work initially before he finally abandoned and demobilized out of the site as at 19th February 2009, despite all encouragement by the client. The contractor in a joint letter dated 9th February, 2009, with three (3) other contractors on the proto-type projects called for upward review even though this particular contractor has abandoned the site. The University replied on 27th February 2009 that ABC Investment Limited's contract with the university was individually and will be treated as a single entity but not jointly, as the conditions of contract signed with the company would subsist and guide the project to completion. A letter of notice was sent by the consultant Architect to the contractor (dated 13th March 2009) informing the contractor of his default, its consequence and subsequent advice to re-mobilise back to site as discussed at the site meeting of 19th February 2009.

The letter notified ABC Investment Ltd that having suspended his duty of carrying out works on site for more than 14 days as stipulated in the contract condition, despite the advice given to the contractor's representative at the meeting held at the instance of the vice chancellor with the Director, Physical Development and Management present at permanent site dwelt on the need for early completion based on existing contract terms. Consequent upon the contractor's refusal to go back to site, it led to the determination of the contract by the client.

5.1.5 Observation:

The contractor's progress of work before the project was determined was far behind schedule as he abandoned the site (since February 2009) for a long period which led to total determination by the client in June 2009.

5.2 Case No 2:

PROJECT:	DEVELOPMENT OF PRINCIPAL OFFICERS RESIDENCES
PROJECT STATUS:	ON-GOING LIBRARIAN'S RESIDENCE
CONTRACTOR:	XYZ RESOURCES LIMITED
CONTRACT SUM:	N25, 280,230.241
CONTRACT PERIOD:	12 WEEKS
COMMENCEMENT DATE:30TH NOVEMBER, 2008	
ADVANCE PAYMENT:	N3, 792,034.54 (15% OF CONTRACT SUM)
CONSULTANTS:	MESSRS A (ARCHITECTS)
	MESSRS B (QUANTITY SURVEYORS)
	MESSRS C (STRUCTURAL ENGINEERS)
	MESSRS D (SERVICES ENGINEERS)

5.2.1 Project case brief

The Management of University X in Abuja desirous of accommodating its Principal Officers within the permanent site in its efforts to move to the permanent site by constructing 5-Bedroom duplex as residence. The 12 weeks duration contract was awarded to and accepted by Messrs XYZ RESOURCES LIMITED in the negotiated sum of N25, 280,230.24 on the 7th October, 2008. The contractor could not mobilize to site until 29th Nov. 2008 due to inaccessibility to the site; this problem was later solved by the client. On mobilization to site, the contractor was granted material advance of 15% in accordance with National Procurement Act 2007 based on advance payment bond.

5.2.2 Progress so far

The overall progress of work to date is approximately 30% with completion of block work on ground floor ONLY while presently waiting to cast first floor suspended concrete slab with wood formwork support in place and reinforcement bars/rod being put in place. The workmanship is average while the progress has been generally slow due to among other reasons punctuated by cash flow from the client's payment end point.

5.2.3 Valuations to date

Valuations to date reflect the following:

- ADVANCE PAYMENT(Oct'08) N3,792,034.54(Paid)
- Interim Valuation No 1 (19/12/'08) N1,602,995.93

(not paid due to procurement year lapse from Client)

- Interim Valuation No 2(02/02/'09) N735,175.24

(Not sent due to absence on site as at the time)

- Interim Valuation No 3(19/02/'09) (N177,330.29) NEGATIVE

(due to amortization of Advance payment)

- Interim Valuation No 4(27/04/'09) N1, 595,410.06

(Reduction of the amortization to 67%)

- Interim Valuation No 5 (20/07/'09) N1,110,366.90
- Interim Valuation No 6(11/09/'09) N1,173,090.83

- Gross valuation to date: N7,690,127.65

Challenges on the project:

The project was cited on an undulating site based on which re-measurement of work done at the substructure to date was discussed at the site meeting of 12th July,2009 and valued and included in Valuation 5 with 100% amortization of advance payment to arrive at N1,110,366.90 to the contractor.

Interim Valuation No 6 in the sum of N1, 173,090.83 has taken into consideration the followings: reconciliation of payments to date (as the contractor's valuation 2 in the sum of N735, 175.24 was not dispatched due to contractor's absence on site for some period at the time of issue) and workdone to date as per measurement on site of 3rd September 2009.

Observation:

The contractor's progress of work on site is far behind schedule; consequently completion date of 19th February 2009 has been exceeded by several months. Contractor's workmen were not on site as at 3rd September, 2009 when the joint site inspection was carried out with the client representative.

Recommendation:

A coordination meeting discussed how the site is to move on to achieve urgent completion possibly considering the following recommendations:

- Call the contractor to possibly offer him a concession based on his status of work executed. That is, the review of remaining works to be done to the first negotiated price before the award.
- Consider accelerated completion on the basis of physical payment-on- site for work done plus a negotiated percent addition between (10-15%) either of the above should be based on actual physical resumption back to site and a condition that all the outstanding work is conclude within the current year's procurement budget.

6. Discussions: results of the interview survey show the following

i) The need to shortening decision making time and protocols especially by the clients and the consultants to make the supply chain more efficient with respect to public procurement by inclusion of timing to all enquiries and constraint with penalty if otherwise.

ii) The need to create stakeholders' awareness on the essence to understand the principle and procedure of the public procurement act through conferences, workshops, and seminars to improve efficiency of project delivery and satisfactory budget performance in the Nigerian construction industry.

iii) The need to standardize the development and use of common procurement platform and timing commensurate with the annual government appropriation that can be used by all chain members.

iv) The use of internet as an efficient medium as in the exchange of procurement information among the procurement sector and stakeholders could be adapted starting from project procurement planning through completion.

7. Key Lessons Learned

- The need to educate and seek efficiency in the use of public procurement act 2007 as a tool in the delivery of construction procurement in Nigeria among the procurement chain members will determine the level performance of annual budgetary appropriation proves vital in this research.
- Considering the fact that the selected respondents as a test case to the efficacy of use of the newly introduced procurement act 2007 in Nigerian construction industry in Nigeria.
- The construction costs in Nigeria could be greatly reduced if the economic time lost during procurement planning through completion stages due to these inefficiencies, is eliminated.
- The level of abandoned and collapsing of construction structures that litter Nigeria are becoming more rampant, but transparency and efficiency in the use of the procurement act 2007 could help end these failed projects.

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Implications of the Concept of Sustainable Development to the Construction Industry

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Abstract

From the increasing population to the widening gap between the rich and the poor has resulted in a growing interest in the concepts of sustainability and sustainable development. During the past decade the concept has been raised to the level of an overarching policy goal for governments. Due to the significance of it, the construction industry is considered as a key sector for achieving sustainable development goals in the UK, as well as, in a global level. This paper is based on the initial literature review of an ongoing PhD research. It highlights the significant role the construction industry has to play in attaining the overall sustainable development goals, by presenting a case in terms of social, environmental and economical aspects. However, the UK construction industry shows poor efficiency in engaging in sustainability, despite the availability of an abundance of policies and advisory documents. This paper argues this to be mainly the result of nontechnical, institutional issues, rather than the lack of technical expertise. The paper presents a research case from a policy perspective to tackle this issue.

Keywords: construction industry, policies, sustainability, sustainable construction, sustainable development

1. An introduction

From the increasing population and the widening gap between the rich and the poor to the negative effects of our consumption patterns on the environment has resulted in a mounting realisation that the current model of development is unsustainable. This has resulted in a growing interest in the concept of 'sustainability' and 'sustainable development (SD)'. During the past two decades the concept has reached a level of prominence 'of a mantra or a shibboleth' (Daly 2002) following the work of the Brundtland commission. The commission's report *Our Common future (1987)* has been largely credited for successfully giving economic and social significance to an issue which was previously conceived as being largely environmentally biased (Carter and Fortune 2008). Since then, SD has been declared as *'the defining issue of the twenty-first century'* (Harrison 2000 cited Jabareen 2004) and *'the most fundamental'* (Sustainable Development Research Network 2002) challenge facing the world as of today; thereby, elevating the concept to the level of *'an overarching policy goal'* for governments (Parkin et al. 2003).

Due to the significance of it, construction industry is considered as a key sector for achieving SD goals. Thus, the need to adopt more sustainable approaches within the industry practices has been stressed, leading to reduced number of accidents, waste and pollution, integrating the supply chain and engaging all stakeholders and creating a more ethical profile for the industry as a whole (Myers 2005). However, this poses a concern as the terms 'sustainable' and 'construction' are both complex concepts, which are open to much debate. On one hand, despite the increased attention and popularity of the concept of sustainability, most authors agree that there is a lot of confusion surrounding its meaning; what it strives to achieve and how it should be achieved (For example see Elliot 1999). Similarly, there are also disagreements in relation to what 'construction' entails. Hence, placing these two terms together to form a new phrase further magnifies this 'interpretive dilemma' (Du Plessis 2007). The main aim of this paper is to provide an understanding on these and make a case for application of sustainability principles within the construction industry. In view of this, the section 1 of this paper goes on to address the first term; 'sustainability', whereas, section 2 addresses 'construction' and its significance in attaining SD. Finally, in section 3 a research case to address problems relating to the uptake of sustainability principles in the construction industry at project level is presented.

2. Sustainability and Sustainable Development (SD)

As Adams (1990 cited Elliot 1999) states the concept of sustainability and SD cannot be understood in a *'historical vacuum'*. Of particular importance to this discussion are the changing ideas about development (including how to go about achieving it) and the role and significance of the environment. It is this literature that resulted in raising the profile of the concept into the 'main stream policy agenda' (Bebbington 2001). Comprehensive discussions on the origins and evolution of the concept have been put forward by authors such as, Mitcham (1995), Mebratu (1998), Dresner (2008), Elliot (1999). Most authors generally commence their discussions on SD with references to the work of the Brundtland commission. Although, the role the work of the commission played in

bringing the concept to global prominence is unquestionable, the origins of the concept could be traced back to much earlier days. Earliest references are pointed out by Ofori (1998). He mentions Plato, who in the second century BC, has deplored the erosion caused by deforestation in Attica and Erastothenes, who in the third century BC, has described how governmental land policy, navigation needs and mining resulted in the deforestation of Cyprus. Others point to more recent debates concerning renewable resources such as, forestry and fisheries (Bebbington 2001) and the 'Limits to Growth' debate, which during the early 1970s, discussed whether the continuous economic growth would lead to relentless environmental degradation and societal collapse (Pezzey 1992). The limits to growth debate challenged the pro-growth perspective of the preceding decades, thus paving the way for SD to emerge as a synthesis of these two extremes (Hill and Bowen 1997). Further, the works of writers such as, Carson (*Silent spring 1962*) and Schumacher (*Small is Beautiful 1973*) helped sow the seeds for public concern for the environment and advocated more qualitative forms of development.

This growing concern about the global development patterns and the impacts they have on the environment resulted in a number of initiatives that paved the way for the concept of sustainability and SD to develop into its modern form. The term sustainability in its modern form was first used by the World Council of Churches in 1974 (Dresner 2008). While the broad concept of SD was first publicised by the World Conservation Strategy (IUCN 1980); the most widely quoted definition for the concept was put forward by the World Commission on Environment and Development (WCED or Brundtland Commission) in 1987. It defined SD as; *'development that meets the needs of the present without compromising the ability of the future generations to meet their needs'*. Thereafter, following the different international developments, as well as, growing academic interest, a large number of definitions are now in circulation for the concept. Amidst all this popularisation, sustainability to date remains mostly ill-defined, not defined or contradictorily defined (Faber et al. 2005). However, despite all the debates and disagreements it could be ascertained that there is relative consensus that SD in essence is about '*managing the relationship between the needs of humans and their environment (biophysical and social) in such a way that critical environmental limits are not exceeded and modern ideals of social equity and basic human rights (including the 'right to development') are not obstructed* (Du Plessis 2007)'. According to Robinson (2004) rather than viewing sustainability as one single concept, it is more useful to look at it as an *'approach or process of community based thinking that indicate we need to integrate environmental, social and economic issues in a long-term perspective, while remaining open to fundamental differences about the way that is to be accomplished and even the ultimate purposes involved'*. However, it is argued that sustainability is not possible just through the actions, taken on their own, within the above mentioned environmental, social and economic aspects (widely known as the three pillars of sustainability). Achieving sustainability requires holistic thinking to consider the complex inter-relationships between these three separate pillars (Atkinson et al. 2009; Du Plessis 2007; Kiewiet and Vos 2007). The construction sector becomes important in this context as its activities have significant impacts in all three of these areas (see section 3.2). It is not only a *'vehicle for improving the quality of life'*, but it is also the *'actor that will determine the environmental and social sustainability of development activities'* (Du Plessis 2007). Thus, the significant role the construction industry needs to play in order to achieve the overall goals of SD has been repeatedly stressed.

3. Sustainability and the construction industry

3.1 The construction industry

Construction has been interpreted in narrow and broad ways by different authors. Irurah (2001 cited Du Plessis 2007), presents four ways in which 'construction' can be interpreted. These include defining construction as; (i) a site level activity, (ii) the comprehensive project cycle, (iii) everything related to the business of construction, and (iv) the broader process of human settlement creation.

The first, which is the most commonly used definition (Du Plessis 2007), provides the narrowest interpretation of construction. It interprets construction only as site-level activities that lead to the development of construction facilities, thereby limiting its use to just one phase of the construction life cycle. This view is also adopted by Morton (2002 cited Bosher et al. 2007), who refers to the *'construction industry'* as all the firms involved directly in the design and construction of buildings. This definition of construction has several problems. First, it talks about only the design and construction activities and thereby, ignores the other phases of the construction life cycle such as, planning, operation and maintenance, and decommissioning. In addition, it only refers to the parties directly involved in these activities. This excludes other important parties that play an integral role such as, those involved in the materials manufacture and supplying, as well as, facilities management personnel. The concept of 'sustainable construction', with which this paper is concerned, perceives the construction industry in a much broader perspective, which necessitates the inclusion of the above mentioned aspects. Hence, it is ascertained that the construction industry is involved in the planning, design, production, alteration, maintenance and demolition of the built environment (Venters et al. 2005). However, even a broader interpretation has been put forward in the Agenda 21 for Sustainable Construction in Developing Countries – A21 SCDC (Du Plessis et al. 2002 cited Du Plessis 2007), which describes construction as;*'the broad process/mechanism for the realisation of human settlements and the craetion of infrastructure that supports development. This includes the extraction and benefication of raw materials, the manufacturing of construction materials and components, the construction project life cycle from feasibility to deconstruction, an the management and operation of the built environment'*. This is inline with the fourth and the broadest level of interpretaion stated above for 'construction' by Irurah (2001 cited Du Plessis 2007) that describes construction as the broader process of human settlement creation. It is within this context that the discussions in relation to the industry's significance and role in attaining SD are carried out.

3.2 The significance of the construction industry in attaining sustainable development

In the 2004 Comprehensive Spending Review, the UK government made plans for the improvement of the nation's construction assets; which included, bringing 3,500 secondary schools to 21st century standards over 10-15 years, creating 100 new hospitals by 2010, eliminating the £3.75billion backlog in repairs of local roads by 2010 and providing 25 light rail schemes by 2010 (Construction Products Association 2007). Achieving these targets would mean following ambitious construction

programmes, consuming large amounts of resources, energy and money, which will in turn present significant environmental, social and economical impacts.

In the current context, worldwide, the construction industry is responsible for more than one third of total energy use and hence, the associated Green House Gas Emissions (Cheng et al. 2008). When the UK scenario is considered, typically buildings use approximately 50% of all energy produced. It has been observed that the commercially available and proven technologies, including smart designs, improved insulation, low energy appliances, high efficiency ventilation can result in lowering this energy usage by an estimated 30-50%, without causing any significant increase in investment costs (Cheng et al. 2008). The amount of construction materials used annually is equivalent to 6 tonnes per head of population in the UK (Shelbourn et al. 2006). These construction materials consume over 90% of non-energy mineral extracted in UK for their production. However, 70million tonnes of these construction and demolition materials and soil turn up as waste annually (DETR 2000), amounting to 17% of the UK total (which is over a tonne of waste per citizen) (BRE 2002). The construction industry is also responsible for 20% of all industrial and commercial noise complaints (BRE 2002). The environmental costs generated by the industry are not limited to the physical construction phase, but accrue over the entire life cycle of the construction (Circo 2008).

Furthermore, construction is a key industry that creates a physical stock of facilities and infrastructure that determines the nature, function and appearance of our towns and country sides for up to 100 years or more after its establishment (Pollington 1999). Thus, the construction industry plays an important role in determining the quality of life of people. It is anticipated that more than 50% of the Earth's population will live in urban areas by 2010 (United Nations 2001 cited Pickett and Cadenasso 2008). People typically spend around 90% of their lives in buildings (BRE 2002). Hence, the buildings have the ability to make significant impacts on the health of their occupants. Indoor air in general has been found to contain two to five times more pollutants than outdoor air (occasionally, this value is found to be greater than 100 times). This poor quality of indoor air can result in various health risks such as, cancers, asthma and Legionnaires' disease (Baum 2007; Kibert 2008) for the public. Overall, the buildings in UK have been found to be less healthy, less efficient, generating more waste and pollutants, and more costly to run compared to those in most other European countries (Halliday 2008). Moreover, being mostly labour intensive, the construction industry, is a major source of employment for people. The UK construction industry employs about 1.5 million people, representing approximately 8% of Gross Domestic Product (GDP).

From an economic perspective, the construction output in the UK constitutes nearly 10% of the country's GDP. It has strong backward and forward linkages with numerous other industries as well. For instance, the construction products accounts for 20% of UK's total manufacturing output, which represents 4% of the country's GDP (Construction Products Association 2007). The state of the buildings and other constructed facilities can also make a major impact on the productivity of the other industries.

In addition to the above effects of the construction industry in terms of social, environmental, and economical aspects, the consideration of sustainability issues can also help reduce some of the key risks associated with construction for the clients (CIC 2003). This could be through reducing the

exposure to Green taxes, minimising costly planning application processing and delays, avoiding loss of reputation and resistance by pressure groups, making buildings more accessible, etc. Moreover, various researchers have shown a positive link between business performance and sustainability in the construction industry as well. A report to the California Sustainable Building Task Force states that a 2% increase in investment in a 'high-performance' building would lead to life-cycle savings that are 10 times greater than the incremental cost increase (Kibert 2008). Accordingly, a side-by-side analysis of two prototype buildings by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) and the National Renewable Energy Laboratory (NREL) has indicated that the high-performance (sustainable) version produced annual savings, which were equal to the added construction cost, producing a simple payback in just over one year (Kibert 2008).

Considering all these it is clear that the challenge now facing the construction industry is meeting the aforementioned targets for housing, education, industry and infrastructure, in a sustainable manner, without compromising the ability to do it again in the future (Construction Products Association 2007; BRE 2002; Waddell 2008). In order to achieve this, the industry has to make all the involved processes, products and services more sustainable. Hence, incorporating sustainability principles within the construction industry seems a necessity if UK is to achieve its SD goals as a nation.

3.3 Sustainable development in the construction industry – 'Sustainable Construction'

The phrase 'Sustainable Construction (SC)' is generally considered as describing the responsibility of the construction industry in attaining SD goals. However, a number of other terms can be found in literature that has been used for similar purposes. These include terms such as; 'green building' (Kibert 2008; Rohracher 2001); 'high performance building' (Kibert 2008) and 'sustainable building' (National Audit Office - NAO 2007). However, it can be postulated that it is acceptable to use the term 'sustainability' in a generic sense. i.e. 'sustainability' is something that is '*dependent on an object which must be described'* (Laloe 2007). This makes the 'sustainable' part of the SD paradigm both a descriptor of something and a target to achieve (Bell and Morse 2008). It describes, in its broadest sense, that our actions today should not harm the future generations to come. In sustainability literature this is often expressed as '*don't cheat on your kids'* (Bell and Morse 2008). Such an approach makes it plausible to apply any discussions on 'sustainability' to anything that has the term 'sustainable' as an adjective (Bell and Morse 2008), such as, sustainable development, or in this particular context, sustainable construction. Such an approach enables the comparing and contrasting of the application of the concept across sectors, as well as, applying lessons learnt from one sector to another. Hence, sustainable construction (SC) was selected as the most appropriate term to describe the application of sustainability principles within the construction industry.

While terms such as, 'green building' and 'ecological building' have been in use for some time, Charles Kibert was the first to define SC as; '*the creation and responsible management of a healthy built environment based on resource efficient and ecological principles'* at the 1994 First International Conference on Sustainable Construction in Tampa, USA (Du Plessis 2007). Since then, review of the literature reveals various attempts at defining the concept. However, none of these

definitions have been acknowledged as a generally accepted and consistent definition for the concept. Nonetheless, a relatively comprehensive definition with a broader scope for the concept has been provided in A21 SCDC, where SC is defined as; *'the principles of sustainable development are applied to the comprehensive construction cycle, from the extraction and beneficiation of raw materials, through the planning, design and construction of buildings and infrastructure, until their final deconstruction and management of the resultant waste. It is a holistic process aiming to restore and maintain harmony between the natural and the built environments, and create settlements that affirm human dignity and encourage economic equity'* (cited Du Plessis 2005). This definition has been acknowledged for combining two important aspects of SC that for the most part has been ignored in the other attempts at defining it: i.e. a) the fact that SC should be based on the viewpoint that built and natural environments are fundamentally interconnected, and b) that it contains 'ethical, moral, and spiritual connotations' requiring 'attitudinal changes' and 'value reorientation' (Du Plessis 2005).

4. Sustainable construction – A case for research

For several years, SC has been a popular policy issue with policy makers and various government authorities, as well as, other non-governmental institutions directly involved in the construction industry in UK. Parkin (2000) states that evidence-based policy and UK policy framework are two of the key contexts and drivers for SD in the UK. A plethora of advisory documents (falling into different categories such as, regulations, policies, strategies, guides and tools) are available in UK providing direction to different project stakeholders on the uptake and implementation of SC. These documents are produced at different governance levels (i.e. national, regional or local authority) and are aimed at different levels of implementation (urban planning, individual construction projects or stakeholder organisations involved). However, one of the key issues highlighted by most researchers in this regard is the fact that the policy responsibility for SC in UK is being shared by several government bodies. These bodies mainly constitute of five government departments that include; Department of Business Enterprise and Regulatory Reform – BERR (formerly the Department of Trade and Industry – DTI), Department for Environment, Food and Rural Affairs – DEFRA, Office of Government Commerce – OGC, Department for Culture, Media and Sport – DCMS, and Department for Communities and Local Government – DCLG (Formerly the Office of the Deputy Prime Minister – ODPM). In addition to these policies and guidance, the UK government has put in place various economic instruments intended to influence the industry towards the uptake of SC. These include taxes and levies such as, the Landfill tax, Climate change levy and the Aggregates levy, which can influence prices and be used to provide incentives for more sustainable actions. The un-coordinated nature between these various policies, regulations and tools have made the uptake and implementation of these at project level often confusing and inefficient (UK Green Building Council 2009).

The challenge now facing the industry, is transforming the strategic sustainability objectives for the nation, which are represented in the industry specific policies and other advisory documents into concrete project level action. Despite the abundance of these policies and guidance the industry shows poor efficiency in engaging in sustainability with no substantial achievements. Review of SD activity within England have found that only a small proportion of buildings can claim to be sustainable in

any way, revealing that SC is not happening in the construction industry in any substantial way (Halliday 2008; Wyatt et al. 2000). Furthermore, NAO (2007) has found that even in instances where SC is considered, certain aspects (such as, the use of sustainable timber; energy saving through the incorporation of energy efficient lighting systems, etc) were adopted more widely compared to others (such as, the use of renewable sources for energy generation, monitoring of the environmental impacts during the construction process and social issues such as, local community consultations). Even the available technological expertise appear to be under-utilised as evidenced by the present gap between the technological ability and the actual performance of the building stock (Rohracher 2001). Therefore, the poor performance of the construction industry in terms of sustainability could be viewed as mainly the result of nontechnical, institutional issues, rather than the technical issues. Hence, it is argued that technological solutions are only one part of the solution in the quest to addressing the challenge of SC. Of equal or may be even more significance, in transforming SC policy into project level practice, are the non-technological institutional processes, which are dependent upon the industry structure, communication channels, and the 'organisation and strategic orientation of its constituent actors' (Boden cited Rohracher 2001). Given the nature of the concept, the uptake and implementation of SC requires decision processes that are integrated across various project level interfaces demarcated by different phases of the construction life-cycle. However, this has proved to be a very challenging task due to fragmented nature and complexity of the construction sector (Myers 2005), the multi-dimensional nature of SC, the lack of a structured methodology and lack of information at various hierarchical levels (Ugwu and Haupt 2007).

Following the above discussions it is construed that the poor transformation of SC from policy into project level practice could be basically due to two possibilities; (a) lack of understanding or poor interpretation of SC by stakeholders at project level and/or (b) inefficiency or ineffectiveness of the institutional processes adopted in operationalising SC at project level. This gives rise to two research questions that has so far been poorly addressed in literature. These are;

(1) Scrutinising the concept of SC as set out in academic research and government policies and advisory documents and comparing this with what is perceived as SC by project stakeholders

(2) Studying the institutional process in transforming SC policy into project level practice and establishing the influence factors on this process.

The institutions in this context is used to refer to 'rules that structure but do not determine the decisions of players' (van Bueren and Priemus 2002). Hence, particular focus is given to identifying the key players in the decision-making process, their involvement and interrelations within the decision-making processes. There is a further need to scrutinise the decision-making lines itself, along with the forces that act as enablers and barriers to this process.

5. The way forward

Although, there is widespread research on the technological aspects of SC (Ex. development of new technologies, materials etc), no evidence of extensive research is found exploring how the non-technical issues, mentioned in the research questions above, affect the effective uptake and implementation of SC within the context of an actual construction project in UK. Of particular importance, is carrying out such an analysis from a policy perspective. This is necessary for uniting policy and practice, so that real progress towards SC could be made. Therefore, the next step of the study is to identify the numerous policy and advisory documents relevant for SC and scrutinise the concept of SC as laid out in them. The findings will be compared against the perceptions of SC held by the key stakeholders involved in the decision-making process. During the next stage the decision-making process itself will be analysed. The ultimate aim of the PhD research study on which this paper is based on is to use the above findings to produce a conceptual framework that can be used to enhance the effective uptake and implementation of SC at project level.

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A System of Classification of Temporary Multi-Organizations in the Building Sector

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Abstract

Various systems of classification, based on metaphors, structures, typologies, etc., have been proposed to explain the functioning and structuring of individual organizations. These systems of classification are often used in the building sector to represent the patterns of conduct and operation of organizations. However, they do not fully contribute to represent the complexity of the building industry in which projects are conducted by *temporary multi*-organizations (TMO). Instead, TMOs in the building industry are mainly classified and studied according to contractual agreements – so called procurement strategies. Procurement strategies establish formal links between actors of the TMO. Nevertheless, in reality, formal and informal communications, authority and procedures do not necessarily follow the expected routes of the legally-bound procurement strategy. Therefore, the formally-established organizational structure only represents part of the relationships and functioning of the TMOs.

This article reports the preliminary results of an ongoing research project that examines the structure and functioning of TMOs according to the real relationships of communication, authority and procedures that link project actors. The study proposes the following questions: What are the differences between the formal structure of the procurement strategy of a project, and the real relationships of formal and informal communication, authority and procedures that exist between the members of the TMO? And, *How* can these differences be represented? The article is based on a survey of nine case studies of construction projects conducted in Quebec, Canada and the further detailed analysis of the TMO created by three construction clients. Research results include the identification of nine possible configurations of TMOs.

Keywords: temporary multi-organization, project team, construction, communication, procurement

1. Introduction

Previous research has examined the main challenges of communication between the multiple participants of the temporary multi-organisations (TMO) that are created by clients to initiate, manage and execute construction projects. The interface between the client and the principal actors of the TMO is often the focus of analysis; particularly (i) the fragile relation that often exists between the client and the professionals and constructors of the building industry (Cherns and Bryant, 1984), and (ii) the effects of informal communication and decision-making (Dainty, Moore, and Murray, 2006; Latham, 1994). It has also been found that the procurement strategy does not reflect the real relationships that exist between all the members of the TMO, particularly those conducted through informal communication (David and Alan, 2008; Emmitt and Gorse, 2007). However, there is still insufficient knowledge about the consequences of informal communication and procedures on the structuring of the TMO.

This ongoing research project aims at bridging this gap by understanding *how* informal communication and procedures influence the structure of the TMO. Inspired by the work of H. Minztberg (notably *"The structuring of organisations"*, 1979) this study seeks at identifying patterns of influence (or contingency factors) that permit to generate a system of classification of TMOs, one that takes into account all the real (formal and informal) relationships between project actors. It examines the literature taking into account different levels and areas of analysis: typologies, metaphors, taxonomies and archetypes. The advantages and disadvantages of the existing systems for the study of TMOs are then identified. The research methods are further explained and finally, the preliminary research results are presented in a graphic manner explaining a preliminary system of classification that is deduced from the analysis.

2. Systems of classification used in the building sector

An organization is a set of connected interests involving people, resources and channels of communication, and established in such a way as to '*be recognizable as an entity*' (Stringer, 1967, p.107). According to Stringer (1967) an organization often has the following characteristics: (i) it has a set of goals ultimately applicable to all its parts; (ii) it establishes means for pursuing these goals; (iii) it has an ultimate expression of the organization's authority; and (iv) it has a permanence which transcends particular tasks. The classification of organizations has been much useful in both management and the construction sector. Classifications identify patterns of conduct, which permit to anticipate, plan and analyse behaviours, procedures and responses. (Green 1996) Organizations, for instance have been classified by structural configurations (Mintzberg, 1979) by metaphors (Morgan 1986) and by their internal structure (PMI, 2008). In construction, where project clients have a relevant role in determining the structure of the TMO, they are classified by origin, by profile and by level of experience. (Walker, 2007; Masterman, 2002; Nahapiet and Nahapiet, 1985)

The existence of multiple systems of classification is not really surprising. According to Miller (1990, p.771) "variety and cohesion of configurations are caused by the interdependent, robust, cyclical and

reciprocal relationships among their parts [configurations] demonstrate integral alignments among elements of structure, strategy, process and environment". This implies that organizations respond to systemic factors (Checkland, 1981; Churchmann, 1974; Le Moigne, 1984) to produce multiple responses to the system and its environment. We explain below the most relevant systems of classification used in the building sector.

Taxonomy, "Classifying classifications": Green (1996) proposes a taxonomy that permits to categorize the systems of classification according to four approaches: (i) client types; (ii) social complexity of client organizations; (iii) naturalistic inquiry and (iv) organizational metaphors. Table 1 shows this taxonomy, the factors used to identify categories and the focus of each system. The taxonomy is complemented by Mintzberg's typologies and the procurement classification system (both shown separately).

Table 1: Client Organizational Classification and Taxonomies (adapted from Green, 1996).

Classification	Main Athors	Factors	Focus
Typologies	Mintzberg (1979)	Contingency	Internal Structures
	PMI (1996)	Process, function	Internal structure
Client types	Higgin and Jessop (1965)	Previous experience	"Sophisticated" and "Na•ve"
	Nahapiet and Nahapiet (1985)		"Primary" and "Secondary"
	Hillebrandt (1984)		"Continuing" and "One-off"; private and public sector
	Rougvie (1987)	Sector	"Public", "Individuals" or "Corporations"
	Kelly et al. (1992)	Size Parameters	"Size": small or large; "Sector": public or privat "Project interest": developper or owner-occupie
	Masterman and Gameson (1994)	Type of project	"Experienced" and "inexperienced"
Procurement systems	Masterman (2002	Legal frame	Contractual arrangments and strategies
	Walker (2003)		
Social complexity of client organizations	Cherns and Bryant (1984)	Multi-faceted	Interest groups, divergent objectives, conflictin priorities
	Walker (1989), Baden Helard (1992)		
	Morris and Hough (1987)		Political issues, clarity of objectives
Naturalistic inquiry	Checkland (1989)	Management and social sciences	"Myths" and "Meanings" for "Sense making"
	Burrell and Morgan (1979)		
	Lincoln and Guba (1985)	Research paradigm	"Phenomenological", "interpretative" or "naturalistic"
	Reason and Rowan (1981)		
	Robson (1993)		
Metaphors	Morgan (1986)		Organizational behavior

**In grey the organisational archetype of the construction industry: the procurement systems.*

Typologies, classifying internal structures: Mintzberg's typology (1979, 1983a, 1983b) and the typology of structures proposed by the PMBoK (PMI, 2008) are central to the understanding of the *internal* structures of the organizations that constitute the TMO. Contrary to the typology proposed by the PMI, Mintzberg acknowledges that the organisation is not only understood in terms of its formal structure and functional division, but on actual formal and informal communication units and

channels. Mintzberg identifies work constellations and coordination mechanisms to describe the informal internal workings of the organization and he identifies the forces and forms that explain how multiple internal aspects can affect other organizations in inter-firm relations (Mintzberg, 1990; 1982). It can therefore be expected that internal forces play an important role in the structuring of the TMO and the project overall process.

Client types, classifying the project initiator: Green (1996) stresses the fact that "construction professionals are all too often guilty of taking an over simplistic view of their clients". In fact, most authors wrongly assume that client organizations are "unitary entities whose objectives are pre-determined and consistent over time". (op.cit., p.155) In response to this, different types of building clients have been identified (Green, 1996). The recognition of client types represents a starting point in the analysis of TMOs, particularly because clients condition the whole project process as they initiate and lead the procurement strategy.

Procurement, classifying contractual arrangements: In the construction sector, the structures of TMOs have traditionally been studied from the perspective of contractual arrangements between organizations (or procurement strategies). Procurement strategies are often divided into three types along with few subgroups: (i) *Separated and cooperative*, (ii) *Integrated* (including "Design-build", "Novation" and various forms of "Build-own-operate") and (iii) *Management-related* (Including "Construction management" and "Project management"). (Masterman, 2002; Walker and Hampson, 2003; Mohsini and Davidson, 1991) Due to its widespread use in construction, the procurement classification has now become an "organizational archetype", namely "a set of structures and systems that reflect a single interpretative scheme. (Greenwood and Hinings, 1993, p. 1052) Greenwood and Hinnings (2006) further explain: "Archetypes are similar to configurations except that they emphasize the importance of achieving institutional legitimacy." (p.827)

Social complexity and naturalistic inquiry, the dynamic character of organizations: Client organizations are complex "social systems" (Green, 1996); they are in fact the result of "collective action constructs". (Crozier and Friedberg, 1977; Stringer, 1967) However, rather than being static, social constructs are in continual re-negotiation as different realities are repeatedly re-formulated by actors. (Green, 1996) Authors that explore naturalistic inquiry remind us that it is important to understand clients - and other organizations - not only as typified entities (having fixed characteristics) but to "understand the ways in which the client makes sense of his own organization". (Green, 1996, p.157) For the TMO, it is also crucial to take into account how other organizational actors perceive each other, rather than reducing the perception of the TMO to a fixed assembly of individual parts.

Organizational metaphors, classifying behaviours: Metaphors have been used in different ways to explain the behaviour of organizations. (Inns, 2002) Metaphors do not attempt to explain what an organization is (a typology), but rather how it behaves as a dynamic network of actors. According to Miler (1996, p. 159), "the importance of Morgan's contribution is that it moves the debate from asking which organizational theory is more 'correct' towards which theory provides the more useful insight in a given situation". However, there is much debate about the pertinence of metaphors for the study of organizations. (Pinder and Bourgeois, 1982; Tinker, 1986; Lackoff and Turner, 1989; Reed,

1990; Tsoukas, 1991) Chia (1996) proposes to change the focus from metaphors towards a process of *metaphorization*, that is "the critical task of systematically re-examining hitherto taken-for-granted concepts and categories and revealing the hidden tensions and contradictions inherent in every literal attempt to adequately represent reality" (op.cit., p.140), an approach also defended by Weick (1998) and Cornelissen (2005). Table 2 summarizes Morgan's (1986) classification based on metaphors and illustrates how they apply to organizational entities and processes in the construction industry. The table serves to explain that a construction project is, in reality, a complex assemblage of multiple metaphors (see the right column). Therefore, even though metaphors provide an insightful and reliable set of indicators on the nature of the composition of the TMO, it is difficult to rely on this classification alone to describe the TMO as a whole.

Table 2: Organizational Metaphor (adapted from Green, 1996)

	Metaphor	Highlights		Main authors	Construction entities and processes
1	Machine	Goal-seeking	Efficiency, quality, and timeliness of production processes in a machine of interlocking parts	Taylorism: Taylor (1911), Fayol (1916), Keys (1991)	Manufacturers, suppliers, project process, project management.
2	Organism	Bilogical systems	Atttributes, structures, and development of organization coping with their environments: evolutionay patterns in the interorganizational ecology	General Systems Theory: von Bertanlanffy (1968), Burns and Stalker (1961), Lawrence and Lorsch (1967), Woodward (1965), LeMoigne (1984)	Inter-organizational relations; client to market; operators; project behaviour
3	Brain	Central intelligence	Information processing, Second order cybermetic. Effectiveness of information processing, problem solving and learning based on cognitive characteristics of people in the organization	Simon (1947), Argyris and Sch n (1978), Beer (1981)	Feasability, programming, design. Project management: coordination, logistics, controls (execution, construction)
4	Culture	Sociological and psychological characteristics	Shared values and belief, Cooperation	Peters and Waterman (1982); Wilkins and Ouchi (1983)	Industry culture, project behaviour, inter-organizational coordination
5	Political		Power and conflict, cooperation mechanisms and power plays between people in organization	Pettigrew (1973), Pfeffer (1981)	
6	Psychic prison		Entrapment in prescribed norms.	Janis (1972)	Procurement strategy, contracts, formal structure. Laws, codes, regulations, norms, etc.
7	Flux and Transformation	Dynamic, process, ontology	Autopoiese, Auto-organization, Chaos, Complexity, Cybernetic, Dialectic. The logic of change of organizations that dynamically and proactively adapt to an ecological environment	Maturana and Varela(1985), Le Moigne (1977, 1999), Morin, (1977), von Bertanlanffy(1968)	Operators; client to market; TMO's project sphere as a whole. Timeline: dynamic transformation of the TMO, project delivery, operations.
8	Domination	Brainwashing	Exploitation mechanisms and power plays between people in organization	Weber, Marx	

3. A new system of classification of TMOs

A multi-organization, is " the union of parts of several organizations, each part being a subset of the interests of its own organization. It is defined by the performance of a particular task through the interaction between individuals" (Stringer, 1967, p. 107). The term "Temporary Multi-Organization" was first used by Trist (1963) in *Organisational Choice*. A TMO is a "socio-technical system; […] a system in which social and interpersonal relationships are partly conditioned by the task – and vice

versa". (Stringer, 1967, p. 107) TMOs have four important characteristics. First, effective communication is essential if such a multi-organization is to perform its task adequately. Second, relations in a TMO are conditioned by particular tasks, which are not directly related to the organization mission, but central to the project goal. Third, participants of the TMO "have other interests apart from the building in question and once it is complete this reason for their collaboration disappears" (Stringer, 1967, p. 107). Fourth, legal frames and procurement strategies describe only the 'formal' system and do not provide the full representation of the dynamic network of the TMO. (Bonami et al., 1996)

Two main challenges must be faced while understanding the structuring of TMOs. First, organizations are rarely studied according to their structural relations within groups, and even less frequently, in *temporary* groups. (Bryant et al., 1978; Cherns and Bryant, 1984; Stringer, 1967) Studies about inter-firm relations do not often take into account the temporary character of TMOs and the fact that TMOs are created for and around a temporary project (despite the obvious relations of procurement highlighted in supply chains). Second, project participants are not fully integrated (neither *within* organizations nor *between* organizations). It is therefore crucial to challenge "the dominant view of organizations as formal structural entities, constrained by internal and external pressures". (Demers, 2007, p.54) In fact, Pinder and Moore suggest that "multiple parameters need to be employed to capture the complexity of organizational similarities and differences". (1979, in Royston and Greenwood, 1993, p.1054)

4. Research methods

This ongoing research project aims at answering the following research questions: What are the differences between the formal structure of the procurement strategy of a project and the real relationships of formal and informal communication, authority and procedures that exist between the members of the TMO? And, *How* can these differences be represented? Answering these questions imply identifying the contingency factors that take into account both formal and informal relationships between project participants. Some indicators, in relation to decision outcomes and processes discrepancies, also led us to inquire into the potential interference of the organizational structure of independent entities (organizations) on the procurement strategy. This led us to carefully consider in our analysis the role of users in the project process and their effective influence on the organizational structure.

The methods included the review of theories, case studies and concepts related with construction procurement, organizational design, construction project management and communication management. Among these, our attention was drawn towards classification systems. Two complementary methods were combined for our analysis: A survey of nine project case studies and the development of an additional three case studies of construction clients in Canada. The case survey followed the methodology proposed by Larsson (1993) and the case studies followed the methodology proposed by Yin (1994). In addition, Proverbs and Gameson's (2008) tools for the identification of cases and Love et al.'s (2002) methods for the triangulation of qualitative data were combined for the analysis of the information.

The nine cases of the **case survey** responded to the following criteria: They were completed within the last ten years; located in Canada; represented an array of various uses; had different funding options; and were of varying size. The nine projects are: Urban development Angus; Centre for public transportation buses; Urban Park Grou; Renovation of the Saint-James Church; Hotel Mont-tremblant; Renovation and addition School M-F; Pavilion 400; New facilities for the School MP and the Conservation of a rural territory (see Table 3).

The three clients chosen for the detailed **case studies** responded to the following criteria: they are institutional clients; they are conducting a construction project; they are located in Canada; they have a defined construction project or real estate department or unit. The three projects are: The Montreal Oratory; the University Campus in Quebec and the Quebec Parks Society (see Table 4).

The framework for the analysis of collected data included a common structure for the detailed examination of the project process based on the nine areas of knowledge proposed by the Project Management Institute (PMI, 2008). In all cases, the organisational structure of the TMO was first represented in a graphic way and then analyzed highlighting the relations between different actors and their strategic interests to participate in the project. For the detailed case studies, clients were first classified according to: (i) origin; (ii) profile; (iii) level of construction experience; (iv) structure (as proposed by the PMI); and (iv) typologies.

The analysis of the literature and the cases showed that the following contingency factors have an important influence on the structuring of the TMO:

- The relations between the internal structures of each of the organizations of the TMO;
- The structure of the department or the team in charge of project management;
- The level of authority of actors within and between the organization(s), specifically in the interfaces between departments;
- The level of authority of actors within the project team. The project team is described here as the group formed by the individual delegates of each organization bonded by the procurement scheme, who act as representatives of their organization during the course of the project (for example in construction site meetings);
- *The inter-organizational relationships (entity to entity) and their evolution of the structure in time through the different phases of the project;*
- *The inter-actor relationships: "unit to unit" as well as "unit to entity"*
- *The actual roles and responsibility of actors (organizations and end-users) within the procurement scheme, according to the legal framework.*

Although the research is designed to inquire in all these areas, this paper focuses on the first phase of the research, which has only developed the last three contingency factors (in italics). The analysis of the survey of the nine project case studies (Table 3) and the additional three client case studies (Table 4) included a partial classifications of (i) the client organization, and (ii) the TMO as a whole (see also *Figure 1*). For the three case studies we also classified the organization responsible for managing the construction of the project. In reality, this analysis needs to be extended to all the participants of the

TMO, but this task was out of the scope of this article. However, the analysis has already permitted us to produce a preliminary typology of TMOs that includes *intra*-organizational relations, *inter*-organizational relations and both project procedures and management practices.

5. Preliminary research results

Table 3 and Table 4 show the cases that were analyzed and the classifications that we identified for both the client organization and the TMO as a whole. The right column in each table refers to the category of the TMO that corresponds to the typology proposed in this article (Figure 1). We identified the following patterns in the nine cases examined in the survey (1 to 9) and the three project case studies (a, b, c):

1. Fragile relations exist between the client and consultants and contractors. This relationship is not necessarily conducted through the existing (formal) channels and protocols;
2. Sometimes "non-expert" participants of the client organization act informally as client representatives, exchanging information with other members of the TMO (particularly with consultants and – in some cases – with contractors;
3. Large amounts of informal communication and decision-making are made outside the pre-established structures and protocols for conducting the projects.

These three patterns are not at all surprising; in fact, they have all been previously discussed in similar forms by authors such as Cherns and Bryant (1984), Naoum (2001), Baiden (2006), Dainty (2006), Emmitt (2007) and Rank (2008). However, we are able to identify *how* these patterns affect the structure of the TMO. Figure 1 represents in a graphic manner the influence of the three contingency factors studied here in the structure of the TMO. The diagrams presented in Figure 1 do not cover the whole range of possible inter-firm relationships. However, they represent the most important patterns that we identified. The vertical reading of each typology permits to identify the formal or informal sequence of the transfer of needs between project actors and which eventually leads to the commissioning of the project. The project stakeholders are grouped in four categories:

a. The users, which correspond to the direct beneficiaries of the project, individuals or groups whose needs will ultimately be fulfilled through the project outcome.

b. The procurement organization also referred to as the "client organization", which ultimately assumes responsibility for the project (program, economic feasibility, risks) and manages the procurement process, directly or through delegated professionals.

c. The operator, which corresponds to the internal unit or external organization that is responsible for operating and maintaining the facility on behalf of the owner.

d. The participants of the TMO that are responsible for the execution of the project: namely the consultants and contractors that are responsible for the design, planning and construction of the project.

The system of classification shown in Figure 1 emphasizes the role of the project initiator and its relation with the users. It also highlights informal relationships that exist between actors of the TMO, besides the relations dictated by the formal procurement scheme. This responds to the pattern we found in the case survey and the case studies, namely that the procurement strategy does not represent the role of external or internal users (procurement strategies explain the relations between the client – as a single entity - and consultants and contractors). In fact, the analysis of the case studies and the case survey showed that the structure of the TMO cannot be properly represented without clarifying their role and relations with other organizations. The cases showed that users influence the project in many ways even if they are not formally involved in the procurement scheme.

The classification includes nine configurations that correspond to the possible relations between actors and the different roles of users, clients and operators in the process of project initiation and procurement:

1) Institutional configurations: they appear when secondary experienced clients (as defined in table 1) procure construction projects. Secondary, experienced clients are often large organizations which have internal units for project procurement.
   a) User initiated: In this case, users (external or internal) initiate the project by influencing the occupant unit (directly or through external pressure groups) and/or the procurement unit. They have a strong influence on the principal agents of the design and management group. Examples include the case of a building project conducted in a University due to the lobbying and pressure of student associations.
   b) External operator-influenced: In this case, a corporate division or franchise initiates the project, based on operational needs. The project is then presented to the head office (the owner) for approval. This is for instance the case of Park operators in Canada, which act as semi-autonomous organizations of the Ministry of the environment and which have the capacity to initiate their own construction projects.
   c) Strategy-initiated: In this case, the client board or chief executives initiate the project based on a strategic plan. For example, the case of a building renovation that responds to a market opportunity identified by the company's chief executive.
   d) Owner-occupant initiated: In this case, the owner responds to the pressure of internal occupants. The occupant formulates the needs and launches the project process, which is managed by a promoter or the client organization. This is for instance the case of the development of renovations initiated by the occupants of a building to respond to their own needs of space.
2) Developer configuration: it appears when experienced, and sometimes fully integrated, client organizations procure buildings as their core business. Residential and commercial developers exemplify this category.
3) Vertically integrated: This configuration represents the case in which a highly complex organization (or a consortium) comprising multiple specialized units conducts an integrated approach to design, build, finance and operate the project. It represents various alternatives of Built – Operate - Transfer (BOT) procurement systems.
4) User driven: In this case, the user is the main driver of the project. End-users are guided or supported by an organization but they directly procure their own individual projects. This is the

case of new procurement approaches used today for low-cost housing projects in developing countries (not surveyed in this article), in which a development-oriented organization supports individual families in the process of conducting their own home projects. (Lizarralde et al., 2009)

5) Cooperative: In this case, end-users are both the initiators and the operators of the facility. They require project sponsors and may create a client organization to procure the project. Residential cooperatives in Canada exemplify this type of configuration.

6) Classic: In this case, the user and the procurement organization are the same entity. The client (a simple structure) builds for its own use and procures the project through a contractor. This configuration is well illustrated by Mintzberg's (1979) "simple entrepreneurial structure". Common examples include the family that commissions a customized home or a family business that procures a home-based working space.

Table 3: Case survey classification

Case Survey	Client			TMO
	Origin	Profile	Level of construction experience	Corresponding TMO classification
1	Mixed	Secondary	Experienced	1c
2	Mixed	Secondary	Experienced	1c
3	Public	Secondary	Inexperienced	1d
4	Mixed	Secondary	Inexperienced	1c
5	Private	Secondary	Experienced	2
6	Private	Secondary	Inexperienced	1b
7	Public	Secondary	Experienced	1c
8	Mixed	Secondary	Inexperienced	1a
9	Mixed	Secondary	Inexperienced	1d

Table 4: Case study classification

Case Studies	Client			Contracting Organisation				TMO
	Origin	Profile	Level of construction experience	PMI Structure	Structural configration (Mintzberg)	Metaphors (Morgan)	Procurement systems.	Corresponding typology
A	Institutional	Secondary client	Experienced	Functional organisation	A mix of both divisionalised and missionary types of organisation.	Culture	Separate - coordinated, Integrated (Design-Build)	1c
B	Institutional	Secondary client	Experienced	Functional organisation	Professional bureaucracy.	Machine	Separate - coordinated, Integrated (Design-Build)	1c
C	Institutional	Secondary client	Experienced	Matrix organisation	Mixed, mostly hierarchic - professional bureaucracy; divisionalised format for the operations of separate sites.	Brain	Separate - coordinated, Integrated (Design-Build), Project Management	1b

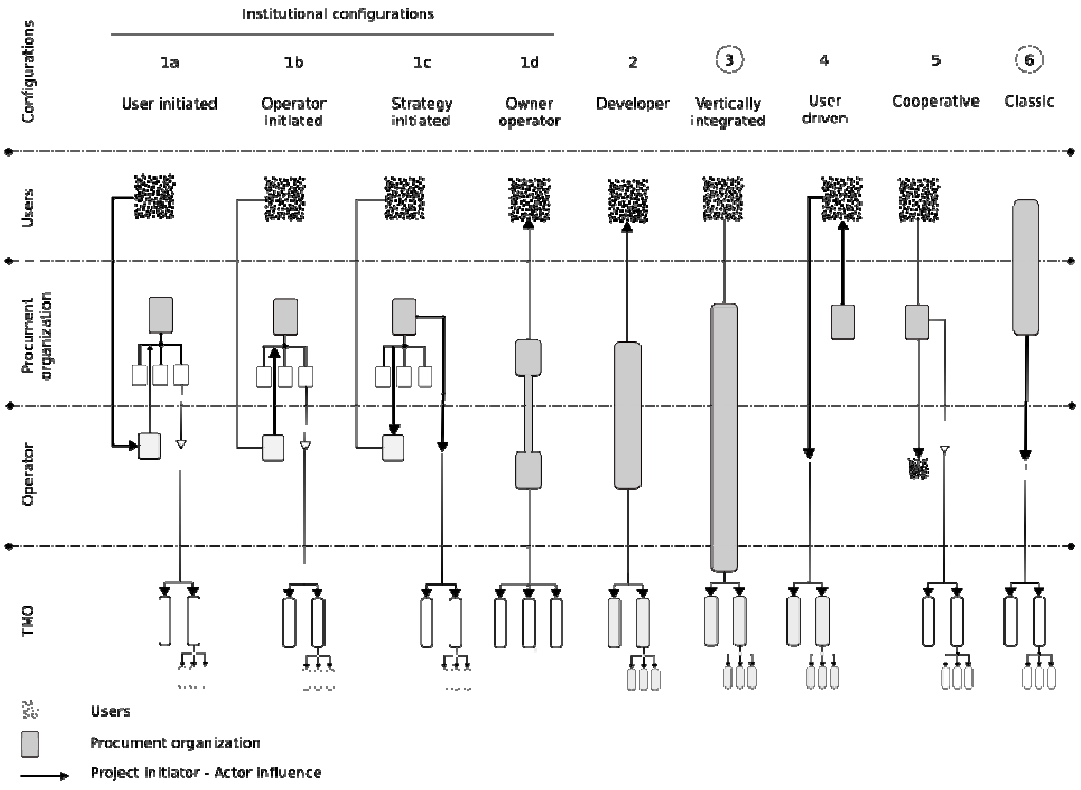

Figure 1: System of classification of TMOs in the building sector

6. Discussion and further research

This article briefly established the theoretical basis for the arguments in favour of a classification of Temporary Multi-organizations in the construction industry. A case survey and three case studies were conducted in order to draw patterns of structures, processes, communication and general project behaviour. We analyzed the structure and functioning of TMOs according to three particular contingency factors. We identified differences between (i) the formal structure of the procurement strategy of a project, and (ii) the real relationships of formal and informal communication, authority and procedures that exist between the actors of the TMO. The research proposes a common structure of analysis built upon the knowledge gained from previous systems based on typology, taxonomy and metaphors. The results include the proposition of nine categories that represent the various possible typologies of TMOs and open the debate on to the pertinence of current systems of classification for the understanding of TMOs.

The proposed system of classification of TMOs recognizes the influence of four main groups of actors; an approach that differs from the traditional procurement system in which only clients, consultants and contractors are fully represented. The categories proposed, although extremely schematic, do produce a rich picture of the overall project nature and behaviour. They show the strategic role of each actor (particularly end-users) and the path of project commissioning. The categories also highlight the influence of power relationships between actors and their multiple and potential conflicting roles. In doing so, it questions the project structures based exclusively on procurement strategies and argues for the consideration of informal communication, networks, power roles and effective project processes.

Further research must address the contingency factors that have not yet been developed in this article. It is also of prime importance to validate the system proposed here with a wider set of case studies (including also projects in different countries and contexts). The preliminary results of the study permit to formulate some questions that will have to be addressed in the following phases of this ongoing research project:

a. What is the influence of the internal structures of each organization in the overall structuring of the TMO?

b. How do the structuring of the TMO (considering formal and informal relationships between all project actors) influence procurement strategies – and vice versa?

c. Is the system of classification proposed in this article pertinent if additional contingency factors are included?

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How can Requested Cooperation Skills in the Tendering Process fit in with European Legislation?

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Abstract

The building sector is in a process of change, where the assignment criterion in tendering is shifting from the cheapest bidder to a process where it becomes more and more normal to use the economically most advantageous bid. Among others, this implies demand for more team work, i.e. partnering or a cooperation similar to partnering.

This leads to a need for new selection and assignment criteria. All criteria in accordance with the legislation can be used as long as they are measurable and unambiguous, but a criterion concerning personal cooperation skills can be difficult to make measurable and unambiguous.

Different benchmarking systems/KPI systems are analyzed in terms of which KPI can be applied as selection and assignment criteria. Furthermore, the extend of client's implementation of these criteria in the tendering process is analyzed.

This paper reports on a case study where a district heating plant's bidding process is analyzed as to what happened in practice and how this can fit in under existing EU-directives. It is found that the building owner requests to use collaborators whom he knows as good collaborators, which in this case means having the right personal cooperation skills and wanting to cooperate for a win-win situation.

Keywords: legal requirements, Key Performance Indicators, tendering, selection and assignment

1. Background

1.1 History

In Denmark the tendering process has change during the last years. One of the reasons has been negative criticism of the building sector for not developing as much as other industries. From 1967 until 2001 a Competitive Tendering Act existed where you had to use price as the only criterion. In practice that resulted in a low price but sometimes, also a low quality of the complete building because of an inefficient building team (Ussing, L. Faber, 2008).

In 1993 The European Union began to make rules for the tendering process. These rules gave the industry the opportunity to use everything as selection and assignment criteria as long as they were measurable and unambiguous. The Danes still used their own Competitive Tendering Act and did not use the rules from The European Union in the right way. In the late 1990s when the Storebaelt Bridge was built in Denmark a French company complained about the tendering process. Denmark lost the case in The European Union and from that moment the Danish players became aware of the rules. (Ussing, L.F., 2008)

That case was one of the reasons for the Danish Parliament to change the tendering rules to the new Tendering Act (Tendering Act, 2001). The Tendering Act 2001 follows the rules from The European Union which spell that you now nearly have to follow the same rules at all times in Denmark, if you are a public client; private clients are still free to choose a tendering process of their own choice. The present rules allow use of criteria such as lowest price but also the economically most advantageous bid, which means all criteria can be chosen as long as they are measurable and unambiguous.

1.2 Clients demand quality from the completely finished building

All over Europe the tendering process is going from using the only criterion, lowest price; to using the criterion the economically most advantageous bid. That criterion can contain criteria as quality, time, aesthetics, running cost, customer service and of course the lowest price. (Nielsen R. and Treumer, S., 2005)

In this change the trend is that clients demand more and more quality from the completely finished building (Ussing, L. Faber, 2008). Quality is more than one thing. Quality can be a requirement for the construction materials, but also requirements for special personal skills for individuals in the project team, the lowest completion time, the lowest running cost and requirements for an efficient project organization.

When working with the criterion, the economically most advantageous bid, it also means that it is more difficult to make the tendering process in a right way. From 1993 until the late 1990s the Court of the European Union only had a few cases going on the tendering process, but since then the number of cases has increased (Nielsen R. and Treumer, S., 2005), (Ussing, L.F., 2008). This increase

of cases coincide with the change of the tendering process, which indicates that, it is difficult to make the tendering process in a right way compared to The European Union's rules for a tendering process.

2. Research question and methodology

The purpose of this paper is to show a practical case where a district heating plant, which in this case is a private client, has handled the tendering process in a way where all concerned parties are satisfied. Following, there will be a review of existing EU-directives and a proposal for a way to use selection and assignment criteria which are easy to make measurable and unambiguous.

Finally, a conclusion is presented, about using this case as a role model for a right tendering process, compared to the claim from the existing EU-directives if the client is a public client and therefore bound to follow the rules from The European Union. Finally there will be a possible answer to the question: How can we use selection and assignment criteria in the future?

3. Discussions – a look in the real life

3.1 Field observations

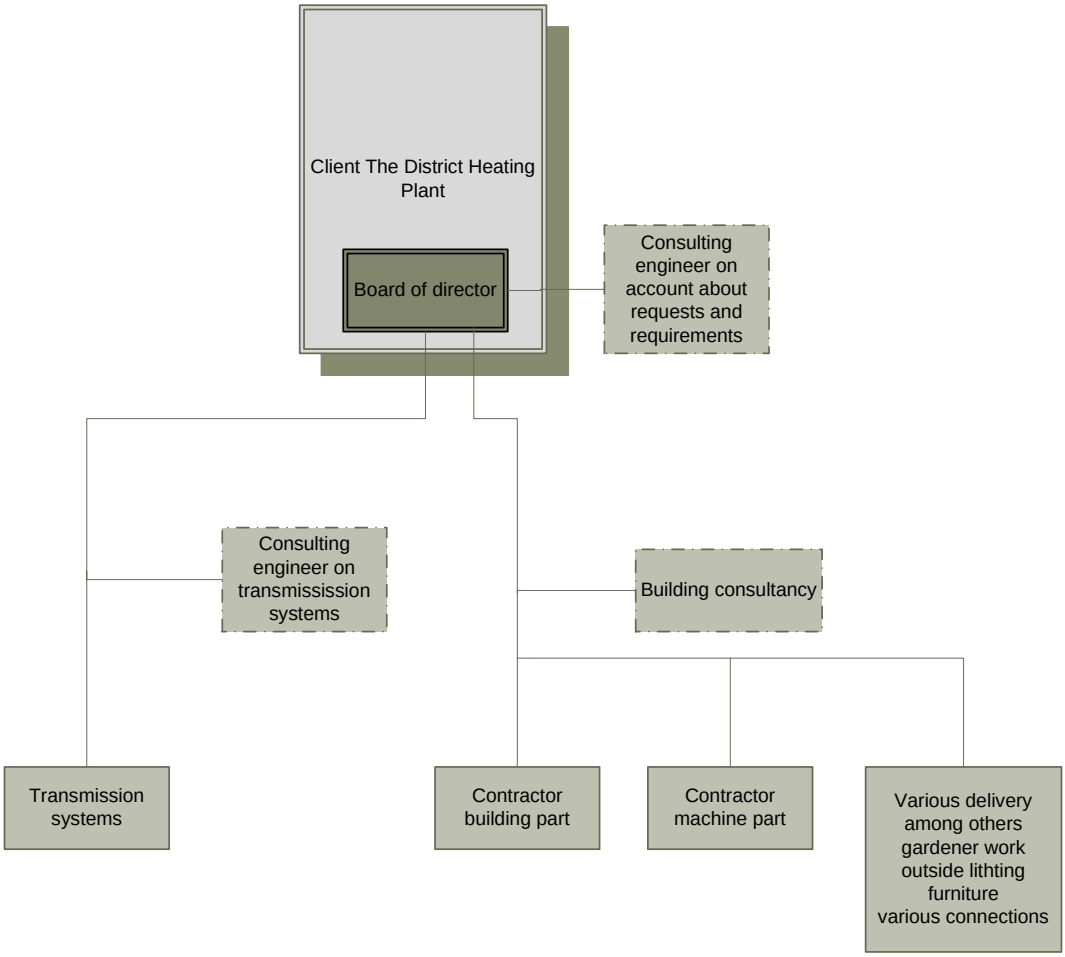

Figure1: Organisation Chart for the District Heating Plant

This case is an example on using selection and assignment criteria in practice in a way where all concerned parties are satisfied. The case is taken from an ongoing PhD project (Faber Ussing, L., 2009). The building project is a little private district heating plant and therefore not as a rule bound by any rules. The project has been followed from where the client got the idea of a new heating plant until the client started using the new heating plant. As a rule the client is private, but because it is a district heating plant the client is assigned to EU-directives about utility companies. The price for the whole project is lower than the threshold value (38 mill.DKK) of the EU-directives about utility companies. This means that you do not need to follow the rules. The price of the Consulting engineer part is lower than the threshold value for service provided (3 mill.DKK.) of the EU-directives about

utility companies, so the client can operate without rules on this part. But the price of machine parts is higher than the threshold value for purchase (3 mill.DKK.) of the EU-directives about utility companies. This means that the client has to follow the EU-directives about utility companies on the machine part.

3.1.1 Consulting engineer part

From the start the client chooses to make an account about requests and requirements for the new heating plant. The account contains different possible construction projects and recommends possible solutions. The account is produced by a local consulting engineer to whom the client's board of directors have confidence. The consulting engineer has experience with project engineering of heating plans and therefore he got the work without competition.

Following four consulting engineers are picked out for selection without an actual prequalification. They are picked out by the client's board of directors on the basis of requests about a consulting engineer to whom the client's board of directors have confidence; a consulting engineer who has experience with project engineering of heating plans, a consulting engineer who wants to work in partnering and a consulting engineer who can create a project organisation with qualified staff.

One of the consulting engineers is beforehand the client's consulting engineer on previous transmission systems work, one is a local consulting engineer with experience in project engineering of heating plans (the engineer who made the account) and the last two have applied because they have heard the decision about the building plans. Whether the four consulting engineers meet the client's requirements was based on information from correspond once with the consulting engineers and on act at the client's board of director's discretion.

To make the assignment, the client called up the four consulting engineers for a one hour's interview with the client's board of director. Before the interview the consulting engineers had received a notice, based on the aforementioned account, and describing some areas which the client's board of director requested clarified at the interview. Some of the requested areas for clarification should be answered in writing others orally.

Some of the areas for clarification which the client wanted in writing were:

- How will the company schedule and organise the project design period and the accomplishment period including an organisation chart mentioning named key persons?

- How will the company ensure a good aesthetic quality of the project?

- Does the company see advantages in using principles from partnering and lean construction in connection with developing and realising the heating plant?

- Is the company willing to cooperate with some of the other consulting engineers, who are invited to an interview or does the company it selves resolve the problem better?

After the interviews a meeting took place between the client's board of director and the operating staff at the district heating plant. After that the client's board of directors decided to assign the job to the local consulting engineer who made the account.

3.1.2 Machine part

The procurement of the machine part followed the EU-directives about utility companies with negotiation. This first meant a normal prequalification. Call for prequalification was public in the Official Journal of EU and the selection criteria were that the companies had to be qualified for the work. Applications were received from three companies. They all had enclosed references from earlier works. The client considered the three companies qualified for doing the work.

After the prequalification the three companies were asked to make an offer with negotiation. For this offer the client made a description containing work descriptions and particular conditions. The particular conditions contained four assignment criteria: Overall economy (weighting 50%), operational reliability (weighting 20%), simple maintenance (weighting 20%) and the contractor's structure of the supply organisation (weighting 10%).

After negotiations and clarifications of the three offers the winner was found. The result appeared with a ten pages evaluation made by the consulting engineer. Every criterion had been examined and the companies had been compared and biased with each other. A summary of the conclusion was send to all the bidders and the contract negotiation was completed with the winning company.

3.1.3 Building part

The building part was not offered in a normal way. The client compiled a list of five contractors which the client in consultation with the client's board of directors, operating staff and the chosen consulting engineer found qualified for making the project. The contractors were mentioned in the order in which the client found them most qualified for the work – number 1 was the contractor which the client considered the best collaborator.

Criteria for coming on the list were:

- Known beforehand by one in the selection board.
- A good reputation regarding quality.
- A good reputation regarding cooperation.
- Known as a company which wants to work for a win-win situation.
- Are operating inside a reasonable community.

The five contractors were weighed compared to the five criteria and to each other by the selection board. The five mentioned criteria were in that way even selection and assignment criteria.

Before the selection board compiled the list none of the contractors were solicited and none of them contacted the client to offer themselves. In this way none of the contractors were aware of being on the list.

Negotiations were started with contractor number 1 on the list. After some time this contractor backed out because he had too many orders and therefore did not have time for doing this work in the right way.

Negotiations were started with contractor number 2 on the list. These negotiations resulted in a contract and following execution of the duty.

The last 3 on the list were never solicited and therefore they were never aware of being on the list.

3.2 The regulations and the legislation

As a starting point the private district heating plant is considered a private client, but because it is a district heating plant with a sort of exclusive agreement to the regular customer, the client is assigned to the EU-directive about utility companies (2004/17).

At the end of the building process the client chooses to get a council security to obtain the building loan. In that way the client suddenly becomes a public client and after this the client today will assign to all the EU-directives. This means the EU-directive about utility companies (2004/17), the EU-directive about procurement (2004/18) and the European Commission's rendering announcement about the community law, which is used with assignment of contracts, which are not or only partly covered by the EU-directives (2006/C179/02). In this case it is a public client operating in Denmark and therefore this case is also covered by The Danish Tendering Act (2001).

In Europe the EU-directives are current for all public clients operating inside EU. The definition of a public client is a client who is:

- A national, regional or local authority, state- and community institutions and public agency.
- Other suppliers, when they get public funding, government subsidy including council security.
- Tenderers, when are they offered part of work in a project for one of the aforementioned clients.

The public clients are assigning to the EU-directives, when the value of the project is higher than the threshold value for the EU-directives mentioned in the European Commission's Threshold values

(2007/C301/01). When the project is lower than the threshold values a public client is still assigning to the European Commission's rendering announcement about the community law, which is used with assignment of contracts, which are not or only partly covered by the EU-directives (2006/C179/02). In practice this means that The EU-treaty from 1993 at all times shall be followed by the basic rules and principle, which means there have to be free movement / flow of goods and services, no discrimination and equal treatment, transparency, proportionality and reciprocal recognition.

The European Commission's rendering announcement from 2006 means that a public client has to be careful if not following the EU-directives. In Denmark the consequence of that is taken by making an amendment to The Danish Tendering Act in December 2007 in a way, so when the EU-directives are not in force, then the Tendering Act has to be followed. The Danish Tendering Act is base on the EU-directives and The EU-treaty from 1993.

A summary of the regulations and the legislation is; if you are a private client you can make the tendering process in a free way or you can choose to follow the EU-directives. If you are a public client you have to follow the EU-directives, i.e. the EU-directive about utility companies (2004/17), the EU-directive about procurement (2004/18) and the European Commission's rendering announcement about the community law, which is used with assignment of contracts, which are not or only partly covered by the EU-directives (2006/C179/02). The public client also has to be aware of national regulations and legislation in the separate EU-countries.

3.3 Use of benchmarking systems/KPI

A way to make the selection and assignment procedure measurable and unambiguous can be to use a benchmarking system or key performance indicators. If a client chooses some key performance indicators e.g. personal skills, personal qualifications and technical competencies, it can be easy just to select the company with the best key performance indicator in those three fields. This requires key performance indicators which are reliable, unambiguous and objective. The question is if that sort of key performance indicators can be found in the real world now or they have to be made before use.

For a long time parts of the building sector in Great Britain have used key performance indicators in form of inter alia KPIzone (KPIzone, 2009). Common for the English benchmarking systems is that the agreement is self-imposed and the input comes from the companies themselves. In practice that signifies key performance indicators which can be reliable, unambiguous and objective. But the indicators can also be unreliable, dubious and subjective because the input comes from the companies themselves. It is assumed that the companies have a big interest in having as good key performance indicators as possible.

In Denmark the government and the parties from the Danish building sector started in 2002 The Benchmark Centre for the Danish Construction sector. This centre is a non-partisan organisation the purpose of which is to make key performance indicators on companies which want to make an offer in the national building sector and the council housing sector. From 1 July 2005 it was a demand for the contractors to have key performance indicators if they want to make an offer in the national building

sector. From 1 September 2008 it was also a demand for making an offer in the council housing sector. From 1 October 2009 it is also a demand that consulting engineers and architects have key performance indicators for making an offer in both the national building sector and the council housing sector. From the beginning of 2010 The Benchmark Centre for the Danish Construction sector will start making key performance indicators also for the clients/house builder. (The Benchmark Centre for the Danish Construction sector, 2009)

The Danish key performance indicators made by The Benchmark Centre for the Danish Construction sector are indicators such as customer satisfaction, adherence of timetable, the number of defects and the number of accidents at work (indicators for contractors), and customer satisfaction, adherence of timetable, adherence of budget and cooperating (indicators for consulting engineers and architects). The rules are; if a company have no indicators, they are not allowed to make an offer on a project for even the national building sector or the council housing sector. (The Benchmark Centre for the Danish Construction sector, 2009)

It is assumed that the Danish key performance indicators are reliable, unambiguous and objective because they are made by a non-partisan organisation, but they are not as fully developed as the English system KPIzone. KPIzone has more than 300 indicators and some of them are indicators such as personal skills, staff conditions, form of organisation, qualification, personal qualities and ability to cooperate. The Danish private district heating plant used these indicators to choose their consulting engineer and contractor (KPIzone, 2009).

In the long term it can be possible to use key performance indicators for the selection and assignment procedure if using a system as the Danish, but the Danish system has to be fully developed. It has to look like the KPIzone in number of indicators, but you cannot use indicators where input comes from the companies themselves, the risk is that indicators are unreliable, dubious and subjective. If the outside world has to trust the indicators, they must be made by a non-partisan organisation to be reliable, unambiguous and objective.

4. Conclusions

The case about the district heating plant is a project where all the practising parties were content with the process. But the consulting engineer part and the building were performed as a private project which means the process did not followed the rules of the EU-directives.

The machine part's selection and assignment process followed the rules in the EU-directives about utility companies with negotiation (2004/17). All the parties were content with the process, but the client used much more time on the machine part's selection and assignment process compared to the consulting engineer part and the building part (Faber Ussing, L., 2009).

The consulting engineer part's and the building part's selection and assignment process were done with much less paperwork and in a shorter time than the process for the machine part (Faber Ussing, L., 2009). But the processes did not follow the rules in the EU-directives.

If the rules have to be followed as the rules in the EU-directives are construed today, the client has to run a real prequalification in the consulting engineer part. The process has to follow the transparency principle and the equal treatment principle and this also means that a consulting engineer who has composed a part of the tender documents is not allow to make an offer for the project. (Klagenævnet for udbud, 2009)

The client could have settled the problem if another consulting engineer, one who did not make an offer on the project, had composed the tender documents. Next the assignment criteria have to be put up in a way were they are measurable and unambiguous and they also have to be weighed against each other.

Neither did the building part follow the rules. If the client also here wants to follow the rules of the EU-directives he had to make a real prequalification. Subsequent there has to be a competitive bidding where the client has to compose a tender document including some weighed assignment criteria. (Klagenævnet for udbud, 2009)

If the rules of the EU-directives have to be followed in a case such as the little heating plant the implication of this is that the client will have more paperwork and has to use more time for the selection and assignment process. (Faber Ussing, L., 2009)

The rules from The European Union from 1993 about the tendering process were composed to strengthen the public sector and thus the interest of the society. The requests from 1993 were among other things to get rid of local agreements. Local agreements existed which under existing laws were corruption. Those agreements discouraged other tenderers from giving an offer for the projects. The requests were to ensure that all interested tenderers from all over the European Union have the opportunity to make an offer. This has to be ensured by rules which are measurable and unambiguous for all the bidders, and the public client should be ensured the lowest price as well. (Klagenævnet for udbud, 2009)

How the requests from the European Union can be ensure cannot be answered. But for sure the rules are an effort on finding a solution accepted by all the member states. For some states the rules seem bureaucratic and controlling and for others quite moderate dependent on which country and region a participant in a project is coming from. Inside the European Union there is a big difference in how much faith we have in other fellow human beings. Thus there is a difference in moral and ethics for participants in a project (Svendsen, G.T., Svendsen, G.L.H., 2006).

A different shown in the studies is that the more welfare in a population the bigger faith we have in other fellow human beings and the better moral and ethics will appear. (Svendsen, G.T., Svendsen, G.L.H., 2006)

The EU-directives are an attempt to make a common denominator accepted by all the member states. The rules are developed in 1993 and regularly revised. The financial situation and welfare of the individual countries have also changed to the better, especially for the poorest of the countries (Statistics Denmark, 2005). This information compared with an expectation about a bigger faith in the

collaborators in a project, thus moral and ethics should raise, with the result that the parties do not work against each other but instead a win-win situation arise.

The previous information can maybe lead to changes in the EU-directives. As the rules are construed now, it is not very easy to make assignment criteria as personal skills, personal qualities and cooperating measurable and unambiguous in a way so the criteria are accepted by the court. In Denmark court decisions from The Danish Board of Complaints on Tendering show that using other criteria than the lowest price are difficult, and there is a need for making measurable and unambiguous criteria (Ussing, L.F., 2008).

In the longer run the EU-directives have to follow the requests of the clients. It can be as in case of the little heating plant were the requests from the client were cooperating in a good way: capability of team work, making a win-win situation and special personal skills and qualities. If these sorts of requests are dominating, the EU-directives must be adjusted to make it possible in an easy way to use such criteria without ending up in court.

A way could be to use key performance indicators as assignment criteria. But if the key performance indicators shall be applicable and impartial, the indicators have to be compiled by a non-partisan organisation, so it can be assumed that the indicators are reliable, unambiguous and objective. At this time of key performance indicators do not exist. The indicators from KPIzone have the right depth as well as the width, but they are made by the companies themselves and therefore not impartial. The Danish key performance indicators made by The Benchmark Centre for the Danish Construction sector are impartial, but they do not have the right depth as well as width yet. If the future can bring a combination of the English and the Danish system there is a chance to get an applicable system.

In the long term it can be desirable to have EU-directives which in a way so even the public clients and the private clients are able to use and want to use the directives, also when they do not need too. If this option has to be a reality in the Nordic countries for private clients, the rules have to be less bureaucratic and less controlling, because a lot of the private clients for example in Denmark want to work as the client in the little heating plant (Faber Ussing, L., 2009). The EU-directives in a design with less bureaucratic and less controlling combined with use of applicable and impartial key performance indicators can be the solution of the future for selection and assignment both for public clients and private clients.

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Study on the Risk Appraisal Framework of PPP in Yangtze River Delta Region

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Abstract

Construction procurement through "public-private partnership (PPP)" has been increasingly employed by governments around the world, and amongst other reasons, three effects PPP brings account for this phenomenon, namely, a) expansion effects; b) resource allocation effects; and c) institutional innovation effects. As one form of PPP, build-operate-transfer (BOT) made its appearance as early as 30 years ago in China. Risks stemming from various sources prevail before, during and after the construction phase, often causing great loss to either the public partner or its counterpart. Hence, to identify and appraise relevant risks is the first step to successfully implementing PPP and thus a problem demanding an urgent solution.

Firstly, this research will obtain the critical risk factors through literature review and revision according to the local reality. Secondly, Analytical Hierarchical Process (AHP) will be used to identify the relative weight of each factor, and thus a risk appraisal system can be established. Thirdly, based on the weights of risk factors, some suggestions will be proposed.

The contribution made by this research is to establish a local risk appraisal system for PPP/BOT and accordingly give some suggestions to promote PPP/BOT projects.

Keywords: risk appraisal framework, PPP, Yangtze River Delta

1. Introduction and objectives

In China, the private investment into fixed assets, such as housing, building and infrastructure, has kept its momentum of development, and its annual increase rate is generally far higher than that of state-owned investment. For example, as shown in table 1, compared with 2006, the private investment on fixed assets in 2007 increased by 40.4%, more than 2 times that of state-owned investment, which was 17.4% for mainland China as a whole. As for the Yangtze River Delta, which mainly covers southern Jiangsu province, Shanghai Municipal and northern Zhejiang province, this is the case except for Shanghai during the period 2006 to 2007. However, from the same source, compared with 2005, the private investment on fixed assets rose by 46.5% in Shanghai in 2006, whilst the stated-owned investment only rose by 5.3% during the same period.

On the other hand, the government investment is far from enough and there is much great potential for private investment to get into the infrastructure. The gap between government investment and the need is huge. Take Shanghai as an example, it is reported that for the track traffic that under construction, there is still a lack of 20 billion RMB.

Table1: Domestic investment on fixed assets (in 100million)

		2006	*2007*	*Increase by*
Mainland China	*State-owned investment*	*32963.4*	*38706.3*	*17.4%*
	Private investment	*19267.2*	*27055.6*	*40.4%*
Shanghai	*State-owned investment*	*1266.4*	*1553.0*	*22.6%*
	Private investment	*635.3*	*645.3*	*1.6%*
Zhejiang	*State-owned investment*	*1812.7*	*1850.7*	*2.1%*
	Private investment	*1610.1*	*2007.0*	*24.7%*
Jiangsu	*State-owned investment*	*2015.7*	*1961.1*	*-2.7%*
	Private investment	*3029.1*	*4100.9*	*35.3%*

Source: National Bureau of Statistics of China

As a means of channeling private investment into macroeconomics, public-private partnership (PPP), theoretically and macroeconomically, brings three effects; a) economy expansion effects, an econometric study conducted by IMF shows that there is a positive relationship between the rate of private investment and real GDP growth, level of per capita GDP, and the rate of public sector investment, whilst a negative one between the rate of private investment and real interest rates, domestic inflation, the debt-service ratio, and the ratio of debt to GDP(Greene and Villanueva 1991). Compared with public investment, private investment contributes more to overall productivity(Erden and Holcombe 2006). b) more efficient resource allocation effects, it is well recognized that the structure of property rights has great effects on the allocation of resources within firms and leaving more economic decision to private sector contributes to the efficiency of resource allocation. An

empirical study found that on average economies that agree with private property rights and allocation of resources through market grew at a 2.76 percent rate compared to a 1.10 percent rate in societies that reject project and interfere resource allocation(Scully 1988). c) institutional innovation effects, PPP is a new way for companies to approach the social sector as it provides companies with opportunity for learning and development(Kanter 1999), and more importantly, in order to mobilize private capital and achieve efficiency, it requires to reexamine and reallocate the roles of policy maker, regulator, and service provider and thus sometimes is deemed by governments as a catalyst to elicit commitment to a sector reform agenda(ADB 2006). In other words, involving a multiplicity of stakeholders, a PPP means that the administrative decision on a project development plan is not exclusively a public responsibility, but is also a result of private and public negotiation and agreement processes(Nijkamp, Van der Burch et al. 2002), and obviously is an innovative approach to traditional institutional arrangement.

It is widely recognized that build-operate-transfer (BOT) is a typical delivery method of PPP, and BOT first made its appearance in the project of Shen Zhen Shajiao B Electrical Plant in Mainland China in 1984, so it can be safely put that PPP made its debut in China then. Since then, PPP has seen great expansion especially from 2000 onward, with China's entry into WTO and successful bid for the Olympic Games. It is reported that about 2/3 of the 32 sport venues for the 2008 Olympic Games and the #3, #4 and #5 subway routes in Beijing were or are being developed through PPPs.

All in all, it is feasible and necessary to elicit more private investment into the fixed assets with infrastructure as its main part, this is especially the case for the Yangtze River Delta region.

However, the present application of PPP/BOT in Mainland China is far from satisfactory. Firstly, the turnover of PPP/BOT projects is relatively small compared with traditional projects. Moreover, with PPP/BOT projects it is very likely that the private sector has to transfer the facility in the middle of concession period due to not so much cashflow as expected. Secondly, new legislations concerning PPP/BOT need to be introduced to promote the practice. Until now only regulations issued by the state council, the ministry or provincial governments, instead of legislations at the national level, are in effect, for example, in 2004, "Regulations on Franchise of Municipal Public Utilities" was issued by the then Ministry of Construction to promote marketization of public utilities, followed by local city governments adopting regulations with characteristics of their own. At the same year and the one followed, "Decision to Reform the Investment System" and "Suggestions to Encourage, Support and Guide the Development of Non-public Ownership Economies" were published by the State Council to encourage private investment into the public utilities. But neither national legislation nor national institution like National Council for Public Private Partnerships of the U. S. is in place to promote PPP.

With no doubt, full of uncertainty and risks that are difficult to control would account for private investors' reluctance to sponsor PPP/BOT projects. In order to get prospective investors prepared for possible risks and uncertainties, a risk appraisal framework need to be developed. As China is a very large country, with 9,600,000 km2 as its territory, a uniform risk appraisal framework is impossible and unrealistic for the whole country. This paper just focuses on the Yangtze River Delta, which can be seen as a homogeneous region from the perspective of economy.

2. Risks involved in PPP/BOT

The completion of a building project is a result of a combination of many events and interactions, planned or unplanned, with changing participants and processes in a constantly changing environment. Success of project hinges on fulfillment of every stakeholder's expectation(Sanvido, Grobler et al. 1992). Compared with traditional procurement method, a PPP/BOT project involves not only public sector but also private sector, which means much more work need to be done to ensure its success.

As a matter of fact, risks and success factors concerning PPP/BOT projects have attracted great attention from academics and practitioners for a long time. After analyzing several cases of PPP projects from different sectors, Lam(1999) concludes that financial risks such as interest rate fluctuation and foreign exchange fluctuation are usually dealt with by techniques such as swap transactions. He makes special reference to residual risks, most of which come from the government side, and he also cautions us against issues stemming from the increasing environment consciousness, drastically optimistic revenue forecast and competitive forces at the same time and in the same locality. In their strategic & analysis report on private-investment opportunities for public transport, Cheatham and Oblin identify three factors influencing the applicability of PPP in one region, and they coin "PPP readiness" to represent them(Cheatham and Oblin 2007). The three key factors are: a) government's commitment to PPP, b) the effectiveness of governmental governance, and c) track record in execution. Jamali deems trust, openness and fairness as basic foundational underpinnings for successful PPPs(Jamali 2004). Nijkamp et al. conclude that PPP has a high chance of success if it is designed on the basis of joint-venture model, and a clear, timely and transparent mapping of all costs, revenues and profitability aspects of a PPP project is a necessary condition.

However, according to the knowledge of the authors, Li et al. (2005) developed the most comprehensive catalogue of PPP/PFI project risk factors which categorizes risk factors into three levels: macro level; *meso* level and micro level. The authors revised Li et al.'s catalogue according to the reality of Yangtze River Delta, for example, there is no problem about the stability of Chinese government, so the risk factor "unstable government" is removed. The final risk catalogue is shown in Table 2.

Table 2: Revised catalogue of PPP/PFI project risk factors

Risk meta-level	*Risk factor category group*	*Risk factor*
Macro level risks (A)	*Political and government policy (A1)*	*Strong political opposition/hostility (A11)*
		Expropriation or nationalization of assets (A12)
		Poor public decision-making process (A13)
	Macroeconomic (A2)	*Poor financial market (A21)*
		Inflation rate volatility (A22)
		Interest rate volatility (A23)

		Influential economic events (A24)
	Legal (A3)	*Legislation change (A31)*
		Change in tax regulation (A32)
		Industrial regulatory change (A33)
	Social (A4)	*Lack of tradition of private provision of public services (A41)*
		Level of public opposition to project(A42)
	Natural (A5)	*Force majeure (A51)*
		Geotechnical conditions (A52)
		Weather (A53)
		Environment (A54)
Meso level risks (B)	*Project selection (B1)*	*Land acquisition (site availability) (B11)*
		Level of demand for project (B12)
	Project finance (B2)	*Availability of finance (B21)*
		Financial attraction of project to investors (B22)
		High finance costs (B23)
	Residual risks (B3)	*Residual risks (B31)*
	Design (B4)	*Delay in project approvals and permits (B41)*
		Design deficiency (B42)
		Unproven engineering techniques (B43)
	Construction (B5)	*Poor quality workmanship (B51)*
		Excessive contract variation (B52)
		Construction cost overrun (B53)
		Construction time delay (B54)
		Late design changes (B55)
		Insolvency/default of sub-contractors or suppliers (B56)
	Operation (B6)	*Operation cost overrun (B61)*
		Operational revenues below expectation (B62)
		Low productivity (B63)
		Maintenance costs higher than expected (B64)
		Maintenance more frequent than expected (B65)
Micro level risks (C)	*Relationship (C1)*	*Inadequate distribution of responsibilities and risks (C11)*
		Inadequate distribution of authority in partnership (C12)

		Differences in working method and know-how between partners (C13)
		Lack of commitment from either partner (C14)

3. Analytic hierarchy process

In response to the scarce resources allocation and planning needs for the military, Thomas Saaty developed the analytic hierarchy process (AHP) in the early 1970s. Saaty(1980) himself identified several benefits of AHP, one of which is to assign weights to the elements.

In order to achieve the objective of this paper, AHP is one of the best methods to employ. Firstly, the elements involved are totally intangible and hard to quantify. Secondly, appraisal framework needs elements with its weights relevant to others at the same level under the same criterion. Fortunately, all this requirements can be fulfilled by AHP.

Saaty(1980) proposed procedures for applying AHP as follows,

a) Define the problem and determine its goal.

b) Structure the hierarchy from the top (the objectives from a decision-maker's viewpoint) through the intermediate levels (criteria on which subsequent levels depend) to the lowest level which usually contains the list of alternatives.

c) Construct a set of pair-wise comparison matrices (size $n \times n$) for each of the lower levels with one matrix for each element in the level immediately above by using the relative scale measurement shown in table 3. The pair-wise comparisons are done in terms of which element dominates the other.

d) There are $n(n-1)$ judgments required to develop the set of matrices in step 3. Reciprocals are automatically assigned in each pair-wise comparison.

e) Hierarchical synthesis is now used to weight the eigenvectors by the weights of the criteria and the sum is taken over all weighted eigenvector entries corresponding to those in the next lower level of the hierarchy.

f) Having made all the pair-wise comparisons, the consistency is determined by using the eigenvalue, λ_{max}, to calculate the consistency index, CI as follows: $CI = (\lambda_{max} - n)/(n-1)$, where n is the matrix size. Judgment consistency can be checked by taking the consistency ratio (CR) of CI with the appropriate value in table 4. The CR is acceptable, if it does not exceed 0.10. If it is more, the judgment matrix is inconsistent. To obtain a consistent matrix, judgments should be reviewed and improved.

g) Steps 3-6 are performed for all levels in the hierarchy.(Al-Harbi 2001)

To simplify the above procedures and alleviate manual work, professional software, Expert Choice, was developed, and makes great contribution to this paper.

Table3: Pair-wise comparison scale for AHP preference

Numerical rating	*Verbal judgments of preferences*
9	*Extremely preferred*
8	*Very strongly to extremely*
7	*Very strongly*
6	*Strongly to very strongly*
5	*Strongly*
4	*Moderately to strongly*
3	*Moderately preferred*
2	*Equally to moderately*
1	*Equally*

Table 4: Average random consistency (RI) (Saaty 1980; Al-Harbi 2001)

Size of matrix	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Random consistency	*0*	*0*	*0.58*	*0.9*	*1.12*	*1.24*	*1.32*	*1.41*	*1.45*	*1.49*

4. Data analysis

After several rounds of consultation, the final pairwise comparison matrices were decided. With the help of Expert Choice, the results turn out as table 5, in which the weight of every element is calculated under its immediate element above. What is missing in the table is the consistency rate of the pairwise comparison among macro level (A), meso level (B) and micro level (C), which is 0.09 actually.

Table 5: Weights of risk factors

Risk meta-level	*Risk factor category group*	*Risk factor*
A (0.699) *(CRA=0.10)*	*A1 (0.414)* *(CRA1=0.02)*	*A11 (0.427)*
		A12 (0.073)
		A13 (0.500)
	A2 (0.372) *(CRA2=0.08)*	*A21 (0.089)*
		A22 (0.394)
		A23 (0.462)

		A24 (0.054)
	A3 (0.125) *(CRA3=0.06)*	*A31 (0.279)*
		A32 (0.072)
		A33 (0.649)
	A4 (0.032) *(CRA4=0.00)*	*A41 (0.600)*
		A42 (0.400)
	A5 (0.057) *(CRA5=0.06)*	*A51 (0.451)*
		A52 (0.409)
		A53 (0.090)
		A54 (0.050)
B (0.237) *(CRB=0.10)*	*B1 (0.399)* *(CRB1=0.00)*	*B11 (0.111)*
		B12 (0.889)
	B2 (0.224) *(CRB2=0.02)*	*B21 (0.073)*
		B22 (0.427)
		B23 (0.500)
	B3 (0.029) (CRB3=0.00)	*B31 (1.00)*
	B4 (0.061) *(CRB4=0.02)*	*B41 (0.073)*
		B42 (0.500)
		B43 (0.427)
	B5 (0.042) *(CRB5=0.10)*	*B51 (0.476)*
		B52 (0.176)
		B53 (0.196)
		B54 (0.065)
		B55 (0.064)
		B56 (0.023)
	B6 (0.245) *(CRB6=0.09)*	*B61 (0.430)*
		B62 (0.255)
		B63 (0.217)
		B64 (0.058)
		B65 (0.041)
C (0.064) *(CRC=0.00)*	*C1 (1.0)* *(CRC1=0.01)*	*C11 (0.450)*
		C12 (0.389)
		C13 (0.078)
		C14 (0.083)

From table 5, we can get the picture of which factors are worth of special consideration before

initiating PPP/BOT project. Overall, macro-level, meso-level and micro-level risks account for 70%, 24% and 6% respectively. Under the macro-level, political and government policy and macro-economy occupy the lion's share, accounting for 78% in total and 41% and 37% respectively. Legal risks are less prominent, indicating that variations of law, taxation policy and industry practice do not pose great risk to the success of PPP/BOT projects. Under the meso-level, project selection, operation and project finance exert much influence on the success of projects, accounting for 40%, 25% and 22% respectively, suggesting that as far as the project is concerned, sponsors pay much attention to selecting lucrative projects and improving operation during the concession period.

When synthesizing with respect to the success of PPP/BOT projects, as shown by figure 1, political and government policy and macro-economy bring forth much risks, taking up 30% and 27% respectively. Next come project selection, legal variations and operation, suggesting sponsors need kind of prudence when selecting and operating projects while legal policies concerned need to be consistent and stable.

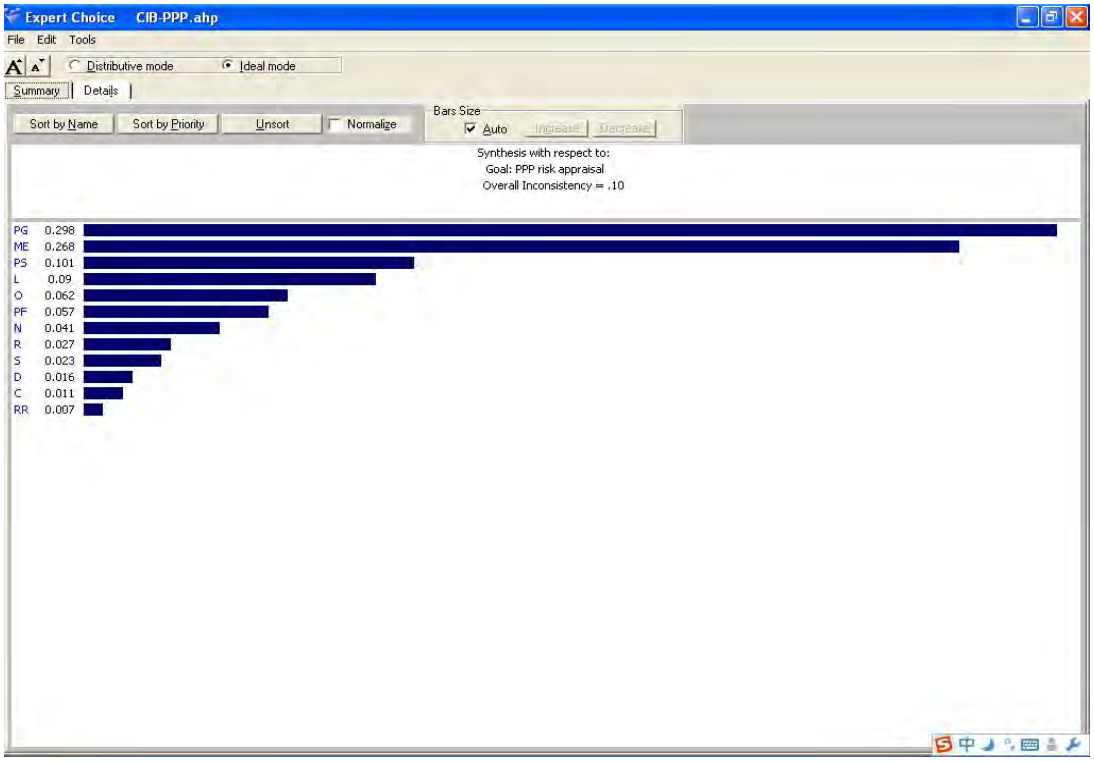

Figure 1: Risk factors' influence on feasibility of PPP/BOT project

5. Discussion

In order to identify the priority of risk factors involved and promote PPP/BOT projects in the Yangtze River Delta of China, a risk appraisal framework is formulated. From the weights of risk factors, some suggestions are proposed,

a) Much more government commitment should be made to PPP/BOT projects, such as improving decision-making efficiency and not discriminating those projects;

b) The public sector should also bear some risks from inflation, interest rate and low efficiency of financial market;

c) Sponsors should be more prudent when selecting projects and trying to improve productivity and cut unnecessary costs when operating them;

d) Specific legislation and professional institute supervising PPP/BOT projects need to be established.

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A General Framework for Risk Allocation Analysis in Public Private Partnerships Based on Transaction Governance in China

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Abstract

Although appropriate using of PPP procurement can achieve better value included less cost, better quality and less time by comparing with conventional procurement, the risks are higher under PPP environment. As a result, the risk provisions are the most important constitution of PPP contract.

Which kinds of risks should be transferred from public sector to private sector, which should be retained and how to transfer without conflict are critical to each party, but how to make a decision to solve the questions above is more important than the questions themselves. In order to provide the solution for the questions above, the resource based view, organizational capabilities and transaction cost economics theories will be used to form a general framework for risk allocation analysis.

In order to constitute the framework, a lot of journal articles, conference papers, newspaper articles, laws, regulations and rules of government are reviewed. Based on these literature reviews, the four levels model was set up. According to this model, the manager or supervisor of the project could recognize their advantages and disadvantages on the basis of characteristics of organization's transaction activities. This will be useful for them to choose appropriate risk allocation strategies.

But due to it is an ongoing research with inadequate data, the framework has to be further studied and it only provides a reference in this paper.

Keywords: Public Private Partnerships, risk management, organizational capabilities, resource based view, transaction cost economics

1. Introduction

After 1978, Chinese economy has grown particularly rapidly accompanied by the "reform and open" policy. Owing to the requirements of population growth, industrialization and urbanization, Chinese government has enacted several bills to accelerate the development of basic infrastructure, such as

“Ten-Year Plan and the Eighth Five-Year Plan for National Economic and Social Development of the People's Republic of China”. Although the remarkable success achieved by China, the national fiscal revenues have not been adequately boosted in respect that limited financial fund of government. Thus, Chinese government quest for alternative approaches.

By learning from foreign countries, Public Private Partnership (PPP) was used as a convenient vehicle to provide more business opportunities for private investors to assume the infrastructure projects. PPP means “a contractual agreement between a public agency (federal, state or local) and a private sector entity. Through this agreement, the skills and assets of each sector (public and private) are shared in delivering a service or facility for the use of the general public. In addition to the sharing of resources, each party shares in the risks and rewards potential in the delivery of the service and/or facility(The National Council for Public-Private Partnerships of USA)”.

Although infrastructure services may be constructed and operated more cheaply with a higher quality and lower life cycle costs by using PPP procurement, the complexity of relationships of different participants and incomplete contract provision will induce all the participants to greater risk exposure. Despite the result of the infrastructure projects will be affected by complex risks existed in PPP procurement, the private investors are willing to finance, procure, design, construct and operate the projects instead of the public sector. Thus, a lot of researchers have pay attention to the risk allocation affairs nowadays. In this paper, the theoretical framework is proposed combine the theory of transaction cost economics with the theory of organizational capabilities to guide the utilizing of risk allocation strategies(Jin and Doloi, 2008).

2. General perceptions of PPP

2.1 Key issues about PPP

PPP was brought forward in United Kingdom in 1982 at first and then spread to United States, France, South Africa, Japan, and China and so on. In general, PPP may incorporate following key issues: (1) In a PPP, the main purpose of public sector is not procuring an asset, but purchasing the service under specified terms and conditions; (2) If two or more private sectors join in the PPP, the private consortium should set up a single purpose entity names as Special Purpose Vehicle (SPV); (3) A license or concession which was granted to SPV by the host government should resort to concession contract; (4) SPV should finance, design, build, operate and maintain an infrastructure project based on the concession contract in concession period(Ng and Loosemore, 2007).

2.2 The general process of PPP procurement currently used in the world’s construction sector

PPP used in all over the world for many years. It has developed and continues to develop in many forms. At the beginning of PPP development, the “one model fits all” strategy was adopted, but

gradually, the deficiencies are emerged according to the complexity of PPP project. Based on five types of private involvement, including service contracts, leasing, joint venture, concession and privatization, the new approaches of PPP, such as PFI, BOT, DBFO, D&B, Turkey and JV, are developed to suit the needs of particular sectors.

A typical organizational structure of a PPP contract is shown in Figure 2.2.1.

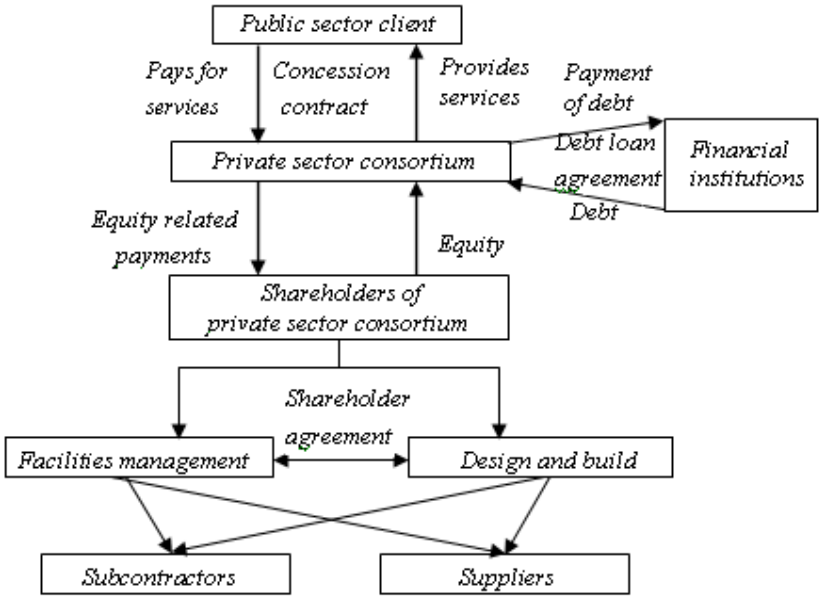

Figure 2.2.1: A typical organizational structure of a PPP contract
Sources: 1. AKINTOYE, A., BECK, M. & HARDCASTLE, C. (eds.) 2003. PUBLIC-PRIVATE PARTNERSHIPS: Managing risks and opportunities
2.CARTLIDGE, D. P. 2006. Public private partnerships in construction.

2.3 Positive and negative results of PPP process

1. Compared with conventional procurement, the benefits brought by PPP procurement are summarized as below: (1) Enhance capacity of government to develop integrated solutions(Budds, 2000); (2) Facilitate creative and innovative approaches(Birnie, 1999); (3) Transfer certain risks to the private sector to realize optimum risk allocation; (4) Reduce the pressures of public sector, including diminish the budget restraint of public sector, reduce administration costs of public sector and ease the difficulty to access professional skills, experiences and technologies(Bing et al., 2005b); (5) Attract capable and experienced private sectors join in the project so as to improve the project buildability, save money and time to deliver the project and satisfy the profit margin of private sector at the same time; (6) Accelerate economic development of the country.

2. On the other hand, the drawbacks affect utility of PPP procurement are: (1) Failures may derives by lack of experiences and appropriate skills(EZULIKE et al., 1997); (2) High charges to users and participation costs are incurred(SAUNDERS, 1998); (3) High total costs will occur on account of inappropriate risk allocation; (4) Time overrun will incur as a result of lengthy delays caused by

political debate and negotiation for contract signing; (5) More risks need to deal with by comparing with conventional procurement; (6) Fewer employment opportunities offer to the public(Bing et al., 2005b).

2.4 Status quo of PPP procurement usage in China.

PPP method, especially BOT scheme was promoted greatly in order to attract private investors, including foreign investors and lenders, to finance the project and to meet the infrastructure requirements of China. The government has awarded a few of stated- approved BOT projects since 1980s. For example, the Shajiao B power plant which is the first BOT-type power project in China; the Laibin B power project, the first wholly foreign-funded BOT project, in which a public tendering process was used; Shanghai Da Chang water project; Changsha power project; and Chengdu water project(Akintoye et al., 2003).

Sino-foreign joint venture which was formed under the Sino-Foreign Equity Joint Venture Law and the Sino-Foreign Cooperative Joint Venture Law is the rudimental format of BOT schemes used in China. Chinese central government and local government make use of the negotiated tendering system to choose the qualified foreign companies for the sino-foreign joint ventures. For standardizing the key issues related to the Examination, Approval and Administration of Experimental Foreign Funded Concession Projects, a joint circularization was promulgated in 1995 by State Planning Commission (SPC), Ministry of Power (MOP) and Ministry of Communications (MOC). The circularization aims at prescribing the type of projects which should be procured using the wholly foreign funded BOT approach and providing a general framework for open tendering process. According to the circularization, a series of pilot BOT projects was implemented and succeeded(Akintoye et al., 2003).

However, there are some critical issues affect the attractiveness of foreign investments to China. In order to solve these problems, a series of documents, including the basic pre-qualification document, tender document and concession document, was composed for a set of five pilot BOT projects by Chinese Government. At the same time, the United Nations Development Program also funded a review of China’s regulatory environment and BOT initiatives, aiming to formulate new national guidelines, regulations and legislations needed for BOT, while Asian Development Bank provided technical assistance to two pilot projects: the Changsha power project and Chengdu water supply projects.

3. Theoretical overview of risks

Risk is “the probability that a particular adverse event occurs during a stated period of time”(Society, 1991). Chances of occurrence, harmful impact for project and exposure time are radical issues about risk. Simply speaking, risk occur where either the outcome or consequence of an activity or decision is less than certain, it can be seen as the uncertain possibility of something happening in the future.

Owing to the complexity of concession contracts, an enormous range of potential risks will influence the expected outcomes. Different categories of risks are identified in the recent study. A. Ng and Martin Loosemore(2007) classified the risks into two main sorts: (1) general risks normally refer to the natural, political, legal and economic events in macro environment of country; (2) project risks. These risks are related to the way a project is managed and related to the event in its micro environment. The other study labelled risks into three levels: (1) macro level risks which are external environment related. These risks are normally related with political, legal, economic, social and weather events; (2) meso level risks which are project related. These risks are associated with project demand, location, design, construction and technology; (3) micro level risks which are participant related. These risks often include inadequate experience of private sector, inadequate distribution of authority in partnership, third party tort liability and so on(Bing et al., 2005a). Another study grouped risks as follows(Shen et al., 2006): (1) project-related risks; (2) government-related risks; (3) Client-related risks; (4) Design-related risks; (5) Contractor-related risks; (6) Consultant-related risks; (7) Market-related risks.

3.1 Risk management theory

Risk management means using a systematic method to treat with risks. Risk management techniques are beneficial to enhance the efficiency and effectiveness of construction industry and value as a consequence(Tang et al., 2007). If a risk has been identified, its estimation would first involve an assessment of how likely it is that the risk would materialize, and what the consequential impact would be.

Normally, there are four stages include in a risk management system(Akintoye et al., 2003): (1) Risk identification; (2) Risk analysis and assessment, including the probability of risk occurring and the impact of risks; (3) Risk response. Risk could be eliminated, reduced, transferred and reserved; (4) Risk outcome recording and evaluation.

The specific risk management process is showed in Figure 3.1.

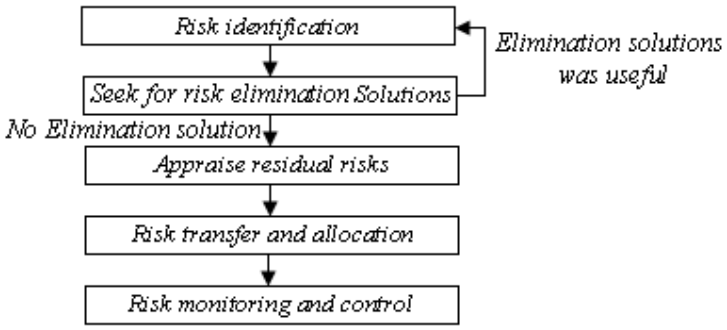

Figure 3.1: The specific risk management process

3.2 Risk allocation of PPP procurement

3.2.1 Risk allocation model of PPP procurement

With a PPP, the emphasis of infrastructure procurement is upon the purchase of services not the procurement of an asset. Under the PPP contract, the government pays for services provided to it by the private sector over time. The government frees them entirely from asset-based risk (including design, construction, operation and residual value risk), and becomes the purchaser of a product that is risk-free in the sense that the government doesn't pay if the service is not delivered or not delivered to the specified standards(Lewis, 2001). These services are delivered utilizing the new infrastructure built by the private sector entities as part of the service arrangement. Thus, it is easy to find that the single private sector sometimes is incapable of fulfilling the entire requirements of PPP project. Hence, private consortium which is constituted by engineering and project management firms, construction companies, financial underwriters and operating enterprises substitutes the single private sector as the private entity of SPV.

The risk allocation process in PPP procurement can seen in Figure 3.2.

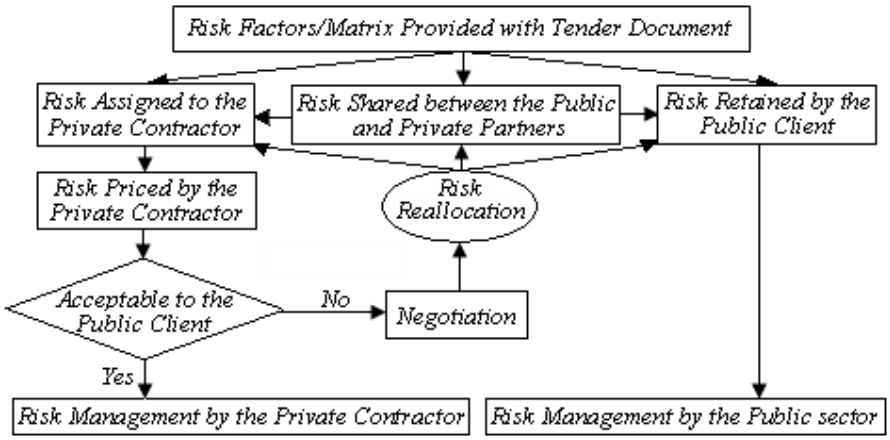

Figure 3.2: The risk allocation process in PPP procurement
Source: BING, L., AKINTOYE, A., EDWARDS, P. J. & HARDCASTLE, C. 2005a. The allocation of risk in

In PPP project, the extent of risk elimination and reduction depend on ability of each party. But typically, planning risks, site acquisition risk, legal and policy risks should be allocated to public sector and the design and construction risks, operation risks and industrial action risks should be transferred to private sector. Beside those risks, it is effective to share some risks, for instance, force majeure, market risks and so on(Shen et al., 2006) .

Normally, risk allocation principles can be summarized as follows(Ng and Loosemore, 2007): (1) The party takes charge of the risks should fully understand its responsibility; (2) The risks should be attributed to the party which is capable for managing them effectively and efficiently; (3) The party assumes the risks should be given change to charge an appropriate premium.

3.2.2 Conceptualization of VFM

Value for Money (VFM) is the key driver for implementing PPP project. In order to achieve the expected VFM, the risks should be distributed appropriately between the parties of the PPP project. By means of comparing the bids of private sector with the independent public sector comparator (PSC), VFM could be demonstrated completely to provide the evidence to public sector whether to take PPP procurement. PSC represents the costs of the project which was procured directly by public sector(Akintoye et al., 2003).

There are three drivers for value for money of PPP procurement(Tahir, 2007): (1) Affordability to execute PPP projects; (2) Risk transfer strategies to implement PPP projects; (3) Expertise needed for carrying out PPP projects.

4. General reviews of resource based view, organizational capabilities and transaction cost economics (TCE)

4.1 Perceptive of resource based view

The resource-based view (RBV) is an economic tool used to determine the strategic resources available to a firm. The fundamental principle of the RBV is that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal. To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile. Effectively, this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort. If these conditions hold, the firm's bundle of resources can assist the firm sustaining above average returns.

4.2 Theoretical development of organizational capability

The risk management capability of each participant is critical for choosing a risk allocation strategy. Due to each party is (Penrose, 1995)an organization, getting a thorough understanding of organization capability is important. Penrose(1995) brought forward that the capabilities of different organizations to develop their productivity are discriminated even if resources are suitable for all of them.

Along with the development of resource-based view (RBV), the competitive heterogeneity of competitors is identified. Some researchers recognized the resources including capabilities, organizational processes, firm attributes, information, and knowledge and so on(Barney, 1991), which the others distinguished capability from resources . Capability means the capacity of an organization to deploy the resources(Amit and Schoemaker, 1993, Makadok, 2001).

4.3 Theoretical synopsis of transaction cost economics (TCE)

The transaction cost theory was first put forward in 1937 by Ronald Coase. After the transaction cost theory was set out, a lot of researchers defined TC. Coase(1937) brought a idea of the definition of TC mainly focus on the costs of imperfect information(Coase, 1937). Arrow(1969) describe TC as "*costs of running the economic system*". North(1990) defined TC as "*the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements*". Williamson, O.E.(1987) suggested that TC should be distinguished with production costs.

Actually, TCE explained the reason why different transactions can be carried out in different ways in the viewpoint of economic disciplines. The three principle dimensions with regard to the difference between transactions are(Jin and Doloi, 2008): (1) asset specificity. Normally, the assets are designated to specific activities in order to produce the value. But sometimes, the alternative utilities of these assets could be generated, if expected or more value can be produced (Williamson, 1996); (2) uncertainty. There are two aspects of uncertainties. One is uncertainty of external environment, the other is the internal uncertainty of organization (Williamson, 1996); (3) frequency. If two parties can all gain the benefits by collaboration, they would like to work together again. (Williamson, 1996). Therefore, to organize a transaction, not only have to compensate for the hazards of opportunism, but also have to comply with the principle of bounded rationality(Jin and Doloi, 2008).

5. Conceptual framework

Based on the literature reviews, the framework could be show as Figure 5.1

6. Conclusion

This article has outlined the context and background underpinning the PPP procurement being pursued all over the world, especially in China. Despite the continuing debate about the utility of PPP procurement, Chinese government has widely promoted it in recent years. Although there are a lot of researches about risk management in PPP procurement, but most of them are only focus on the specific risk allocation categories, such as design risks should be taken charge by private sectors and so on. There are seldom researches are looking for critical reasons to provide the base model for project managers and related people to make a decision about risk management strategies. Under this circumstance, the risk allocation analysis framework was generalized by considering the transaction governance of organization in order to achieve the good VFM of project.

The further researches should be done by using interview and semi-structured questionnaire in mainland China, in order to accommodate it to China. Also, the model should be tested and rectified by using the data getting from the survey and interviews.

Acknowledgement

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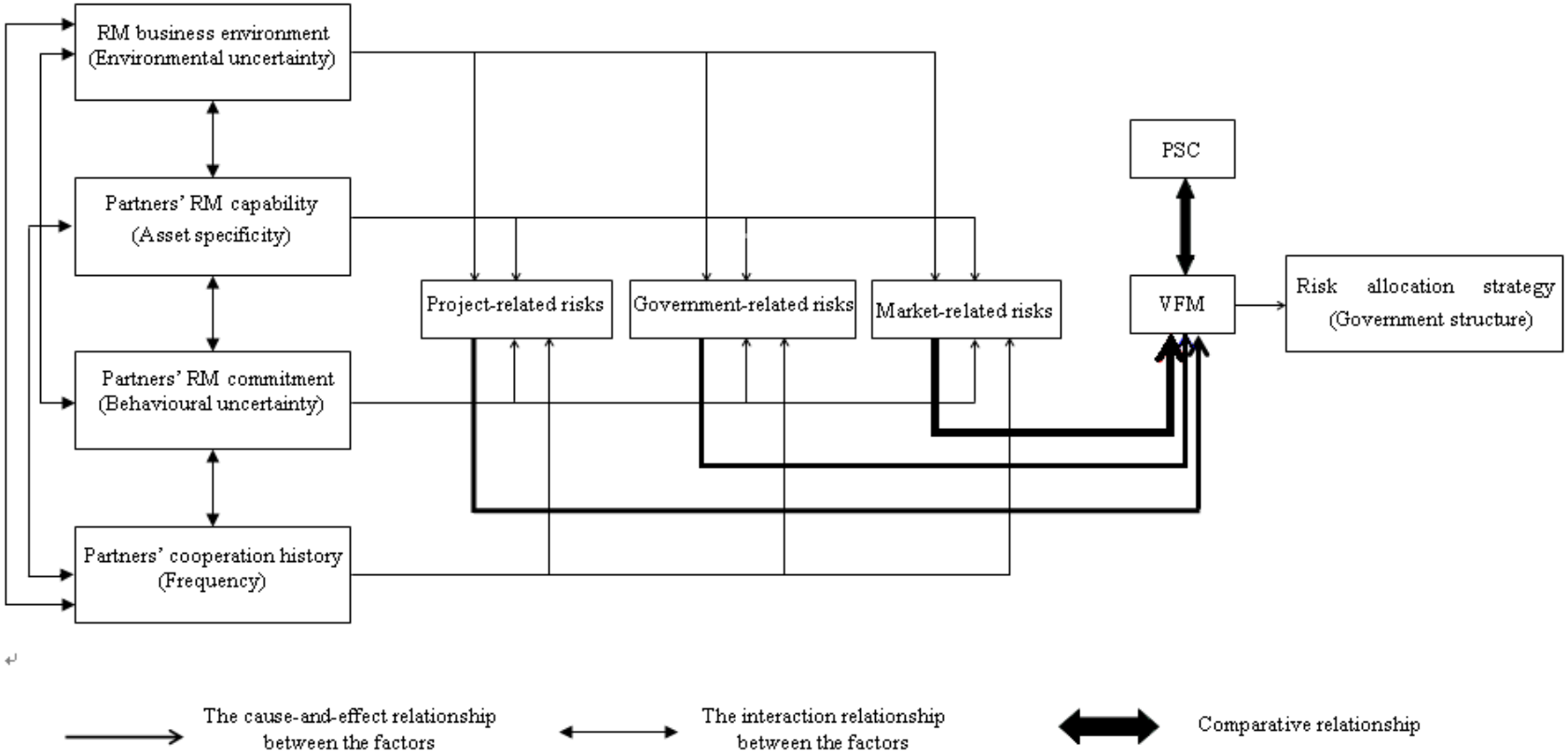

Figure 5.1 Conceptual framework of risk allocation analysis in PPP

An Assessment of Success Factors and Benefits of Project Partnering in Nigerian Construction Industry

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Abstract

The adoption of project partnering is increasingly been used as one of the innovative tools to effect quality changes on construction projects and overhaul the shortcomings of traditional approach to procurement system. In Nigeria, the drive to achieve greater value on every infrastructural project has prompted the Government and project owners to embrace project partnering. This study seeks to assess and distinguish the various potential factors contributing to project partnering success, and analyse the benefits that can be accrued from its efficient practice in Nigerian construction industry. Data for this assessment were collected through industry based survey questionnaires different types of organisation in Nigeria - clients, consultants and contractors, on the subject matter. A total number of Ninety-five questionnaires were distributed and seventy-eight was returned. The data obtained were analyzed by using percentile and one-way analysis of variance. The research confirms that Nigeria contractors and clients are more supportive on project partnering than consultants. It is therefore concluded that certain requirements must go through if project partnering is to succeed in Nigeria These include a collaborative team culture, long-term quality focus, consistent objectives, and resource-sharing, if properly implemented can provide a workable model for enhancing overall project performance.

Keywords: construction industry, project partnering, project performance, **s**uccess factors, Nigeria

1. Introduction

The construction industry is no doubt a very competitive and risky industry, and the engagement of infrastructural projects are highly capital intensive. The progress of these infrastructural construction projects is hindered by several factors, such as lack of cooperation, limited trust, and ineffective communications often resulted in an adversarial relationship among the project participants. This kind of relationship is always reflected in difficulties in resolving claims, cost and programme overruns, low profitability, litigation, and a win-lose-climate which invariably affect the completion of the project within schedule and with the required standard (Moore et al 1992). The persistence of these circumstances in the recent past had attracted many developed and developing countries, Nigeria among to adopt one successful management method that helps to provide innovative solutions and better resolve conflict. This technique is partnering, a collaborative system of procuring construction projects.

The first broad application of this project partnering in construction industry was by the United States of America Army Corps of Engineers in the late 80s (Jones Day,2002). In United Kingdom, it was first applied on the North Sea oil and gas industries in the early 1990s (Bennett, 2000). In 1994 Sir Michael Latham came out with a reviewed partnering notion and it was commissioned by the UK government. In South African construction industry, partnering application is on high increase (Baird and Bennett, 2001). In Hong Kong, the intensive reviews of the construction industry (Tang Report and Grove Report) have advocated partnering and it has recently been introduced on a number of projects including one high profile metro project (Bayliss, 2002).

In Nigeria, the adoption of this new procurement technique other than traditional system is to encourage the private sectors to actively participate in the financing, construction, management and operation of infrastructure services and facilities in the country. This will establish a long-term relationship that will foster an organizational environment where trust, increased open communications and employee involvement in construction project so as to lower the risk of cost overruns and delays as a result of better time and cost control over the project. It will also increase the opportunity for innovation, especially in the development of value engineering changes and constructability improvement.

Significantly in Nigeria, project partnering techniques have been gradually applied to some projects, and because of the growing quest of people's demand for substantial improvement in project performance, corporate bodies, professional organizations, financial institutions, international and local donor agencies are coming together to fully participate in partnering so as to ensure its effectiveness to achieve the sole desire. Some of the recent reference projects are the gas flaring projects implemented in a joint venture between the Nigerian National Petroleum Corporation (NNPC) and the oil multinationals, Zenith Bank Plc partnered some organisation on infrastructural development in Port Harcourt, River State, etc. In a nut shell, there is huge embrace of partnering as alternative due to perceived failings of traditional system of procuring construction contract that calls for changes. There is therefore the need to review the success factors as well as the benefits that are

accruable or obtainable from partnering system. This study therefore aimed at investigating partnering success factors and it benefits in Nigerian construction industry.

2. Partnering as an innovative procurement technique

From the available literature (CII, 1991; Cowan et al., 1992; Moore et al.,1992; CII, 1996; Bennett and Jayes, 1995; Barlow et al., 1997; Bennett and Jayes, 1998; Bresnen and Marshall, 2000) it is very clear that different perceptions towards partnering prevail. There is conformity over the general concept of partnering as a cooperative relationship between business partners in construction industry formed in order to improve performance in the delivery of projects but there is considerable variation of definition. This inconsistency is undoubtedly due to the different world perspectives of the authors and variations in the development and implementation of partnering between national industries and also within national industries. Confusion over definitions is further fuelled by the often imprecise use of the term partnering in industry literature. This general use of partnering without further detailed references in fact often counter-productive and tends to propagate the perception of partnering as fuzzy concept which is talked about by many but few understand.

Barlow et al. (1997) conclude that partnering is best considered as a set of collaborative processes. Processes which emphasise the importance of common goals and raise such questions as how such goals are agreed upon, at what level are they specified and how are they articulated? Chris (2004) stated the following generic definition as it reflects the views held in most literature reviewed:

- partnering is a set of collaborative processes rather than simply a form of relationship;
- partnering is a co-operative arrangement between two or more organisations based on mutual objectives and increased efficiency through shared resources, open communications and continuous improvement;
- partnering is applied in either in project partnering or in a long-term relationship known as strategic partnering;
- project partnering is typically practised at a first generation level or at a more developed, more committed second generation level (mature partnering) (Baird and Bennet, 2001).

Construction Industry Institute (CII 1991) cited Partnering as a long-term commitment between two or more organisations for the purposes of achieving specific business objectives by maximizing the effectiveness of each participant resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based on some certain key elements:

- commitment- this must come from top management since jointly-developed partnership charter is not a contract but a symbol of commitment;

- equity- all participants' interests are considered in creating mutual goals and there is to satisfying each participant's requirements for a successful project by utilizing win/win thinking;

- trust- teamwork is not possible where there is cynicism about the others' motives. Through the development of personal relationships and communication about each participant's risks and goals, there is better understanding. With understanding comes trust and with trust comes the possibility for synergistic relationship;

- development of mutual goals/objectives- at a partnering workshop the participants identify all respective goals for the project in which their interests overlap. These jointly-developed and mutually agreed to goals of each party, limiting cost growth, limiting review periods for contract.

2.1 Elements for the success of project partnering

Several analysts and writers have identified critically a variety of requirements and factors responsible for the success of partnering relationships in construction industry, among these analyst are Chadwick (1995), Dixon (1996), Tyler and Matthews (1996), Cheng et al. (2000) and Black et al. (2001). Despite the variations in their findings, the results of such studies tend to re-affirm Bennett and Jayes' (1998) assertion that the concept of true partnering feeds on co- operation and teamwork, openness and honesty, trust, equity and equality, if it is to succeed. The output work of Lui and Fellows (2001) provides a useful synthesis of these views by concluding that partnering can enhance project performance subject to both (1) work assurance – that partners will work together for the synergistic whole, and (2) benefit assurance – that gains will be distributed equitably. These appears to be a reasonably widespread belief, therefore, that given the right circumstances to this method of procurement more than any other can deliver 'win-win' solutions for all involved.

Saunders (1994) advocates a 5-stage process for organizations wishing to adopt the partnering approach to procurement: (1) identify the product and services that will benefit from partnering, (2) convince internal and external organisations of the benefits that can be achieved, (3) select the first partners by concentrating on suppliers of key products and services identified, (4) define the objectives of the relationship to ensure that both parties have a clear purpose in their activities; Lewis (1995) recommends setting both short and long-term objectives to ensure that current activities are consisitent with the strategic plans of both parties. And finally, (5) refine and develop the relationship to ensure that lessons are lessons learnt from mistake prior to rolling-out the new approach.

Lorraine (1994) identified a workshop approach to successful partnering. The workshops, attended by personnel from both parties, should be established to encourage the cultural change required. The worksop they said, carrying the support of champions within both organizations, should establish the procedures for the avoidance of conflict and devise a project mission statement. The workshop participants should be drawn from the senior management team and must be fully committed to making the partnership work.

Chan (2004) cited several empirical studies and the opinions of industry practitioners from archival data identifying factors responsible for the success of project partnering which were reviewed in this study. These factors are therefore grouped and summarized as follows: (1) Collaborative team culture, (2) Long-term quality perspective, (3) Consistent objectives, and (4) Resource sharing**.**

2.1.1 Collaborative team culture

According to Chen and Chen (2007), six significance success factors were potently identified, all related to collaborative team culture as discussed below.

(a) Efficient coordination

Mohr and Spekman (1994) posits that coordination reflects the expectations of each party from the other parties in fulfilling a set of tasks. They asserted that before attaining a good coordination that will result in the achievement of stability in an uncertain environment, an increase in contact points between parties and sharing of project information must be in place.

(b) Partnership formation at the design stage

Lewis (1995) advocates the involvement of key suppliers during the design stage of a project. He acknowledged that traditional competitive tendering invites narrow responses as suppliers must meet bidding specifications to ensure that their offer is considered. By failing to involve suppliers in the design process, considerable potential values may be lost. Lewis argued further that this stifles creativity and changes made following a competitive tendering exercise are costly because of the lost time and aborted design costs. Chen and Chen (2007) stipulated that one of the key rules related to partnership formation is that for design to be effective each firm must be feel free to question any assumptions made and may make the expert party question its own assumptions, sometimes with surprising results.

(c) Dedicated team

The success of every construction project demands dedication from senior to the junior staff right from the inception. The findings of Cheng et al. (2000) are directed to external and internal staff to a project firm, and indicate the actions required to achieve changes as dedication. He said commitment and support from partnering organizations are crucial, as they are the sources of transferred knowledge and information.

(d) Flexibility to change

Chen and Chen (2007) emphasized that construction projects are dynamic and may change from time to time due the nature of the environment the projects involved. He acknowledged that for a successful project partnering staff must be flexible to the changes so as to ensure that the programs, policies, procedures and practices are restructured to meet the partnership vision, mission, values and goals.

(e) Long-term Committment

Bresnen and Marshall (2000); Cheng et al.(2000) said long-term commitment can be regarded as the willingness of the involved parties to integrate continuously to unanticipated problems. More so,

Mohr and Spekman (1994); Kelly (2005) anticipated that more parties are expected to balance the attainment of short-term objectives with long-term goals and achieve both individual and joint missions without raising the fear of opportunistic behaviour.

2.1.2 Long-term quality perspective

According to Chen and Chen (2007), three significance success factors are potently identified all related to long-term quality perspective, and it includes: (i) Productive conflict resolution strategy, (ii) Commitment to quality, and (iii) Commitment to win-win attitude.

(i) Productive Conflict Resolution Strategy

Slater (1998); Lazar (2000) stated that because of the discrepancy in goals and expectations, conflicting issues are commonly observed among parties. Conflict resolution techniques such as coercion and confrontation are counter-productive and fail to reach a win-win situation. Cheng et al (2000) claimed that conflicting parties look for a mutually satisfactory solution, and this can be achieved by joint problem solving in order to seek alternatives for problematic issues. Such a high level of participation among parties may help them to secure a commitment to a mutually agreed solution.

(ii) Commitment to Quality

This factor is very important in project partnering because the attitude of the actors to commitment has a great influence on the quality of outputs. Unlike traditional method of procuring construction project, quality remains a watch-word as a result of committed resources.

(iii) Commitment to Win-Win Attitude

According to Chan, Chan, Chiang, Tang, Chan and Ho (2004), win-win environments should be developed to replace a win-lose attitude. It also represents the open arising of problems among parties and a non-defensive manner during arguments. It explains that all team members could make decisions alone because of clear identification of responsibility and accountability. In addition, the establishment of sharing risks, rewards, and the willingness to exchange ideas are illustrated. The participants could make and keep real commitments. Therefore, a long-term commitment to the process among the parties could be created.

2.1.3 Consistent objectives

Under this group the under listed five success factors were identified from the literatures:

(a) mutual trust, (b) effective communication, (c) clear definition and understanding of responsibilities, (d) behaving in a manner consistent with objectives, and (e) technical expertise.

2.1.4 Resource sharing

In the case of resource sharing, five success factors were identified from the literatures as follows: availability of resources, support from Top Management, financial security, equal power/empowerment, and total cost perspective.

2.2 Benefits of successful project partnering

Chris (2004) identified the common response of people new to the ideas of partnering as to question the tangible benefits which partnering can bring to their organization. He said this is an understandable reaction particularly into today's economic climate where every element of business strategy is carefully scrutinized in terms of its potential for adding value. No doubt partnering has recorded a number of benefits through practising but before these positive results came into effect there are a lot of problems in measuring the performance of partnering in real sense. Slater (1998) recognized major problems in analysing the positive effectiveness of partnering in construction industry. In his assessment, two major reasons were identified: (1) partnering consists of a number of interrelated business processes which always occurred at the sametime within the framework of an overall project management process making it difficult to disseminate any benefits (or problems) and attach them to a particular partnering process; and (2) objectives differences of organizations involved in project partnering, the degree of measuring the attainment to which all mutual and individual goals are being achieved are difficult.

According to Chan, Chan, Fan, Lam, and Yeung (2005), and Black, Akintoye and Fitzgerald (2000) the underlisted benefits of partnering can be achieved by government or any organization if project partnering is proper implemented: reduction in costs and time of project implementation, establishment of good and less adversarial relationship, risk sharing, operational savings, increased implementation speed, construction projects cost savings, quality improvement (access skills, experience and technology), improved design, increased understanding of parties, increased customer satisfaction, enhanced economic growth of a nation, facilitate creative and innovative solutions, true costing and true value, enhanced facility maintenance, improved return on resources, increased revenue generation to the national development, improved administration, financing option, and reduced risk exposure, etc.

3. Research methodology

Data were collected from construction firms, consultancy firms and clients in the south Western geo political zone of Nigeria that have project partnering experience. Out of the 95 questionnaires that were administered, 73 of these were suitable for analysis. The responses gathered from these sources provided an absolute and reasonable conclusion for the assessment of success factors and benefits of project partnering in Nigerian construction industry. Percentiles and One- Way analyses of variance (ANOVA) were utilized in the analysis of data collected.

Table 1: Designations of Respondents

Profession	*Frequency*	*Percentage (%)*
Engineer	*21*	*28.77*
Quantity Surveyor	*17*	*23.29*
Architect	*17*	*23.29*
Contractor/Builder	*18*	*24.65*
Others	-	-
Total	*73*	*100.00*

Table 1 shows the profession of Respondents on the assessment of success factors and benefits of project partnering in Nigerian construction industry. It is evident from the table that 28.77% of the respondents are Engineers; 23.29% Quantity Surveyors; 23.29% Architects and 24.65% Contractors/Builders.

Table 2: Respondent's Years of Experience

Years of Experience	*Frequency*	*Percentage (%)*
0-5	*10*	*13.70*
6–10	*20*	*27.40*
11–15	*22*	*30.14*
16–20	*21*	*28.76*
More than 20	-	-
Total	*73*	*100.00*

Table 2 shows the industrial working experience of the respondents. The average years of experience of respondents were 12 years. One can infer from table 1 and 2 that the respondents are highly knowledgeable and are experienced thus information provided can be relied upon.

In accordance with respondents' roles and responses, one-way analysis of variance was performed through statistical package for social science on the survey data and the results of the analysis were presented in Tables 3 to 5. The tables show '*F* statistics' (based on *F*-ratio or value) this tests was performed to see if there is an agreement in the opinion of the three groups of respondents by comparing their mean values. The value of '*F* significant' indicates the probability of rejecting the null hypothesis of no difference between the mean values between groups. Lower probability value indicates that the null hypothesis can be rejected, suggesting that there is difference of opinion between groups.

A probability value (significance level) below threshold value of 0.05 suggests a high degree of difference of opinion between groups on that factor. For example, in relation to Table 3 factor 1 (exploitation is regarded as a perceived failing of traditional adversarial relationships) the *F* ratio is

6.10 and the observed significance level is less than 0.01; one can reject the null hypothesis suggesting that there is no consensus of opinion between the groups (consultants, contractors and clients) that exploitation is regarded a perceived failing of traditional adversarial relationships to the same extent. This implies that there are differences of opinion between the three groups. This is supported by the mean value of 3.00 for the factor by consultants compared with 4.23 by contractors and 3.95 by clients. It is worthwhile to note that the factors were ranked according to their means value.

Table 3: Perceived failings of Traditional Adversarial Relationships in Nigerian (by organisational category) [C1-Consultants, C2-Contractors, and C3-Clients]

				ANOVA[a]	
Failing Factors	*C1*	*C2*	*C3*	*F Statistics*	*Significance level*
Exploitation is common	*3.00*	*4.23*	*3.95*	*6.10*	*0.01*
Specification rigidity	*3.11*	*3.84*	*3.48*	*2.31*	*0.11*
Decisions are made with limited knowledge	*3.19*	*3.55*	*3.62*	*0.75*	*0.47*
Short-term focus	*3.15*	*3.29*	*3.86*	*1.94*	*0.15*

Table 4 shows the opinion of respondents on the factors perceived to be responsible for the success of project partnering in Nigerian construction industry. It can be seen from tables 4 that all respondents believe that mutual trust is essential for success in the project partnering relationship; and while consultants have rated it highly, contractors and clients rated it more essential. This result is encouraging, given the fact that traditional relationships between contractor and client are widely known to be mistrustful. Therefore, the analysis depicted that organizations which have not been involved in project partnering have recorded a slightly lower rating for this factor (p =0.15), although it is their most important one.

From the analytical tables, effective communication was also given a very high rating by all categories, and by both organizations involved and those not involved in project partnering. Support from top management was also considered an important factor. Contractors and clients regard this as an important factor. Consultants, however, rated it as a lower priority. Since many consultants are partnership based, they likely to be involved in decision making and therefore less likely to be frustrated by a board of directors far removed from the day to day problems of construction projects. Organizations with experience of partnering have rated this much more higher than those without. As with any new approach, without the backing of senior management, it is unlikely to succeed. Clear definition and understanding of responsibilities was also rated as an important factor, by organizational category (p = 0.23), and by organization who involved in project partnering and those without partnering experience (p = 0.06).

Table 5 shows the respondents opinions on the benefits attributable to project partnering by organization category. It can be extracted from the assessment of the rating results that the three most

essential benefits that have the highest mean values are: establishment of good and less adversarial relationship (4.30). This therefore indicated that consultants, contractors and clients believe that as a result of proper partnering planning, there will be an efficient establishment of good relationship among the parties to the construction project with a significant level of 0.07.

Increased customer satisfaction was rated most important by contractors (4.45) and clients (4.24) more than the rating of consultants (3.85); this is because contractors and clients are directly connected to the project execution under the umbrella of project partnering. Also, understanding of parties will be increased was as well ranked among the most important benefits.

The least important benefits are operational savings, construction projects cost savings, it encourages financial option, and increased revenue generation to the national development. Table 9 shows that most of the benefits expected from the parties are better relationships rather than project-based benefits (such as improved design, quality improvement, understanding of the parties, etc.). It can therefore be deduced that because a better relationship between the parties produces the project-based benefits, the project-based benefits have not been rated highly by the respondents, Black et al (1999).

Table 4: Factors that are responsible for successful project partnering in Nigerian construction industry (by organisational category) [C1-Consultants, C2-Contractors, and C3-Clients]

				ANOVA[a]	
Success Factors	*C1*	*C2*	*C3*	*F Statistics*	*Significance level*
Establishment of efficient coordination	*3.58*	*3.84*	*3.95*	*0.75*	*0.47*
Partnership formation at the design stage	*3.69*	*3.90*	*3.95*	*0.28*	*0.76*
Dedicated team	*3.80*	*4.45*	*3.76*	*2.94*	*0.06*
Flexibility to change	*3.81*	*4.19*	*3.95*	*1.02*	*0.37*
Long-term commitment	*3.81*	*3.97*	*3.76*	*0.29*	*0.75*
Productive conflict resolution strategy	*3.61*	*3.97*	*3.90*	*0.84*	*0.44*
Commitment to quality	*3.96*	*3.87*	*4.14*	*0.47*	*0.63*
Commitment to win-win attitude	*3.77*	*4.03*	*4.05*	*0.52*	*0.60*
Mutual trust	*4.38*	*4.74*	*4.71*	*1.30*	*0.28*
Effective communication	*4.19*	*4.77*	*4.48*	*2.87*	*0.63*
Clear definition and understanding of responsibilities	*4.19*	*4.58*	*4.57*	*1.49*	*0.23*
Behaving in a manner consistent with objectives	*3.88*	*4.42*	*4.14*	*2.59*	*0.08*
Technical expertise	*3.65*	*3.93*	*3.62*	*0.96*	*0.39*

Availability of resources	*3.65*	*3.64*	*3.76*	*0.11*	*0.90*
Support from Top Management	*3.92*	*4.77*	*4.71*	*8.03*	*0.01*
Financial security	*3.38*	*3.97*	*3.67*	*3.03*	*0.05*
Total cost perspective	*3.61*	*3.97*	*3.95*	*1.39*	*0.25*

Table 5: Benefits which can be achieved from the use of project partnering in Nigerian construction industry (by organisational category) [C1-Consultants, C2-Contractors, C3-Clients]

				ANOVA[a]	
Benefits	*C1*	*C2*	*C3*	*F Statistics*	*Significance Level*
Reduction in costs and time of project implementation	*3.42*	*4.13*	*3.81*	*2.61*	*0.08*
Establishment of good and less adversarial relationship	*4.15*	*4.52*	*4.24*	*2.70*	*0.07*
Risk sharing	*3.19*	*3.77*	*3.29*	*2.90*	*0.06*
Operational savings	*3.11*	*3.45*	*3.62*	*1.58*	*0.21*
Increased implementation speed	*3.81*	*4.13*	*3.76*	*0.87*	*0.42*
Construction projects cost savings	*3.11*	*3.45*	*3.62*	*1.58*	*0.21*
Quality improvement	*3.73*	*3.68*	*3.67*	*0.02*	*0.98*
Improved design	*3.27*	*3.71*	*3.67*	*1.39*	*0.25*
Understanding of parties will be increased	*3.81*	*4.06*	*4.09*	*0.64*	*0.53*
Enhanced economic growth of a nation	*3.42*	*3.84*	*3.57*	*0.92*	*0.40*
Increased customer satisfaction	*3.85*	*4.45*	*4.24*	*2.70*	*0.07*
Enhanced facility maintenance	*3.38*	*3.71*	*3.38*	*0.32*	*0.73*
Improved return on resources	*3.35*	*3.55*	*3.38*	*0.31*	*0.73*
Increased revenue generation to the national development	*2.08*	*2.03*	*2.71*	*1.74*	*0.18*
Improved administration	*3.50*	*3.90*	*3.76*	*1.13*	*0.33*
It encourages financing option	*3.31*	*3.29*	*3.00*	*0.56*	*0.57*
Reduced risk exposure	*3.54*	*4.06*	*4.14*	*2.31*	*0.11*

4. Conclusions and recommendations

This research work has conducted an analysis of success factors and benefits of project partnering in Nigerian construction industry. The following findings were drawn from an in-depth analysis of the research work:

1) The use of project partnering is on the increasing trend in Nigerian construction market. Many companies who participated in this research work have already been involved in project partnering;

2) The research respondents believe that certain requirements must be met if project partnering is to succeed in Nigerian construction industry; in specific, mutual trust, good and effective communication, commitment from all parties, a clear understanding of roles, consistency and a flexible attitude. It is a common notion that considerable effort from all parties to a contract will definitely beget changes;

3) There are many benefits that can be derived from the use of project partnering to execute construction projects. And these benefits are beneficiary to all contracting parties, including clients, consultants, project managers, main contractors, sub-contractors, and on-site employees. An establishment of good and less adversarial relationship, increased customer satisfaction, an improved understanding of the parties to eradicate the root causes of poor project performance and ineffective communication and increase in project implementation speed are some of the highly benefits designated to Nigerian construction industry;

4) The project partnering process could empower the project personnel to accept responsibility and to do their jobs by delegating decision-making and problem-solving to the lowest possible level of authority. Project partnering could generate a workable model for people to communicate more effectively and efficiently thus eliminating unnecessary misunderstanding and possible conflicts, when properly implemented.

4.1 Recommendations

It is worthwhile to connote that the findings of this research collaborate with the recommendations of Latham Report published in the United Kingdom, which forms the basic guidelines and skeletons for implementing successful project partnering. Therefore, based on the derived research conclusions, the following recommendations are made for the improvement of construction projects in Nigeria:

1) The Nigerian construction industry should widely accept and practice project partnering across a wide spectrum of the industry in order to exploit the sustainable treasures and benefits it offers as an alternative method of procuring construction contracts to traditional method because of its numerous advantages;

2) In assembling a construction partnering team members, careful consideration should be given to professional experience, the personalities of the construction partnering team members, and to whether he team has sufficient skills in multiple disciplines;

3) Emphasis should be given to the early implementation of construction partnering process and a structured approach, also to the design of partnering activities, regular monitoring of partnering process, selection of qualified facilitators for partnering workshops, and appointment and true empowerment of the partnering champions;

4) The professional bodies like the Nigerian Institute of Quantity Surveyors (NIQS), Nigerian Society of Engineers (NSE), Nigerian Institute of Builders (NIOB), Council for Regulation of Registered Engineers in Nigeria (COREN) etc should lend their assistance in form of workshops, seminars, discussions etc to give more enlighten to construction project participants (i.e. clients, consultants and contractors) on how project partnering works, its success factors, and the benefits that can be achieved from its adoption.

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Balancing Stakeholder's Requirements in Project Procurement – Have we learnt anything yet?

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Abstract

Procurement methods play a significant role in identifying responsibilities of stakeholders and setting the physical, financial and legal boundaries of the project. Operational performance of projects in post-construction phase is greatly influenced by the procurement decisions made at the early phase of project development. For this reason, project procurement strategy is strongly associated with environmental uncertainties and operational risks expanding of entire life of projects. Effective assessment of operational performance and management of underling risks is essential for success in infrastructure project financing agreements such as Public-Private-Partnerships (PPP). Financial indicators such as return on investment, net present values, cost benefit ratio etc. are considered as crucial factors when the feasibility of the project is assessed. These factors are difficult to ascertain upfront and have significant implications for both the government and the concessionaires. Based on a case study conducted in a recently completed road PPP project in Australia, this research presents the rationale of project development from the perspective of potential risks in the post construction period. Based on the quantitative modelling of operational risks considered over the entire concession period, this research highlighted a few important factors for optimal front-end planning and minimising overall investment risks in projects. It has been revealed that while stakeholders related risk is one of the key factors impacting operational performance of PPP projects, the same was not integrated in the upstream decision making process. The findings of the research have highlighted a key risk areas associated with the stakeholders for better management of PPP practices in the future projects.

Keywords: project procurement, Public-private partnerships, font-end planning, risk management

1. Introduction

Effective risk management is essential for success in infrastructure project financing agreements such as Public-Private-Partnerships (PPP). Return on investment risks are considered as crucial factors when the feasibility of the project is assessed. These factors are difficult to ascertain and have significant implications for both the government and the concessionaires (UNC, 2001; Zhange, 2005). The opportunity for engagement of private parties in the public infrastructure project is usually defined by the conducive market conditions and optimal performance of the end facility ensuring appropriate investment returns over concession period. The overall partnership arrangements and decisions for investments in the PPP projects are usually based on operational performance of the project. The operational performance is again highly dependent on many underlying factors including market conditions, end-users perception and acceptance, growth in demand, environmental certainty etc. (Zhang and Kumaraswamy, 2001). If these factors are not appropriately analysed in the context of the project scope definition, the performance of the project over the long run can not been ascertained. In most projects, there is always a misunderstanding in terms of causes and effects of operational performance over initial decision analysis and thus risk of non-performance and potential conflict between parties become eminent. A proactive assessment of the variable parameters impacting operational performance of project at an early phase of project development can assist in significant reduction of operational costs in the PPP projects. Simulation techniques can be used to assess the influence of different market conditions and expectations of investment returns and, consequently, the stability of toll regime can be established (Ng *et al*, 2007; Tiong, 1999).

In the construction industry, the procurement route is usually chosen based on best value for money for clients. Based on this value for money principle, public-private-partnerships (PPP) is one of the most common methods for procuring public infrastructure projects across Australia. Focusing on the PPP procurement method, this research aimed to identify the key factors and their quantitative impacts on upfront decision process. Assessment of these factors is highly crucial for accurate understanding of the influence of different market conditions in the post construction phase of projects (Stainback, 2000). Market fluctuations along with end-users' dissatisfactions can eventually lead to poor operational performance, which potentially leads to disputes, litigation and even bankruptcy in the project (Jin and Doloi, 2000).

Based on a case study conducted in a recently completed road PPP project in Australia (named as Link-Road Project A), this research presents the current risk management practices in order to understanding how the practice can be enhanced for a better project outcomes. In order to quantify the operational risks, simulation modelling was used on the projected data over the entire concession period. The results are then compared with the real operational data. The findings of the research have highlighted a few key risk areas in order for the associated parties for better management of PPP practices in the future projects.

2. Public-Private-Partnerships in Australia

At present a well-developed PPP market does not exist in Australia and there have been signs of a willingness by the Commonwealth to develop a coherent policy. The multiple Governments, each with their own policies on privatisation and PPP, prevent them from developing a strategy that delivers interstate homogeneity. However, despite various technology and terminology differences, there is a tendency towards homogeneity: e.g. the Victorian Department of Treasury and Finance is in the course of preparing the whole of Government standardised commercial principles and contractual provisions. Australian tax legislation and in particular Section 51AD and Division 16D of the Commonwealth Income Tax Assessment Act 1936 make tax deduction for certain costs associated with ownership, including interest charges, depreciation and maintenance costs impossible to be applied to private sector consortia (SDTF, 2006).

Particularly in Victoria, the Partnerships Victoria policy was introduced in 2000 providing the framework for a whole government approach to providing public infrastructure and related ancillary services through public-private-partnerships. Although each project has its own unique complexity, the Partnerships Victoria policy brings consistency to the procedures for managing and implementing projects. The policy focuses on gaining value for money including whole-of-life costing, managing risks and protecting the public interest. The State retains delivery control of core public services. Once government has determined that new public infrastructure and related ancillary services are required, departments and agencies need to consider carefully how they can best be delivered. The method of delivery may be traditional ("design and construct") or take more recent approach, such as public-private partnerships.

2.1 Financial risk management in PPP

Though the typical risk management practice in construction includes all risks over the life cycle of project, due the virtue of nature of the PPP project being the privatised infrastructure, the financial risk management is considered highly significant (Cartlidge, 2006). The financial evaluation of a privatised infrastructure project is complex and challenging because of the complexity of the non-recourse financing technique and a variety of risks and uncertainties. The radical reallocation of risks among project participants makes the concessionaire undertake much more and deeper risks than mere contractor. Successful development of a private project requires effective management of these risks and the use of improvement financial engineering techniques to explore financial opportunities (Wibowo and Kochendorfer, 2005). Thus the development of a stand-alone project on a non-recourse or limited recourse financing structure, where debt and equity used to finance the project are paid back from the cash flows generated by the project, the lenders primarily rely on the revenue stream over operational phase of the project. Consequently, the concessionaire in the PPP project expose to suit of risks including development risk, completion risk, cost-increase risk, performance risk, operation risk, market risk, political risk, and environmental risk over the currency of the project. All these risks, if not managed effectively, may potentially result in substantial financial consequence to the concessionaire. In order to understand how such risks are handled in practice, a recently completed case project was analysed in details. Following sections focuses on the various risks and

adopted action plans in the selected case project. Based on the simulation analysis, this research aims to identify the pros and cons of industry based practices and thereby highlight the shortcomings for managing some of the stakeholder based operational risks impacting successful performance of the project. The research is then concluded by highlighting the requirements for shift of the risk management practices for potential improvement in deriving optimal outcomes in future projects.

2.2 Case Study: Link-Road Project A

Link-Road Project A is the nation's biggest road project to date in Australia. The $3.8 billion project delivered one of the fully electronic tollway systems comprising about 45 kilometres of freeway standard road in Australia. The toll regime was already set out in accordance with the terms of the concession deed between the Government and the concessionaire. Toll regime has both government and concessionaire implications and its determination is based on considerations of affordability, benefits derived from the facility and other factors that are ascertained from detailed "willingness to pay" surveys. As a result of the feasibility study of the Link-Road Project A undertaken in this study, the suitability of the toll regime has been assessed. Following section discusses the risk management approaches adopted in the Link-Road Project A.

2.3 Risk management in Link-Road Project A

Based on the product disclosure statement of the Concessionaire, two main groups of risk factors that influence the distributions of Concessionaire Unit Trusts and the Market Price of the stapled units are concessionaire's investments in infrastructure assets and stock markets. In general terms, the concessionaire receives very few warranties from the state government in relation to any aspect of project. As a result, the concessionaire had to enter into contracts with third party subcontractors in order to transfer these risks to those subcontractors where applicable. In case of occurrence of some very specific risks called as Possible Key Risk Factor (PKREs) which have a relevant effect, the concessionaire is entitled to negotiate with the state to obtain redress. Based on the product-disclosure statement analysis, some of the highest impacts risks have been shown in tables 1 – 5 below.

Table 1 above shows some of the key design and construction related risks with potential consequences, likelihood, impacts and response plans. As seen, delay in construction and cost overrun were considered highly likely with significant potential impacts in the project. As these two risks have been entirely transferred to the contractor under design and construct contract, the state and the concessionaire become free from the responsibility. However, risks for any requirement of further environmental compliance were borne by the concessionaire in the project. Work approval related risk was consider highly significant in terms of likelihood and impacts and was shared between contractors and the concessionaire.

Table 1: A summary of design and construction risk factors

Risks	*Analysis*			*Response plan*
	Conseq-uence	*Likelihood*	*Impact*	
Delay in construction	*High*	*High*	*High*	*Contractor should be engaged with a Fixed term contract. If delayed, contractor will be liable to pay liquidated damages*
Over budget	*High*	*High*	*High*	*Contractor is responsible under a fixed price contract. If costs exceeds budget, contractor will be liable to pay costs over the budget*
Requirement of further Environmental Effects Statements (EES) by the state	*High*	*Medium*	*Medium-High*	*If such requirement delays the progress by over six months, the Concessionaire will be entitled to negotiate for appropriate provisions under Commonwealth Environmental Law*
Increase in cost due to any delay in work approval	*High*	*High*	*High*	*Contractor is responsible for any additional design and construction costs under Design and Construct contract and operation costs will be borne buy the Concessionaire*
Site contamination	*High*	*Low*	*Medium*	*Concessionaire will bear this risk*

As shown in Table 2, most of the operational risk factors have been considered as low to medium impact risks and predominately managed by the contractor and concessionaire in the project. Risks for any major repair and maintenance work were passed onto the unit holders as an uncertain risk in the project.

Having analysed the traffic volume prediction risks as shown in Table 3, it can be seen that both identified risks related to low traffic volume and introduction to any alternative travel modes are highly significant across all three dimensions, yet managed by transferring to the unit holders alone. While such transfer mechanism deemed to be simple and attractive to both project owner and the contractor, the underlying factors associated to these risks and potential impacts on the overall outcomes in the project is highly complex. Both of these risks reflect high stakes in the community at large. Thus accurate understanding of the need in the community and realistic modelling of community perception are highly desirable in effective management of these risks.

Table 2: A summary of operational risk factors

Risks	*Analysis*			*Response plan*
	Conseq-uence	*Likelihood*	*Impact*	
Inability of operating the tolling system or Cost of Operation and Maintenance is greater than expected	*High*	*Low*	*Medium*	*If failure is due to Concessionaire, unit holder will bear this risk.* *If the failure is due to contractors faults, contractor is responsible.*
Major repairs and maintenance costs are more than expected	*High*	*Medium*	*Medium-High*	*Unit holders and insurance companies*
Industrial action impacting toll collection	*High*	*Low*	*Medium*	*Industrial relations obligations under the operations & maintenance contract. Operator's capped liability to collect toll of $15 million*
Tolling system not ready in time	*High*	*Medium*	*Medium-High*	*Operator will be compensated from contractor's liquidated damages charge.*

Table 3: A summary of Traffic Volume Prediction risk factors

Risks	*Analysis*			*Response plan*
	Conseq-uence	*Likelihood*	*Impact*	
Low Traffic volumes	*High*	*High*	*High*	*Unit holders will bear the risk*
Introduction of alternative travel modes/routes	*High*	*High*	*High*	*Unit holders will bear the risk*

Among the financial risk factors shown in Table 4, both risks associated with long term rise in interest and refinancing issues are highly significant across all three dimensions. The management strategies for both of these risks are market specific where bulk of the risks have been transferred to the unit holders concerns. While the unit holders are expected to shoulder such unforeseen risks, provisions have been made to reduce the impacts by way of employing hedging mechanism and insurance policies. Table 5 shows one high impact and another medium impact miscellaneous risks associated with potential disputes and unforeseen natural disasters. While the concessionaire is usually responsible to resolving any conflicts and disputes arising in the project, the force majeure risk is managed by transferring to the third party including insurance companies alike.

Table 4: A summary of Financing risk factors

Risks	*Analysis*			*Response plan*
	Conseq-uence	*Likelihood*	*Impact*	
Real long term interest rates increase	*High*	*High*	*High*	*During both construction and the start of operations, 100% of the Senior Debt will be hedged, resulting in Unit-holders being insulated from changes in interest rates. From year seven to ten, 80% of the Senior Debt will be hedged.*
The operator is unable to arrange refinancing facilities or that the term of refinancing is less favourable than expected	*High*	*High*	*High*	*Unit holders and insurance companies*

Table 5: A summary of Miscellaneous risk factors

Risks	*Analysis*			*Response plan*
	Conseq-uence	*Likelihood*	*Impact*	
Dispute over interpretation or enforceability of legal documentations	*High*	*High*	*High*	*Concessionaire remains primarily responsible for obligations to State*
Force majeure	*High*	*Low*	*Medium*	*Insurance companies and State upon negotiation.*

3. Risk assessment framework

Quantification of risk factors identified through literature review forms part of the theoretical framework of this research. Information about Link-Road Project A included in the Product Disclosure Statement of the Concessionaire, in conjunction with current information extracted from the web pages of the Concessionaire, the principal Contractor and the Representation of the State Government, have been used for this purpose. In addition to this, a questionnaire was performed in order to look for current performance data related to Link-Road Project A and to corroborate the data available from other sources. However, the information requested in this questionnaire was considered commercial-in-confidence. For this purpose, Project Directors, Communication Directors, Finance Managers, etc involved in the Concessionaire for the Link-Road Project A, principal contractor and the government agency were contacted via electronic mail and a copy of the questionnaire was sent to each one of them. Out of 30 questionnaires mailed out, only 18 were returned. Though the number of

responses was reasonably low, due the highest quality response, the responses were considered highly authentic to validate the research.

Most of the risk factors already identified as most significant to the feasibility of Link-Road Project A were estimated within their allowable ranges relating them to a specific probability distribution. Information extracted from the Product Disclosure Statement of Link-Road Project A in conjunction with other sources included in its web page were used for this purpose. After an appropriate quantification of the risk factors, a base scenario was established and Monte Carlo simulation and sensitivity analysis were performed. From this analysis the most sensitive variables to the investment return were identified. Finally, two new scenarios were taken into account for most sensitive variables and varied them in a broader range to study the extreme values which provoke high uncertainty levels for the feasibility of the project. Finally, the results of the simulation from different scenarios were compared with the operational project data in order to understand the rationality of the decision making process.

3.1 Quantification of operational parameters and underlying risks

A number of assumptions were made as part of the concessionaire bid on the initial level of toll charge in the project. The estimates of the key variables that form the 'base case model' for the financial analysis were submitted by the concessioner as part of their bid. Some of the key assumptions as appeared in the product disclosure statement are discussed below:

Table 6: Traffic volume project in opening year 2008

Vehicles	*Annual Average Daily Traffic (AADT)*	*Average Toll Paid per Trip ($ per vehicle)*	*Total Revenue Tolling System ($ million) per year*
Cars	*234,900*	*2.60*	*222.92*
Light Commercial Vehicles (LCV)	*12,600*	*3.63*	*16.69*
Heavy Commercial Vehicles (HCV)	*10,700*	*6.62*	*25.85*
		Total	*265.47*

Traffic volumes: Based on the projects made by a consultant, the traffic volumes for the opening year 2008, following year 2009 and at the end of the concession period 2031 are summarised in Tables 6, 7 and 8 below. It was assumed that a steady growth of traffic will still continue well after the end of concession period. Furthermore, a Ramp-Up period for the project was estimated at 15 months where traffic volumes are expected to commence at 72% of initial steady state traffic volumes.

Table 7: Traffic volume projection in opening year 2011

Vehicles	*Annual Average Daily Traffic (AADT)*	*Average Toll Paid per Trip ($ per vehicle)*	*Total Revenue Tolling System ($ million) per year*
Cars	*273,400*	*2.65*	*264.45*
Light Commercial Vehicles (LCV)	*13,900*	*3.62*	*18.37*
Heavy Commercial Vehicles (HCV)	*11,600*	*6.66*	*28.20*
		Total	*311.01*

Table 8: Traffic volume projection in opening year 2031

Vehicles	*Annual Average Daily Traffic (AADT)*	*Average Toll Paid per Trip ($ per vehicle)*	*Total Revenue Tolling System ($ million) per year*
Cars	*359,200*	*2.69*	*352.68*
Light Commercial Vehicles (LCV)	*16,100*	*3.65*	*21.45*
Heavy Commercial Vehicles (HCV)	*12,800*	*6.67*	*31.63*
		Total	*405.76*

Construction costs ware estimated at $2.5 million and construction began in Nov 2004. Capital Expenditure following construction completion was divided into two categories: civil assets and tolling and customer services. Costs over all 30 years concession period were estimated as per December 2004 and with a provision for escalation an average rate of inflation of 2.65%.

Interest costs: The concessionaire had fully hedged the interest rate exposure for the first six years from financial close. Thus the interest rate is 100% hedged until November 2010. In addition to this, interest rate is at least 80% hedged for four year thereafter until November 2014. The concessionaire also assumed a long-term unhedged interest rate of 6.23% per annum determined by reference to a five year interest rate swap commencing in 10 years implied by an interest rate swap curve as at 30 July 2004.

Refinancing and Re-Gearing: The concessionaire had assumed that first two out of three tranches (Trenches A and B) will be refinanced with interest on faculties in 2010 and 2012 respectively and then all three tranches are fully refinanced in 2014 and 2019. At each of the refinancing dates, it was assumed that the refinancing margin over the unhedged base interest rate of 6.23% per annum is between 0.7% and 0.8%. Operating and maintenance costs were estimated at 63.4million for first year of operation with a provision of cost escalation at a rate of average inflation over the term of the concession period.

3.2 Variability of risk factors and scenario analysis

Taking into account the information presented in Section 1.7 on the operational estimates of the project data and based on the information disclosed in the product disclosure statement on the variability analysis, a few key factors were further investigated in terms of alternative scenarios and underlying risks associated with the variations. Simulation modelling approach was used to investigate the impacts of the variations. The variability ranges of these key factors and rationale of assumptions for simulation analysis are discussed below.

Traffic Volumes: Based on information provided by in the Product Disclosure Statement, the projected yearly traffic volume was compared with its respective future real traffic volume in the project. These two indices were found to be very close with a variation range of only ±1%. Taking into account of the cumulative effect of this variation during the whole concession period, a mean value of $26.47million with a standard deviation of $10.78million (based on 4 years estimates) for a normal distribution was used in the model.

Inflation Rate: Based on estimations included in the Product Disclosure Statement, a long-term inflation rate of 2.6% has been assumed. In addition to this, a long-term inflation rate range between 2.0% and 3.0% is estimated based on information provided by The Reserve Bank of Australia (RBA) and included in the Product Disclosure Statement. From these data, the range of inflation rate related to a triangular distribution used in the model is: 2.6% (most likely value), 2.0% (lowest long term inflation) and 3.0% (highest long term inflation).

Operating & Administration Costs are estimated to vary using a normal distribution where the parameters are defined from the available Product Disclosure Statement. Mean value the figure as estimated in the Product Disclosure Statement for the first year of operation ($63,400,000 escalated with CPI for the following years) is used for this purpose. Standard deviation is defined by 1% of the figure estimated for each year of operation (Mean Value). Capital expenditure is estimated to vary using a normal distribution with a mean value which is based on the figures across different groups such as years 1- (ending in 2013) -$3,300,000; years 6-10 (ending in 2018) -$41,600,000 etc. Standard deviation is defined by 10% of the figure estimated for each group of years included in the concession period (mean value).

Interest Rates: The interest rates considered are 100% hedged to 2010 and 80% hedged to 2014. Beyond that date a long-term interest rate has been estimated as follows: unhedged base interest rate of 6.23% per annum over which a margin between 0.7% and 0.8% is assumed. According to this, the long-term interest rates were varied within a range of ±1% based on a normal distribution with a mean value of 7.03% and a standard deviation of 1%.

At a second stage, two additional scenarios (Scenario 3 and Scenario 4) were considered where the most sensitive variables traffic volume, inflation rate and long-term interest rates were varied in order to study extreme values of those variables which provoke high uncertainty levels to the feasibility of the project. Among these new scenarios, in Scenario 3, mean value of traffic volume is estimated to be 10% lower, most likely value of inflation rate is estimated to be 0.5% lower (e.g 2.1%) and mean

value of the interest rate is estimated to be 0.5% higher (e.g.7.53%). Similarly, in Scenario 4, traffic volume mean value is estimated to be 15% lower, most likely value of inflation rate is estimated to be 1.0% lower (e.g 2.1%) and mean value of the interest rate is estimated to be 0.5% higher (e.g.7.53%). As the processes of simulation study is considered out of scope for this manuscript, the details of analysis have not been included. The following section discusses the sensitivity of some key risks and the contrast of the same with the real operational performance of the project to date.

4. Sensitivity and contrast to operational risks

Sensitivity analysis was performed to identify critical inputs of the financial model and how their variability impacts the result. Both base case scenarios 1 and 2 showed a clear consistency over change of variable parameters in their hypothetical range. In addition, sensitivity analysis was performed to study how internal rate of return and net present value of the scenarios are affected. It was found that the revenue due to tolling system forecast for year 2021 was the most sensitive variable with a change level of upto 45.3%. Revenue due to tolling system forecast for year 2011 and 2031 were found to be second and third most sensitive variable with a change values of 21.0% and 19.7% respectively. Long-Term Interest Rates ranked fourth with a change of -9.6% followed by the fifth ranked Inflation Rate being the sensitive parameter with a change value of 8.1%. If sensitivity showed by the four variables which comprise “Revenue due to Tolling System” (2008, 2011, 2021 and 2031), their total combined percentages of change is accounted for 77.8%.

Similarly, the sensitivity analysis on the net present value revealed that the revenue due to tolling system forecast for year 2031 was the most sensitive variable with a susceptible to change upto 53.9%. Revenue due to tolling system forecast for year 2021 ranked second with a change value of 26.4% and inflation rate ranked third with a change value of 6.8%. If sensitivity showed by the four variables which comprise “Revenue due to Tolling System” (2008, 2011, 2021 and 2031), they are accounted for a total of 86%.

As we can see above, most sensitive variables are not proportionately ranked when the internal rate of return and the net present value of the project are compared. One of the reasons for this difference is that a direct relation exists between the net present value and the discount rate. However, the internal rate of return is clearly independent from the discount rate.

Table 9 shows the operational figures reported immediately after beginning of operation in 2008 and approximately one year latter. While these operational results are not based on any official documentation, the source of the information is predominately public newspapers and similar periodic media reports. As seen, compared to the base case estimate (Table 6) and the variability in the alternative scenarios, the operational figures are significantly out of range. The first week figure shows that the when the toll was not collected and the vehicles were allowed to travel free, the number of total trips as down by 28% which equates to same percentage of fall in revenue from the target. Since the toll began after one month of the opening the project, the demand fell further to 51% showing an unsustainable return on investment. Consequently, the concessionaire shares slumps by 14.5% resulting a significant loss in asset value and eroding confidence among the unit holders in the

project. Though this situation could initially be contemplated with the ramp-up provision over first 15 months, the operational figure after first year of operation with 42% fall in demand shows further deviation from the project performance as targeted. As a consequence of this ill-performance, currently a legal battle over $400 million between the concessionaire and the private contractor has reportedly been started. The contractor has now been accusing the concessionaire on their misleading information on the traffic forecast and projections which expected to end up with a significant escalation of the overall project cost over time.

Table 9: Operational figures reported after operation began in 2008

Vehicles	*Annual Average Daily Traffic (AADT) before Toll Start*	*Annual Average Daily Traffic (AADT) since Toll Began*	*Concessionaire shares*
After first week (27 July 27 – 08 Aug 2008)			
Combined traffic including Cars, Light Commercial Vehicles and Heavy Commercial Vehicles	*196,848* *28% DOWN*	*133,722* *51% DOWN*	*14.5% DOWN*
After first year of operation (08 Sept 2009)			
Combined traffic including Cars, Light Commercial Vehicles and Heavy Commercial Vehicles	*159,000* *42% DOWN*		

5. Conclusions

In this research, a comparison has been presented between the engineering based financial analysis practices and real case scenarios that highlights the need for a paradigm shift in understanding and management of stakeholders in privately funded project such as PPP projects. The results of the research show that the basic engineering assumptions and statistical prediction on demand over time do not always contemplate by the reality over operation phase of project. The bulk of the investment decisions in privately funded projects are based on operational performance which entirely relies on the perception in terms of usability and willingness of the target end users in the project. The end-users' perception is again driven by the broad range of parameters including broader economic condition of the community. Thus a clear understanding of the end user's perception and comprehensive assessment of current and future trends in terms of affordability, usability, willingness, motivation, needs and requirements is fundamentally critical in appropriate scope definition and making investment decisions in projects.

In order to understand the rationale on investment decisions, a financial base case model of Link-Road Project A was performed considering all the information currently available. Two base scenarios were considered due to a variation in interest rates resulted from a refinancing of concessionaire's debt facilities at the post construction phase. A Monte Carlo simulation was performed to evaluate the

quantitative impacts of key variables in the model. The input data includes the variation of some risk factors within their allowable ranges while other factors were considered not susceptible to change. Both cases show similar results which then concluded the project as a highly feasible project.

In the analysis, the traffic volume is found to be a very risky factor because inaccuracy of only a 10% in projections can lead, in conjunction with other variations of risk factors, to a failure of the project. Given the current performance data, it seems that the accuracy of the traffic projection and assessment of growth in demand among stakeholders for using the project facility over time are highly questionable.

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Comparison of Indian PPP Construction Industry and European PPP Construction Industry: Process, Thresholds and Implementation

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Abstract

Since the 1990's, there has been a rapid rise of Public Private Partnerships (PPPs) across the world. Governments in developing as well as developed countries are increasingly using this procurement method to bridge the much needed infrastructure gap. PPPs are seen as an important tool for producing an accelerated and larger pipeline of infrastructure investments, and catching up with the infrastructure deficit. Arguably, this is why developed and especially developing countries are very keen on PPP models. This paper will compare the PPP procurement process followed in Europe compared to India and presents a thorough review of literature on governance issues, the process, thresholds and choices that the Indian construction industry faces in grappling with this procurement route, together with the associated challenges. The methodology used is a combination of reviewing documentation available/produced to date with a combination of comparison carried out based on Social, Legal, Economical, Environmental, Political, and Technological (SLEEPT). Consideration is also given to the different PPP models used for different sectors in Europe and in India. The paper argues and concludes that the challenges that confront the construction industry in India are multifaceted and likely to impact on the implementation of the PPP model if a strict governance regime is not followed in terms of process, thresholds and implementation.

Keywords: PPP, PPP construction industry (European and India), governance, process, implementation

1. Introduction

Over the past 15yrs governments have been struggling to achieve economic development and competitiveness through improving their basic infrastructure. PPP is rapidly becoming the preferred method for public procurement for delivering both transport and social infrastructure projects throughout the world, thus gaining importance as a vehicle to finance much-needed public infrastructure across the globe. PPPs are confused with privatization. PPPs are not privatization

(UNECE 2008), as under PPPs accountability for the delivery of the public service is retained by the public sector whereas under privatization, accountability moves across to the private sector.

The current global economic downturn is also effecting the PPPs. Reduced availability of loans to private investors and PPP projects along with altered risk consideration of banks and investors has increased the cost of loans. The temporary slowing down of demand growth due to higher costs for PPPs has increased pressure on price and margins, along with project selectivity. Successful PPPs require an effective legislative and control framework and it is highly recommended (UNICEF, 2009) that each partner recognize the objectives and needs of the other more minutely in the present economic scenario, along with highlighting the fact that PPPs are still in their infancy in most countries. It is argued that lack of processes, procedures and enabling institutions, i.e. Governance, is the main barrier to extending their use (UNECE, 2008).

2. PPP concept

PPP is a generic term for the relationship formed between the private sector and public bodies often with the aim of introducing private sector resources and expertise in order to help provide and deliver public sector assets and services. PPP projects are based on the assumption that both sectors have particular skills and characteristics providing each with advantages in undertaking certain tasks. Quite naturally this has created a widespread interest in the term PPP and it has become quite fashionable, both politically and socially. Much is being claimed in the press and in public debate as to the inherent benefits of PPP. Attaining the means to accomplish this has resulted in alternative sources of finance being sought, as well as ways of making public sector services more cost effective (CIC, 2000). PPP arrangements come in many forms and are still an evolving concept which must be adapted to the individual needs and characteristics of each project and project partners. As a result, there are various types of PPPs, established for different reasons, across a wide range of market segments, reflecting the different needs of governments for infrastructure services. Although the types vary, two broad categories of PPPs can be identified: firstly, the institutionalized kind that refers to all forms of joint ventures between public and private stakeholders and secondly, contractual PPPs.

The most common PPP models are Design-Build (DB), Design-Build-Maintain (DBM), Design-Build-Operate (DBO) or Build-Transfer-Operate (BTO), Design-Build-Operate-Maintain (DBOM) also known as Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), Build-Own-Operate (BOO) and Build-Own-Operate/Maintain (DBFO, DBFM or DBFO/M). PPPs can also be used for existing services and facilities in addition to new ones. Some of these models are Service Contracts, Management Contracts, Lease, Concession and Divestiture (Deloitte 2006).

Globally, PPPs have played a central role in answering the pressing need for new infrastructure development especially in the transportation sector i.e. roads, tunnels, bridges, airports, ships, railways, and other forms of transportation. Thus transportation is the largest sector implementing the PPP model in the world. Factors that make most transportation infrastructure ideal for PPPs are firstly, the strong emphasis on the role of cost and efficiency helps to align private and public interests and secondly, the growing public acceptance in many countries of associated user fees for assets such as

roads and bridges which makes private financing easier in this sector. The ability to limit participation to paying customers, in the form of train tickets or bridge tolls, ensures a revenue stream that can offset all or some of the cost of provision in many countries, a format readily understood by the private sector. The scale and long-term nature of these projects are well served by PPPs.

Table 1: PPP models used in various sectors in different countries (Adapted Deloitte, 2006)

Sector	*Country*	*PPP models*
Transport	*Australia, Canada, France, Greece, Ireland, Italy, New Zealand, Spain, UK, US, India*	*DBOM, BOOT, Divestiture*
Water, wastewater, and waste	*Australia, France, Ireland, UK, US, Canada, India*	*DB, DBO, BOOT, Divestiture*
Education	*Australia, Netherlands, UK, Ireland, India*	*DB, DBO, DBOM, BOOT, DBFO/M, integrator*
Housing/Urban Regeneration	*Netherlands, UK, Ireland*	*DBFM, joint venture*
Hospitals	*Australia, Canada, Portugal, South Africa, UK*	*BOO, BOOT, integrator*
Defence	*Australia, Germany, UK, US*	*DBOM, BOO, BOOT, alliance, joint venture*
Prisons	*Australia, France, Germany, UK, US*	*DB, DBO, BOO, management contract*

Europe: The infrastructure needs for the European Union run into trillions of dollars. The energy sector alone requires $1.2 trillion over the next 20 years. Approximately $90 billion is needed annually for infrastructure investment in Germany alone (IFSL, 2009).

India: “The most glaring deficit in India is the infrastructure deficit.” The importance of infrastructure for rapid economic development in India cannot be overstated. India spends just 6 % of its GDP on infrastructure. To achieve its targeted GDP growth rates, the country will need to invest approximately $250 billion in infrastructure over the next five years (DEA, 2008c).

3. PPPs in Europe:

Europe in 2008 saw the intensification of the credit crunch and the severe economic downturn presented challenges in all sectors of the economy that rely on private finance. The downturn led to

delays to projects and 2009 is set to be one of the most challenging ever for the PPP industry. However in Europe we can still see PPP projects coming to financial close. The PPP market in Europe was growing in size over the last two decades and in 2005-06 the PPP market increased in size by 37% (Piper, 2007). This was due to more countries in Europe launching projects and putting projects through tender. High growth is expected in rail, waste and water, healthcare and defence sectors. In 2006 the tender value of PPP projects has more than doubled since May 2004 and is around €54 billion according to the fourth annual report (Piper, 2007). Table 2 shows the top ten countries ranked in order of the capital value of the projects from 2001-08. On top is the UK followed by Spain and France.

Table 2: PPP in Europe, value of signed contracts (IFSL, 2009)

Ranking	*Country*	*Capital value of projects € million*	*No. of signed deals.*
1	*UK*	*61131*	*536*
2	*Spain*	*4127*	*38*
3	*France*	*4093*	*34*
4	*Italy*	*3563*	*20*
5	*Republic of Ireland*	*3253*	*19*
6	*Greece*	*2398*	*8*
7	*Germany*	*2029*	*40*
8	*Belgium*	*1780*	*6*
9	*Netherlands*	*1733*	*9*
10	*Poland*	*1520*	*2*
11	*Austria*	*899*	*6*
12	*Finland*	*700*	*1*
13	*Bulgaria*	*654*	*6*
14	*Hungary*	*556*	*11*
15	*Cyprus*	*500*	*1*
16	*Portugal*	*450*	*7*
17	*Other countries*	*977*	*7*

PPP projects have been launched across a wide range of sectors in Europe. Roads are by far the most dominant sector, assisted by the fact that the concession model has a long and successful history within Europe, particularly in southern European countries (City & Financial, 2008). In recent times apart from the road, bridge and tunnel infrastructure projects there is an increasing demand for hospitals, with a real health infrastructure market in Europe with projects in Italy, Spain, Portugal, France, Germany, Czech Republic and the UK. Rail also represents 15% by tender value of the

market which consists mostly of light rail projects. The infrastructure for heavy rail has been delivered using a PPP model in only a few cases such as the Perpignan to Figueras cross border rail link. The scale and politics of such projects make them difficult to deliver. However, there are several big schemes currently in development for high speed links in Portugal, Austria and the Netherlands (Piper, 2007).

Table 3: Sector wise Pre-tender projects in Europe (Piper, 2007)

Sector	*%*
Bridges/Tunnels/Roads	*60*
Rail/Light rail	*22*
Defence	*4*
Healthcare	*4*
Sports /leisure/tourism	*3*
Airports	*2*
Education	*2*
Waste/Water	*2*
Prisons	*1*
Maritime/ports	*1*
Regeneration	*1*

The European markets are evolving rapidly with the transfer of know how both on the public and private sector sides (IFSL, 2009). This does not mean that all projects are structured in the same way across sectors and borders - governments are developing structures which suit their own environment - being everything from the legal framework, public expectations through to commercial practice. The momentum behind PPP as a globally accepted form of infrastructure and public service procurement by government has far exceeded expectations. There is a flow of ideas and know-how from the European markets to America, Asia and Africa (Deloitte, 2006). There is concern that an overheated market may lead to less rigorous evaluation of projects and less well defined deals which may deliver short term benefits, in terms of completed projects, but in the long run will devalue the currency of PPP. Thus parties involved in the PPP process should follow a strict corporate governance of projects to ensure a sustainable market (IFSL, 2009). The need for maintaining transparency in the entire PPP project cycle and stakeholder interactions has been highlighted as a key factor in determining the success of PPPs. The private sector has urged the government and other public sector project sponsors to be cautious of the 'selection by nomination' procedure, which is not the same as transparently awarded PPP contracts (UNECE, 2008).

4. PPPs in India

The evolution of the Indian Construction Industry was almost similar to the construction industry evolution in other countries: founded by Government and slowly taken over by enterprises. After independence the need for industrial and infrastructural developments in India laid the foundation stone of construction. The period from 1950 to the mid 60's witnessed the government playing an active role in the development of these services. With the present emphasis on creating physical infrastructure, massive investment was required, thus in the late 1960s the government started encouraging foreign collaborations in these services. The objective of such an imposition was to develop local design capabilities parallel with the inflow of imported technology and skills. This measure encouraged international construction and consultancy organisations to set up joint ventures and register their presence in India through public-private partnerships and mechanisms like Build-Operate-Transfer (BOT). As the infrastructure requirement was of an immense magnitude, budgetary sources could not raise the necessary scale of resources. The PPP approach was explored and was considered best suited for finding the required level of resources.

Currently 86 PPP projects have been awarded in India (ADB, 2008). Roads and port sectors have dominated the number and size of PPPs. Public authorities have identified a whole range of sectors for PPP, including roads/highways, ports (air, sea, container), telecommunication, water supply, waste management, tourism, power, industrial infrastructure, township development, leisure, and health. Many of the projects are already in the bidding stage using both memorandum of understanding (MOU) and competitive bidding procedures (PPIAF, 2008).

It is estimated that US$ 320 billion investment (at 2005/06 prices) is required for 2007-12 in India with major expenditure on the power sector followed by the railways. Furthermore, the Government itself envisages that the investment in infrastructure would rise gradually from 4.7 % of GDP in 2005/06 to 8 % by 2011/12. This translates to an investment of US$ 384 billion (at 2005/06 prices), assuming that the real GDP grows at 9 % per annum and annual inflation remains at 5 % (DEA, 2008).

Table 4: Sector-wise figures of total no. of projects along with sector wise investment required (DEA, 2008).

Sector	*Total no. of projects*	*Investment required US $ billion*
Power	*32*	*130*
Railways	*3*	*66*
National Highways/roads	*186*	*49*
Civil aviation	*6*	*9*
Ports	*38*	*11*
Urban Development	*35*	*55*
Total	*300*	*320*

It is evident from the tables above that the road sector dominates in terms of the number of projects, accounting for 62 % of total projects. Ports come second in terms of the number of projects, i.e., 13 %, which is 32 % in terms of value. It is noteworthy that if ports and central road projects are excluded from the total, there is in fact a relatively small value of deal flow. The potential use of PPPs in e-governance, health and education sectors remains largely untapped across India as a whole, though of late there have been some activities shaping in these sectors. Another addition to the database is the energy sector which indicates 32 projects. Out of the 32 projects in the energy sector, 28 of them are hydro based power projects on a BOOT basis. In terms of main types of PPP contracts, almost all contracts have been of the BOT/BOOT type (either toll or annuity payment models) or close variants. In terms of approach to provider selection, almost all the projects (in the sample data available for 300 projects) were competitively bid (either national or international competitive bidding) with the negotiated ones (through MOUs) primarily accounted for by railway and ports sector (DEA, 2008).

5. Governance

Governance in PPPs is open to much interpretation. Governance refers to the processes in government actions and how things are implemented. It also relates to the quality of institutions and their effectiveness in translating policy into successful implementation (UNECE, 2008).

Good governance is important on PPP projects at all stages of its development. Good governance requires that there is participation from all involved stakeholders. Many PPPs have failed owing to strong opposition from civil society, local media, and other stakeholders. Public opposition has led to many cancellations, both before and after the concession award. Alienation of actual users of the asset and lack of public support have increased project costs, delayed project completion, and ultimately jeopardized the sustainability of public services. Lack of communication and poor stakeholder management could become deal-breakers. A predominant reason for this is lack of effective communication with the principal stakeholders of the project. It is important for the project sponsors to disseminate information among the various stakeholder groups about the virtues of partnership options and convince them about the benefits that would accrue to them. Feedback and consultations with the stakeholders will ensure support, client focus, and improved coordination of the project. It is also observed that the degree to which the formation and stewardship of the rules is undertaken without harming or causing grievance to people will populate decency. It will also provide transparency within the PPP process with a degree of clarity and openness with which decisions are made leading to accountability to which political actors are responsible to society for what they say and do (UNECE, 2008). This would bring in a culture of fairness, demonstrating that rules apply equally to everyone in society and bring efficiency which is not limited to human and financial resources and is applied without waste, delay or corruption or without prejudicing future generations. If governments executing PPPs make a conscious effect in implementing good governance then it can lead to economic development (Deloitte, 2006).

6. Process

The PPP process followed in India is based moreover on the same principles as are followed in Europe. There are three main stages in a PPP project (UNECE, 2008), firstly project preparation and development, secondly the bidding phase and thirdly the implementation and operating phase. According to Deloitte, 2006, India along with many other countries are still evolving in the PPP model including designing the partnership policy and legislative framework, getting the procurements and contracts right and building the marketplace by encouraging the private sector to bid on these kinds of contracts. India could benefit and learn from the lessons learned: in the United Kingdom for schools, hospitals and defence facilities; in Australia and Ireland for roads; and in the Netherlands for social housing and urban regeneration. India can learn and avoid some of the mistakes made, such as the tendency to apply a one-size-fits-all model to all infrastructure projects and they can adopt from the outset some of the more flexible, creative and tailored PPP approaches. A PPP programme becomes significant only when a fully comprehensive system is established along with political will and commitment (UNECE, 2008).

7. SLEEPT: Comparison of implementation of PPPs in Europe to India

SLEEPT methodology is used to compare the complexities of implementing PPP projects in Europe to India. The six components of SLEEPT are as follows (CI, 2007):

- *Social*: Public acceptance of private sector involvement.
- *Legal framework:* Standardised documentation.
- *Economic:* Access to significant private sector borrowing.
- *Environment:* Clearly defined sustainability and impact criteria.
- *Political framework:* International, national and local will or commitment.
- *Technological:* Access and availability of quality PPP practitioners and experienced project sponsors.

7.1 Social

Public opposition has led to many cancellations, both before and after the concession award (UNECE, 2008). The social and cultural norms within a nation can significantly alter the behaviours of people, ultimately affecting the operation of systems and structures in place. The complex nature of the PPP procurement along with a vast documentation requirement was putting a lot of pressure on the implementing authority. Because of their complexity they were also confused with privatisation and thus not readily accepted in some countries.

Governments implementing PPPs need to be abundantly clear and determined about the basic motivation and objectives for opting for PPPs. In the developed and developing countries the vast infrastructure deficit which is difficult to procure by means of state funds is eminent, thus making a case for the PPP's. While resource constraints and maximizing government revenue are legitimate

motivators, they should be driven much more by the core drivers of effectiveness gains such as improved service standards and customer satisfaction along with efficiency gains such as value for money and improved service at optimal costs (EC 2004).

In Europe the acceptance of private finance in public services was slow but took momentum in the early 1960's with toll highways in Spain (EC, 2003). However, today Europe is implementing the PPP model in all the sectors. In India the PPP model took off slowly as it was confused with privatization. The PPP model was used in the transportation sector but the acceptance of this model was slow due to bureaucracy and red tape. To date there are certain sectors still untapped due to public opposition, budgetary constraints and a lack of know-how of the subject (DEA, 2008).

7.2 Legal framework

PPPs need to have detailed policy to in still confidence and attract the participation of private investors and commercial lenders. PPPs can succeed only if they are structured and planned in detail and are managed by expert dedicated teams - preferably, a single, centralized unit servicing as a 'one-stop' shop for investors and a nodal point for facilitating co-operation among the different government agencies. Governments also need to use technical, legal and financial advisors, where needed, to match the advantages of the private sector, particularly in large-scale programs.

In Europe, if a PPP model is to be implemented then all EU member states are obliged to adhere to the relevant EU legislation. A Central PPP unit has been established by the EC. This unit will help in setting up the national PPP units for the implementation of identified PPP projects by providing the expertise and knowledge on PPP projects (City & Financial, 2008).

In Europe, all the EU member states have their own national legal systems and procurement guidelines. The original PPP philosophy had originated within the UK common law legal system. Translating that common law approach to other legal systems has inherent difficulties. In some nations issues that would appear to be pre-determined can unravel as disputes move away from the site and into the courts. A further legal difficulty within PPP is the requirement for the settlement of contractual disputes. Given the variations in the formats, bidding procedures, agreements, and overall execution of PPPs among the various local bodies/ agencies, the private sector has highlighted the need for standardized prequalification and bidding procedures and guidelines for ensuring efficiency, predictability, and ease of the approval process. A significant difference in the national legal approaches is the consideration of the intended longevity of relationships. In Europe the approach is broadly that each PPP contract should be treated independently as a one-off agreement. In India there is more consideration of a longer term effect of continued development together (a form of partnering expectations) beyond a single PPP project.

The Indian authorities are making conscious efforts in setting up PPP cells at state level to access project development resources; advisory support on infrastructure legislation and regulatory frameworks and detailed PPP policies along with the methodology to deal with PPP projects. To expedite the process, the government authorities have also called for the streamlining of the statutory

clearances on environment, defence, airport authority, land acquisition, etc (DEA, 2008a). In India government authorities need to pay more attention to subsequent potential renegotiation. Lessons should be learned from the cases in Latin America where over 60% of 1,000 concession contracts awarded in the 1990s were renegotiated within three years. Bidders often offer below-cost prices to win the contract in anticipation of later renegotiation. A concession agreement should cover all possible causes of later adjustments, leaving minimum room for renegotiation. In the Worli Sealink project in Mumbai, the project consultants were replaced midway through the construction phase. The new consultants suggested a change in project design that resulted in escalating the project cost multi-fold causing further project delays. Thus India needs to develop an appropriate legislative framework for PPPs, clarification of entry conditions, suitable contractual structures, and clarification of incentives and concessions (RASTOGI A; KALRA P; PANDEY A, 2008).

7.3 Economic

Effective PPP models will have to make economic sense to the parties involved for their success. Thus it has to devolve sensibly the roles and fair sharing of responsibilities, costs, and risks between the public and private sectors. Project development needs to be done by government, for which it needs to create dedicated funds. These funds would help create a pipeline of bankable projects. PPP projects often raise debt funding on a limited-recourse project finance basis. This means that the lenders rely merely on project assets and cash flows and do not have recourse to the project sponsors. Debt finance usually represents 60–80% of the financing structure. Therefore, PPP design and documentation should provide adequate protection to debt service against non-commercial risks related to force majeure, regulatory changes, contract termination, etc. Risk is assigned to the partner best able to manage it. Commercial risk is better borne by the private sector partner, while regulatory risk is better borne by government agencies. Well-prepared projects reduce the cost of bids and attract more bidders in a public tender.The management style applied to European PPP projects is commercially oriented. The projects are commercial self-contained cost centres. The typical special purpose vehicle (SPV) – concession holder may place the construction and operational contracts with a subsidiary in exactly the same way that they would treat any other contractor.

The European International Bank (EIB) is the EU's financing institution and was established to provide long-term finance for projects in support of EU policy objectives. In this way the bank contributes towards the development of a closer-knit Europe in terms of economic integration and greater economic and social cohesion. Accounting and statistical rules relating to PPP's have also continued to cause uncertainty for EU member states with the obligation to comply with the Maastricht criteria. In this regard, Eurostat adopted a decision on 11th February 2004 on the deficit and debt treatment of PPP's. Eurostat states that the assets involved in a PPP may be classified as non-governmental assets, and therefore recorded off the government's balance sheet if the following conditions are met. Firstly, the private partner bears the construction risk and secondly the private partner bears at least one of either availability or demand risk (City & Financial, 2008).

India was under socialist-based policies for an entire generation from the 1950s until the 1980s. The economy was characterised by extensive regulation, protectionism, and public ownership, leading to

pervasive corruption and slow growth. Since 1991, continuing economic liberalisation has moved the economy towards a market-based system. By 2009, India had prominently established itself as the world's second-fastest growing major economy. The Public Authority of India is committed to raising the investment in infrastructure from its existing level of 4.7% of gross domestic product (GDP) to around 8% (PPIAF, 2008). Infrastructure shortages are proving a key binding constraint in sustaining and expanding India's economic growth and making it more inclusive for the end-user. Thus the Indian government is actively promoting PPPs in the key infrastructure sectors of transport, power, urban infrastructure, and tourism, including railways. PPPs are seen as an important tool for producing an accelerated and larger pipeline of infrastructure investments, and catching up with the infrastructure deficit in the country. A PPP Cell has been established to administer various proposals and co-ordinate activities to promote PPPs. The Government of India has established the India Infrastructure Finance Company Limited (IIFCL) as a wholly government-owned company to provide long-term finance to infrastructure projects, either directly or through refinance (DEA, 2008c). The IIFCL caters for the burgeoning financing gap in long-term financing of infrastructure projects in the public, private, or PPP sector. Any government project awarded to a private sector company for development, financing, and construction through PPP will have overriding priority under the scheme.

7.4 Environmental

A view of the current development of environmental controls enacted by various governments is closely linked to both the social and political components. A well developed impact and sustainability control regime would indicate that the PPP projects are likely to encounter more detailed scrutiny in countries with less developed controls. Europe has comparatively well developed environmental control criteria as compared to India.

7.5 Political

A strong political will from the government can only promote the commissioning of PPP projects by overcoming resistance and giving a clear signal of the government's intention to meet its contractual commitments. The political stability of government interacts most significantly with the economic and technological components. Government stability would be a necessary precursor to the private sector lending money for the PPP projects and also for the Special Purpose Vehicles (SPVs) being prepared to risk significant bidding costs in preparing a project proposal. This means managing the pressures and expectations of elected bodies, the media, and other stakeholders, which often push implementing agencies for faster delivery. While political commitment is welcome and necessary, pressures for overly optimistic timelines need to be dealt with appropriately.

The driving force in promoting PPP politically in Europe is the European Commission (EC), in particular the Directorate General "Internal Market". By incentivising EU Member States to implement PPP projects, the European Commission aims at further opening national markets to competition, in particular the sectors of transport, public health, public safety, waste management and water distribution (City & Financial, 2008).

One of the major intentions of the EC under the Maastricht Treaty of 1992 is the setting up of trans-European Networks (TEN) as a means to promote the inner-European harmonisation. The development of these networks is identified as crucial in terms of the dual objectives of the smooth running of the internal market and the consolidation of economic and social cohesion. The intention to set up this European cross-border network refers to the transport, energy and telecommunication sectors. Due to the absence of specific community rules governing PPP's in relation to TEN's, general public procurement law has to be applied. The financing of TEN's projects is mainly by the EIB (City & Financial, 2008).

Given the enormous investment requirements in infrastructure development in India, the need for a sustainable pipeline of PPP projects has become paramount. The private sector recognizes the enormous business opportunity of PPPs in India and has welcomed the government's PPP initiatives. Most of the European countries have a stable political system thus making implementation easier as compared to India which has been through political turmoil in the last decade and is now showing political stability. The private sector remains eager to see more substantive, enabling changes by government in the policy and regulatory provisions and procurement procedures for PPPs in India (DEA, 2008x).

7.6 Technological: Technological differences in the approach to project delivery

PPPs can effectively be delivered within Europe using local contractors because of the historical prevalence of large construction companies. India does not have the preponderance of large local contractors with the expertise in PPP projects as the concept of PPP is still evolving. In such circumstances the creation of joint ventures between local companies and larger international consultants/contractors will be beneficial. This could impose certain constrains due to differences in procurement regulation.

8. Conclusion

The current global financial crisis is having an impact on the funding of all capital investments, including PPP projects in all countries. Despite this, projects continue to reach financial close demonstrating that the PPP model is still considered to be robust. The success of the market in future will be a function of the ability of the public sector and the private sector lenders to respond to new challenges. The momentum in PPPs is to regain traction as conditions in the financial markets stabilise. There is no doubt that the challenging fiscal position faced in Europe will have an impact on the overall capital spending over the medium term. In India PPP is a relatively new approach to procurement and lessons could be drawn from the experiences of developed and developing countries on the conditions for the success of PPP. As a relatively late entrant in the PPP development process, India can learn and benefit from these lessons.

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Procurement Strategy as Means of Capacity Building in Sri Lanka: Architecture, Design and Labour Training

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Abstract

This paper is the second result of a study that, on the basis of a technical review carried out on a sample of ideal-type projects in Sri Lanka, is considering ways to create and link labour development opportunities through architectural design. The first outcome of this study was presented in a paper delivered at CIB-W89-BEAR 2008 conference held in Sri Lanka. Calling for an 'open' (or 'incremental') industrial design strategies aimed at connecting construction markets rather than keeping them separate, it argued that technological contamination and compromise can increase the rate of participation of the labour force to their own progressive training.

This paper presents a physical framework to test the validity of above theoretical proposition. For Sri Lanka, four systems have been specifically selected to work as socio-technical bridges: 1) steel (for welding and cutting skills); 2) concrete panelling (for casting); 3) concrete framing (for off-site casting); and 4) concrete block-work (for manufacture and assembly). Through an analysis of targeted design interventions undertaken by the author, the paper argues that by enabling proper and yet scalable labour performance in different practical environments, the strategically 'designed' use of these systems should allow the vast workforce employed in the building sector to travel across markets, improve vocational skills and better its economic conditions.

Using building projects as training opportunities without losing productivity, however, means that the technologies employed must have latitude for errors and non-optimal application - i.e., they must be inherently 'robust' as opposed to precise and therefore more 'sensitive'. This requires training strategies to be planned and their socio-technical parameters to be defined at an early stage of the building procurement process. In other words, the seemingly fragmented processes of 'design' and 'construction' must be brought together by recognizing alternative procurement strategies that naturally establish links between different industrial actors, social agencies and building delivery networks.

Keywords: architectural design, labour training, robust technology, procurement process, developing countries

1. Robust Technology: Creating opportunities for cross-industrial design

In fast urbanizing countries such as Sri Lanka, the inexorable rural-to-urban migration trends have resulted in a steady flow of informal workers to the construction industry, where, for the migrants with limited or no knowledge on the formal-sector work, the low-cost and low-skilled construction activities provide an easy entry point into the informal job market. Reciprocally, the knowledge base of this largely informal construction workforce is confined to the degree of technical complexities available within the construction activities of low-cost building markets. In order to move into a more technologically-advanced building market that could offer them better economic remunerations, these workers must find ways to acquire new knowledge and build incremental skills.

However, without adequate knowledge-building platforms – both formal and informal – the migrant workers tend to be confined forever into the low-skilled building markets that they first entered as unskilled labour. This has led to a technological fragmentation of the construction industry by establishing further restrains for training, know-how and carrier development paths, and subsequent limitations in internal knowledge dissemination and technology transfer. Such type of industrial compartmentalization is detrimental to the social acquisition of skills, and restricts the operational frameworks of given technologies (Pathiraja and Tombesi, 2009).

Facilitating socio-economic growth of construction labour force then rests on the industry's ability to implement knowledge-building platforms to help workers overcoming the '*technological barriers*' generated by their own skill limitations. More specifically, targeted and incremental skill-development opportunities will have to be established for workers trapped in insular socio-technical pockets to learn specific skills that would enable them to move into building markets of higher socio-technical and socio-economic capabilities. In such light, the knowledge-building process must be treated as a way of '*bridging-up*' the knowledge gap between different construction markets by targeting specific trade-based skills that must be acquired by workers to transcend into the next socio-technical level.

A position taken up by this paper on workforce development looks at whether above '*technological bridging*' can be achieved through the building procurement process; in particular, can real building projects be used as training grounds for labour development, thereby re-visiting the traditional on-the-job training conceptions, but realized within a more formal and industrially-organized framework.

This proposition rests on three technical attributes that must be acknowledged during the building design stage. Firstly, the building design should incorporate technological applications that offer training opportunities to build targeted skills to a given labour group. Secondly, technical and cultural conditions that must be in place for successful implementation of training interventions must be addressed during the initial project conception. In that respect, conditions such as the nature and extent of the training program, the physical site where the training task is to be performed, the minimum working module required to build the specific skills, the minimum work gang needed to carryout the up-skilling tasks, etc., must be dealt with at the building design stage. Thirdly, the

building design should be conceived in such a way that the overall outcome of the project is not compromised due to the on-site training interventions. In other words, workmanship errors that may transpire during the skill-building tasks should not lead to a chain of failures in the performance of the final product, neither formally nor environmentally or mechanically.

Accordingly, for building projects to be used as training opportunities without compromising their productivity, technological systems with latitude for errors and non-optimal application must be employed - i.e., they must be inherently 'robust' as opposed to precise and therefore more 'sensitive'. To this end, it is considered advisable to recognize that technological contamination and compromise can increase the rate of participation of the labour force to their own progressive training. What is proposed, in other words, is the definition of a broad technological framework at industry level that is both flexible and adaptable, and can therefore be used to expand the options available within any given project, helping the latter perform as training grounds.

2. Four building systems as qualifications for cross- market application in Colombo

In practical terms, however, the task of envisaging real building projects as labour training opportunities will require the identification of building trades and systems that are best suited to support such process in the first place. In that respect, the targeted capacity-building process should be undertaken as a bottom-up approach by investigating and ascertaining the building systems and processes that are most relevant to the local socio-technical, socio-economic and socio-cultural context; economy of scale, sustainability issues, existing technological traditions, labour divisions, local needs of production, etc, will naturally dictate terms in such analysis. Clearly, the training applications should be demand-led because the targeted up-skilling process should not only lead to better job opportunities for construction workers, but it should also build the capacity of the industry to deal with its rapidly increasing spatial, cultural, and environmental challenges.

In selecting possible building systems for '*cross-industrial*' design in Colombo, therefore, two main parameters have been considered. The first parameter looks at the validity of such capacity building process to the long-term social, economic, and environmental aspirations of the society. For example, the building systems that use scarce, expensive, and labour-intensive materials and processes were avoided to make the subsequent training applications relevant to the speed and scale demanded by the local building delivery needs. The second parameter concerns with the existing distribution of material usage in different building markets. In particular, to support workers progressing into construction markets of higher cultural and economic capabilities, building trades and processes that have the capacity to travel across the industry were selected for the targeted skill-building applications.

Accordingly, for Colombo, four systems have been specifically selected to work as socio-technical bridges: 1) steel, 2) concrete panelling, 3) concrete framing, and 4) concrete block work. More specifically, the training interventions proposed for steel works have targeted the development of welding and cutting skills of un-skilled steelworkers; the local knowledge on component casting have

been the focus of up-skilling strategies based on concrete panelling and concrete framing; the blockwork-related training tasks seek out to widen manufacture and assembly skills for building systems that use modular cement blocks as their primary building component.

Once the suitable building systems and trades have been identified, a series of design interventions were undertaken by the author to determine the validity of the proposed cross-industrial, labour-training strategy from a design point of view. These design projects were set in construction markets of different economic and technical complexities so that a scalable intervention of proposed training opportunities – or '*socio-technical bridges*' - can be realized. Due to space limitations, this paper will only look at the application of steel welding skills in the proposed cross-industrial, skill-development strategy.

3. Capacity building through '*Technological bridging*'

In short, the purpose of the selected design interventions was to conceptualize, develop and incorporate '*scaled*' labour performances of afore-mentioned building systems so that they could be applied across different building markets, thereby establishing an incremental knowledge-building platform. This required building systems to be designed to respond to the task of '*technological bridging*' as determined by the labour up-skilling needs of the industry as a whole, in addition to addressing the formal, environmental, and structural objectives of the immediate project.

The graph in Figure 1 illustrates the results of the above process with respect to the use of steel welding applications. The horizontal scale in the graph presents the technical complexity of a task associated to the subsequent steel welding and cutting skills proposed for different socio-technical levels; the complexity of a task increases with the level of information and the quantity of tools required for its successful application. The vertical scale of the graph relates to the subsequent degree of manual skills demanded from workers to perform a given task. The dotted blocks shown in the middle of the graph define the extent of technological possibilities available in different construction markets (or almost-insular, socio-technical fragments of the industry); the conditions where these blocks overlap represent knowledge interfaces common to two different socio-technical pockets.

The graph thus represents a social matrix (and a technical ladder), where the skills and technical complexities built into a series of steel welding joints is epitomized in a scalable paradigm. More crucially, it also denotes a possible knowledge-building path for welders with different skill levels; one could move from one project to another – and therefore, from one construction market to another - by using the subsequent welding systems as opportunities for incremental knowledge building.

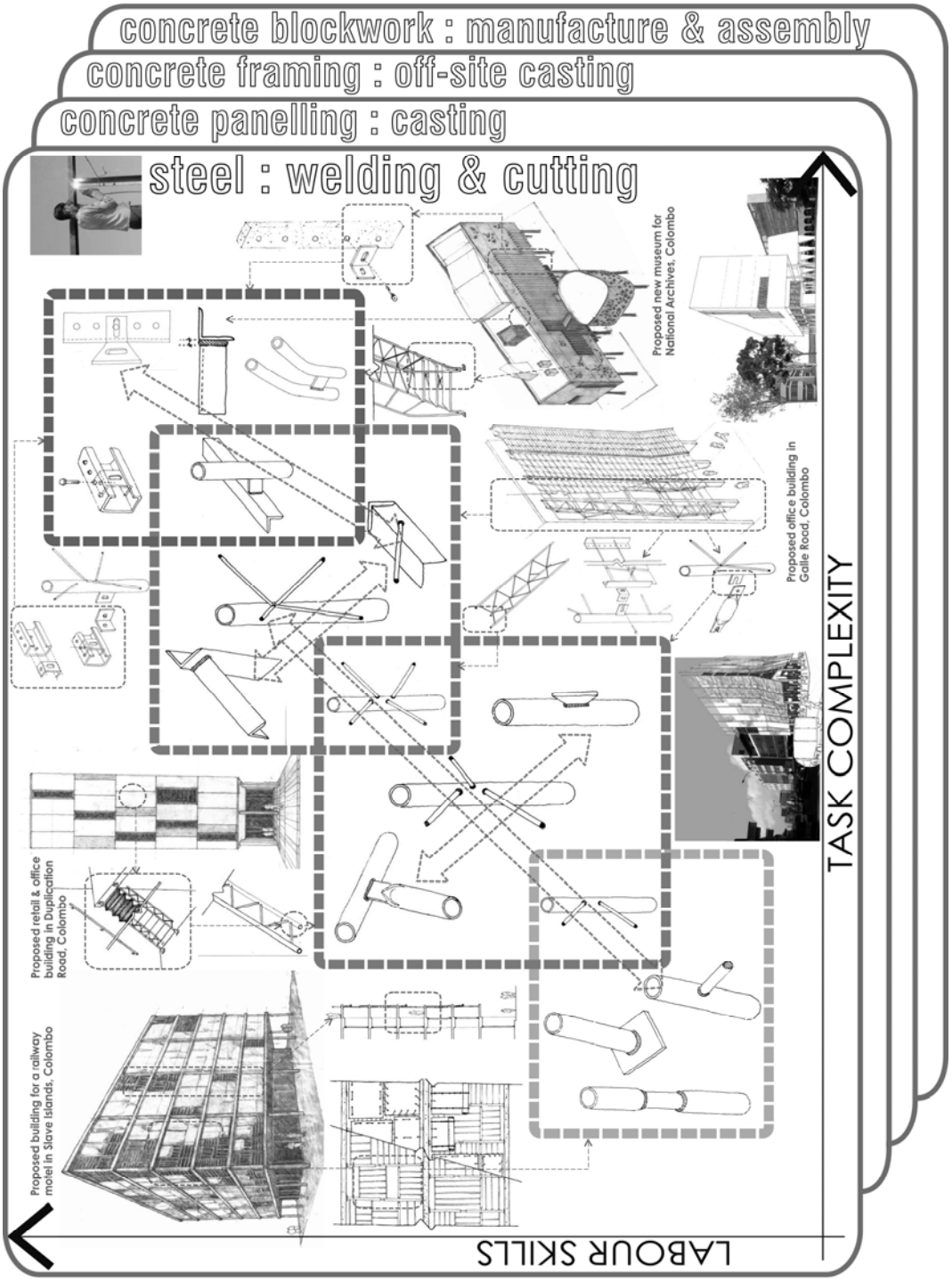

Figure 1: Cross-industrial labour up-skilling strategy for steel welding and cutting tasks

For example, one of the jointing systems proposed for the lower end of the technical ladder focuses on welding a steel reinforcement bar to a steel tube using a ‘tee’ joint. As such, the firsts of these

interventions looks at the application of basic welding skills as a way of introducing unskilled workers to the particular trade. The 'tee' joint, for example, is one of the most fundamental forms of welding joints and allows a connection between two members, which are located approximately at right angles to each other in the form of the letter T.

The above materials and jointing system are then incorporated in a façade screening system - proposed for a Motel building in Colombo – with the intention that the subsequent facade building process can be used as a training platform. This process of designing building systems to accommodate targeted knowledge interventions, however, has to be supported by other formal and technical strategies so that they would not subject to failure chains, structurally as well as economically. The above facade-screen system, for example, has been designed with the possibility of using motel balconies as micro-construction sites, thus averting the need for additional capital input in terms of space and resources for fabrication and training tasks. The structural performance of the system is strengthened by early design decisions to impinge on easy and flexible joints that can be executed well by unskilled workers following a modest up-skilling process; the formal errors that may transpire during the training process are subdued by the use of particular design tolerances.

Then, in the higher up of the technical ladder – in the third socio-technical pocket to be precise - a jointing system that uses the same materials but welds four re-bar joints to a steel tube is conceived for a vertical truss that holds a self-moving, sun-shading panels of a Commercial building. In between these two joints, however, a series of other jointing systems have been proposed to work as '*technical bridges*'; the welder who works in the Motel project can use these intermediate systems to acquire the skills necessary to move into the higher construction market and perform the joint designed for the Commercial building. Incidentally, these intermediate jointing systems have also been incorporated into building systems proposed for real building projects, thereby subjecting the latter to be used as training opportunities.

As such, by enabling proper and yet scalable labour performance in different practical environments, the strategically 'designed' use of these systems could allow the vast workforce employed in the building sector to travel across markets, improve vocational skills and better its economic conditions. By proposing such an organic knowledge-building platform, I argue that architectural design in general, and real building projects in particular, could constitute a vehicle through which labour development opportunities are created and linked.

4. Robustness by constituency: Ability to respond to social and cultural differences in building procurement

Proposing such an organic skill-development strategy is one thing, but making it to work with the real-world building procurement conditions is another. In particular, the application of such on-site labour training strategy will have to overcome the fragmented nature of building production process that has yielded into varied patterns of information flows. For more clarification on this regard, I turn to Turin (2003), who sums up various building procurement approaches into four main categories: (1) '*one-off*' approach, (2) '*component*' approach, (3) '*model*' approach, and (4) '*process*' approach.

Accordingly, '*one-off*' approach is desired for '*unique-product*' production, where the product is generally sold before it is produced; the producer agrees with the product conditions specified by the designer to client's requirements before the production is started. In the '*component*' approach, the manufacturer takes a dominant role in the production process by being in charge of interpreting user requirements, product design, production information, and the execution of production. This leads to a reduction of the contractor's involvement in the assembly stage as mass-produced components are directly assembled by the manufacturer on site. The '*model*' approach, on the other hand, gives authority to the contractor to oversee the production process. According to Turin, the fundamental difference between this procurement approach and the previous method is that, in the '*model*' approach, "*it is the collective final product that is standardized whereas in the component approach, standardization applies to parts*" (Turin, 2003). Finally, the '*process*' method differs from all the other approaches by establishing the project team well before the design stage; the early designation and involvement of the contractor/manufacturer lead to the establishment of a '*more coherent team*' from the very beginning of the operation (Turin, 2003; see also Drucker, 1963).

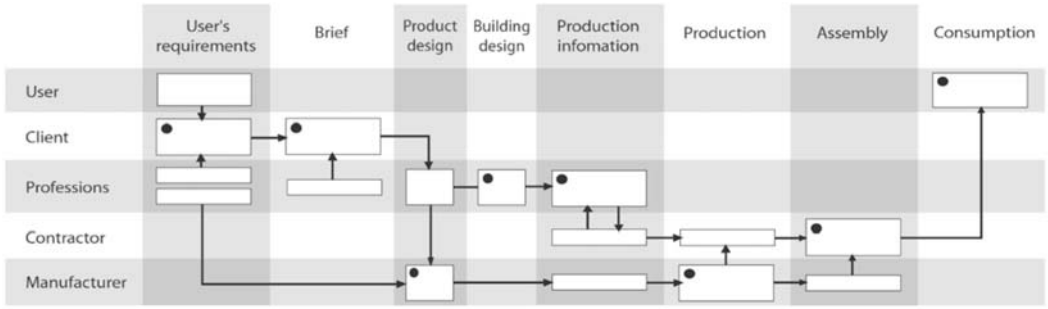

Figure 2: 'One-off' procurement path (Turin, 2003)

Such fluctuations in the social organization of building process suggest that a closer scrutiny is needed to understand how the proposed labour-training function can be incorporated into building production. For example, the application of Turin's '*one-off*' model tend to be selective in countries like Sri Lanka, where only the higher-end construction markets and state-commissioned public work can afford appointing an independent team of professions on a fee basis to undertake the design task. In addition, the responsibility of product design and the gathering of product information, which are seen as the designer's prerogative in Turin's elucidation of '*one-off*' approach (Figure 2), tend to shift into the realm of other actors; for typical commercial buildings in Sri Lanka, the contractor usually develops the product information, even if a design professional had undertaken the task of building design (Figure 3).

This, in-fact, is generally the key setback in the '*one-off*' method: there is a lack of integration across the production process due to the apparent separation of design and construction tasks. Such structural deficiencies in the building procurement process can be detrimental to the application of proposed labour-training strategies. For example, having minimal input of contractors to the design process hinders the opportunity to incorporate the contractor's incentives and technical premise for the design of future training interventions.

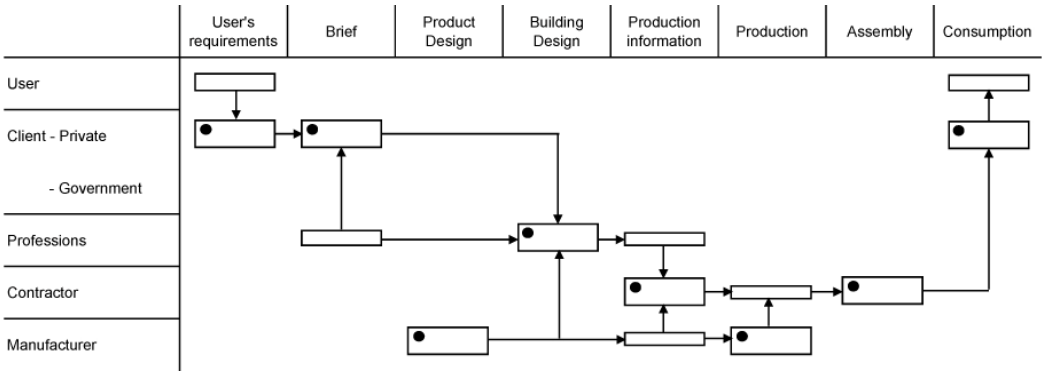

Figure 3: 'One-off' procurement path in a typical Commercial building, Sri Lanka

It may also be required that, during the building design stage, additional economic and performance incentives to be built into the technological systems, in order to lure contractors and manufacturers to the proposed labour-training interventions. Within such premise, not only that the scope formulation for training tasks becomes the design professions responsibility, they must also bring in contractors and manufactures into the design process – formally or informally – thereby undermining the traditional information flows of '*one-off*' procurement approach.

Out of Turin's other procurement paths, the highly mechanized '*component*' approach is rarely followed in Sri Lankan construction activities, mainly due to its dependence on a high degree of specialization on the part of the manufacturers. On the contrary, procurement strategies similar to Turin's '*model*' approach' is widely used in Sri Lanka, where it is a common practice to offer a contracting organisation the sole responsibility of design and construction of a project. The fact that one actor undertakes the whole operation within a single policy - thereby integrating design and construction - may provide greater opportunity to facilitate training needs. However, any such investment on the part of the contractor may need to be justified in economic terms. More significantly, the design professionals input in such interventions – in particular, the formulation of training tasks and the subsequent delineation of workmanship tolerances - will have to be recognized and facilitated.

By taking into consideration the afore-mentioned social conditions and relationships of the current building procurement models, and the subsequent need for their re-structuring to accommodate labour-training aspirations, I have developed an alternative model that brings in the task of labour-training as a key prerogative of the procurement path (Figure 4). I envisage this to incorporate a series of structural variations to the standard '*one-off*' and '*model*' processes, which, as mentioned above, are generally the more widely sourced building procurement approaches in the fast urbanizing economies.

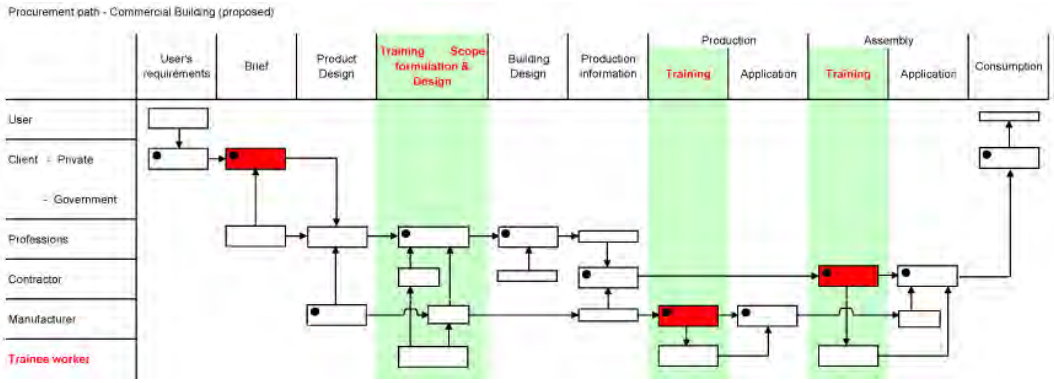

Figure 4: Proposed 'training-oriented' procurement path for a typical Commercial building, Sri Lanka

Firstly, I call for the introduction of a new procurement phase called '*training scope formulation and design stage*', which brings together different actors – directly or indirectly - under the task of defining the technical and cultural scope of future labour training applications. This moves from the hypothesis that the most suitable scenario to incorporate labour-training as an on-site production activity may require bringing the key actors into the production process as early as possible. It will allow the actors to formulate training strategies collectively, and incorporate individual's incentives and qualifications for labour training within a singular policy and process.

Secondly, it becomes important to bring in construction workers – especially '*trainee workers*' – as a major party involved in such a training-oriented procurement path, because their contribution is critical to the production/training process as well as to the finished product. Thirdly, it must be recognized that design professions bear greater responsibility in setting up training parameters and the subsequent definition of workmanship tolerances and conditions, thereby allowing training programs to be implemented without compromising the productivity of the building outcome. The design professions' continuous involvement across various procurement stages - from brief definition to the gathering of production information and execution - therefore, is critical to such a training-oriented building procurement strategy**.** Finally, the leadership role that the contractor and manufacturer could play in the implementation of training tasks – either at the construction site or at the production yard – must also be recognized and accommodated within the targeted procurement frameworks.

5. Towards 'robustness' in technology: Pre-empting counterarguments

However, in appropriating the proposed training-focused procurement strategy for building production, one of the fundamental questions that need closer scrutiny is: how can such a socio-conscious process be an advantage within conventional market conditions, where individuals are supposed to attempt maximising their own advantages? A more structural question lingers on the ability of varies parties taking part in the production process to gain a profit – either economic or cultural - through a market transaction that exchange labour training via production of durable goods. What are the incentives for contractors and manufacturers to invest their time and money in facilitating labour training at their assembly and production sites? Can clients – both public and private - reap benefits by allowing their building projects to be used as training grounds for skill development? Does such organic knowledge building process possess enough scope and effectiveness

to make the industry and the state become involved – either directly through project implementation or indirectly via regulatory interventions? More importantly, would the design professionals themselves be enticed to embrace such process?

5.1 Building '*labour-training*' incentives for contractors, manufacturers & clients

For contractors and manufacturers who often function in an arena of impetuous market conditions, incentives for facilitating labour training will have to be both economical and performance-related; the differences between capitals gained by reducing the use of skilled labour and quality thus compromised can be bridged by adequately planned on-site training applications. If training becomes integral to the production process and built into the immediate product output, the resultant product can be durable and cost-efficient, both of which are marketable propositions for contractors and manufacturers; cost-effectiveness and good performance could collectively contribute to a marginal attractiveness of certain products over others, thereby elevating internal labour training as a plausible market strategy.

In addition, contractors can also maximize the productive value of their labour by proper internal up-skilling processes. This becomes increasingly important in the light of structural changes to traditional labour divisions, where workers now tend to be either self-employed or find work through labour sub contractors as opposed to being attached to a labour gang headed by a master builder (and learning building skills through informal apprenticeship process). The subsequent structural limitations caused by the scarcity of skilled workers could lure contractors into supplementing on-the-job training programs. If planned properly, therefore, internal up-skilling can maximise the productivity of one's investment, and consequently maximize the profit obtainable from the sale of one's goods.

Identifying incentives for private clients to supplement training programs is rather a complex phenomenon. One alluring factor, of course, is economy of scale as explained above; cost-effective use of unskilled workers through suitable up-skilling strategy could confer a financial advantage over alternative products and processes available in the market. Clients could also be lured into labour up-skilling through government interventions such as tax concessions, tender regulations, community reward schemes, etc. Simultaneously, socio-economic incentives – as opposed to mere profit-oriented objectives - can also be promoted by encouraging a cultural appreciation of the building's ability to mitigate social costs. On the one hand, labour training can be projected as a collective responsibility of the society that ought to be supported through building production process. On the other hand, a sense of environmental responsiveness through proper application of technology, which in-turn be made possible through proper technology transfer at the building site, can be induced into most building activities.

5.2 The role of industrial and institutional actors

From the standpoint of the building industry, however, supporting such process gives multiple advantages. Out of these, most crucial is the ability to build industrial capacity to address diverse construction challenges thrust upon it. In the countries of the developing world, where urbanization patterns and regional restructuring trends have contributed to an array of spatial problems including scarcity and inadequate performance, and where financial capacity to implement formal training programmes is inept and negligent, the development of an organic knowledge-building platform is much needed, to say the least.

The benefit to the state by implementing such process is equally prominent. On the one hand, it gives them an opportunity to use individual buildings for industrial and regional development by adapting them into training grounds for workforce development. On the other hand, by instigating a proper knowledge-building platform, construction activity can be projected as a possible employment generation opportunity for the vast unemployed of the society. In such context, both the industry and the state should bear the responsibility to play an important role in facilitating industry-organized labour training structures. In particular, the government's general role as a major client of the construction industry can be used as an opportunity to regulate the proposed labour-training strategy as a key procurement practice in a country.

An additional barrier to the implementation of such alternative procurement methods, however, could come in the form of lending institutions, which tend to safeguard their interests by dictating the methodologies that the burrowers should follow. The procurement route is one such area where their advice is focused (Rameezdeen & De Silva, 2002). Especially in major construction projects that are funded by foreign aid, the client's choice in the selection of procurement method can become secondary to conditions of the financial contract. It is necessary, therefore, to build new incentives into the financial structure when projects are funded by organizations such as World Bank or Asian Development Bank, so that labour-training can be projected as a prerequisite of the building process.

6. Conclusions: Labour-policy making capacity in architectural design

In summary, what I have depicted here is a theory of how architects can build labour policy making into the design of their buildings. The traditional function of architect within the '*one-off*' procurement model reflects a social separation of design and construction, where the building design is seen as the prerogative of architect's office, while the assembly at site is treated as the contractor's domain. This fragmentation is detrimental to an on-site skill-development process, because training strategies and consequent workmanship tolerances need to be determined well before the building design stage, and proper communication between different parties would allow this to be pursued effectively as well as economically. At the same time, the architect's intervention throughout design and production stages is paramount, for the tolerances will then have to be incorporated in to the building design to avoid structural, environmental or formal failures in the finished product.

'*Design*' and '*construction*', therefore, ought to function simultaneously if labour policy-making needs to be built into architectural production. To realize this objective, architects must develop a flexible influence over the operations of the building process. The term '*flexibility*' is the key here, because the idea is not to dictate terms of production, but to intervene positively depending on various constrains and potentials of particular procurement processes. What is crucial for such a depiction of architect's role is the function of '*design*' in building production. In particular, building design ought to be thought as a problem-solving exercise, aimed at servicing the production process by intervening - physically and intellectually – in its different tasks and operations, including the design of '*training*' tasks.

However, for a process like this to be accepted, in order for it to flourish, it takes more than architects wanting to get the job done; the success of this framework lies in its ability to build organic links between various parties of the construction process by advocating of partnering and restructuring the networks of clients, design professionals, contractors, manufacturers, policy-makers, legislating authorities and consultant institutions. At a theoretical level, it also becomes necessary to switch the analysis from building as an economic transaction to design as a cultural activity and technical process. Such reflection of the building activity could bring forward the argument that, for competent performance of the building industry, positive interventions to the realms of labour and technology are essential.

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Construction Partnering – Is Relationship Agreement better over Traditional Practices?

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Abstract

In contrast to traditional partnering approach, relationship agreements provide an alternative delivery method in which all parties work together as a cohesive team to achieve an agreed outcome, and boast a range of advantages that have yet to be realised by the wider construction industry. The objective of this study was therefore to better understand the concept of relationship agreements by identifying advantages, limitations and critical factors in relation to traditional approach leading to success of the delivery method. A questionnaire survey was designed to test the respondent's perception of advantages, limitations and factors critical to the success of relationship agreements. Based on the quantitative analysis of the data received from 97 valid responses in the survey, the research was able to generate a range of results that support and contradict those found in previous studies. It was concluded that while Relationship Agreements may not be as time efficient as Traditional Procurement Methods, the integrated management team has a number of advantages. The results achieved in the study highlight a number of advantages and limitations in relationship agreements.

Keywords: relationship agreements, critical factors, project success, advantages & limitations

1. Introduction

Perhaps the most recognisable characteristic of the construction management industry is its bullish mentality towards standard forms of project procurement. The idea that “your profit loss is my gain” is entrenched throughout all standard procurement methods and can only be seen as counter-productive as it generates a variety of inefficiencies during project delivery. While this problem exists on an international level, the following study has been based on medium to large scale developments in the Melbourne construction industry.

The bullish mentality displayed in the construction industry often results in a difference of opinion on project issues escalating into disputes and claims with informal adversarial attitudes (Jones 2001). The conflict will then result in unnecessary cost and time delay to the project which could otherwise be avoided. Previous studies have shown that errors by the contractor in the preparation of a tender price and uncertainty of design at the time of tender can result in substandard quality of workmanship (Naoum 2000). Anecdotally, an earlier involvement of an integrated team potentially assists in reducing conflicts among the project partners. Relationship Agreements adopt a project management process in which all parties work together as a cohesive team to achieve an agreed outcome. Rather than penalising non conformance with the threat of liquidated damages and excessive variation claims, etc; participants in a relationship agreement will generally receive a share of profit that is determined by the overall team performance. Critical attributes of relationship agreements include accelerated delivery times, reduction in conflict, appropriate risk allocation, informed decision making and a reduction in the overall project cost. Previous studies have shown that sharing of a profit margin ensures team decisions result in a “best for the project” outcome, rather than that of the individual parties, therefore forming the primary theory behind Relationship Agreements (Rahman and Kumaraswamy 2002).

Relationship Agreements can be seen in both the form of a Project Alliance and Partnership, while the notion of partnering is well understood. The idea of a Project Alliance is a relatively new concept and unfamiliar to many working in the industry. Previous studies indicate that three factors critical to the success of Relationship Agreements include the establishment of the Joint Risk Management team to effectively manage the project risks (Rahman and Kumaraswamy 2002), ensuring team member trust and are confident in one another’s abilities (Wong and Cheung 2005) and establishing open and reliable lines of communication between team members (Ross 2006).

Although the theory behind Relationship Agreements remains relatively simple, previous studies have shown that a lack of trust between parties and a difference in opinion on resolving disputes may jeopardise an otherwise successful project and cause an unwarranted market perception of the particular procurement process (Bresnen and Marshall 1999). In consideration of the above findings, this study proposes to unveil the perceptions of the industry, identifying the pros and cons of relationship agreement in relation to traditional approach and thereby highlight the key distinctions of the critical factors in achieving project success.

2. Background review

Partnering has been viewed as an effective tool in successful delivery of projects across many countries including UK (Naoum 2003; Wood and Ellis 2005), Europe (Williams and Lilley 1993), Hong Kong (Rahman and Kumaraswamy 2002) and Singapore (Kwan and Ofori 2001). There is an increasing perception that partnering could help managing risks and uncertainties and thereby improve productivity in projects (Bresnen and Marshall 2000; Chan 2001; Cheung et al. 2006). Given the nature of modern construction projects where involvement of multitude of contracting parties result very high risks, partnering based on relationship agreements and cooperative teamwork perceived to be an effective medium for managing conflicts between diverse participants (Rahman and Kumaraswamy 2002).

Traditional procurement methods generally produce a culture of defensiveness, with each party spending significant amounts of time on money on protecting its contractual position. Even where the parties are on relatively good terms, management cost will include full detailed documentation in the case of dispute (Jones 2001). In case of a dispute, the general focus of each party is on blame allocation, rather than finding a workable solution for the problem. The constant threat of a dispute arising creates a defensiveness in the general context of contractual negations in which each party attempts to transfer more risk onto the other.

Traditional delivery methods generally select the lowest tender bid in order to reduce the costs associated with the project, however, it is often the case that lowest tender bid is incorrect. Incorrect tender bids, combined with management decisions to exclude profit and even overheads when desperate to win a tender, can result in contractors work being of substandard quality. Incorrect bids may also result in the contractor pursuing claims and inflated measurements to recover losses, both of which can result in disputes between the contractor and the client, causing unwarranted cost over-run and program delays to the project (Naoum 2000).

A lack of vision on behalf of the client and failure to take into account any factors other than the tender price can also lead to substandard quality of the work and poor OHS practices if the contractor selected is not experienced or suited to the particular project. Traditional Procurement Methods may also result in a lack of value management and design innovation as builders are restricted to pricing a predetermined solution with specific products. Much focus is placed on liquidated damages and performance security which provide only negative incentive to perform with little focus on rewarding the contractor for completing the project ahead of schedule. At most, liquidated damages ensure compliance with the minimum contractual requirements, with little reward for outstanding work or to encourage to the contractor to strive for and excellent result (Jones 2001).

In contrast, Relationship Agreements embrace a wide range of approaches to managing the owner-constructor relationship based on the recognition that there is a mutual benefit in a cooperative agreement (Jones 2001). An integrated project team is assembled early in the project phase, who eventually share in

a profit determined by the overall project outcome, decisions are therefore made on a best for project basis. The two most common forms of Relationship Agreements include Project Alliances and Partnerships.

Partnerships in Australia have generally been formed on a typical contractual agreement with an overlying detail confirming the relationship agreement. This could, for example include both parties signing a typical AS4000 contract with an executed agreement placed over the top of the contract, confirming the details of the relationships (DTF 2006). In the past, partnerships that have been established in this fashion have experienced limited success, as confusion remains over precedence of the documents (Ling *et al* 2006). While many partnerships have been successful on projects that have not required dispute resolution, when a dispute erupts, parties tend to refer back to the traditional contract rather than the overlaying relationship agreement, therefore ignoring the benefits associated with the executed Relationship Agreement (Ngowi 2007; Wong and Cheung 2005).

In contrast to Partnerships, parties that participate in a Project Alliance sign a formal agreement that explicitly states the terms and conditions of the alliance, therefore leaving no confusion of the contractual terms (Jones 2001). Alliance agreements have experienced success in Australia on projects that have been fast tracked. However, such projects still evidently suffer from ill-defined risks and many unknowns (Ross 2006).

The structure of Relationship Agreements involves a collaboration of owner and non owner participants to deliver the capital project, with all participants sharing the responsibility for the project risks and for achieving project outcomes. The project model creates a commercial framework where all participants will win or lose, depending on their collective performance against agreed project objectives. This then creates incentive to achieve project objectives and a “best for project” focus among the participants (Cheung et al 2006).

Having reviewed the characteristics and key structure of the partnering arrangements, diverse views on pros and cons of partnering agreements in relation to getting best values in projects emerge. However, a clear consensus in terms of understanding the relationship agreement among wider project stakeholders and its links to the successful project delivery is not quite widespread in the past literature (Cheung et al 205; Jones 2001). The objective of the study was therefore designed to better understand the concept of Relationship Agreements by identifying advantages, limitations and critical factors leading to success of the delivery method. The aim is limited to the investigation and evaluation of the potential advantages and limitations involved in relationship contracting.

3. Research methodology

The survey method was adopted to test the hypotheses proposed in this study. A questionnaire survey was designed for respondents to assess the performance of a project that they had participated and to evaluate

the influence of the variables in measuring respondent's perceptions of the advantages and limitations of Relationship Agreements. The questions were phrased to ask the respondents an affirmative response on the relevant indicators impacting the success of relationship agreements in project. Respondents' profile and the project information were also collected in the survey.

Before undertaking an industry-wide survey, a pilot study was conducted among a five member focus group explaining the research intents and the questions in order to validate the contents for accurate translation of the overall model construct. Based on the feedback received, the questionnaire was refined and the ethics clearance was obtained from the University Ethics Committee for conducting the industry-wide survey. The preliminary data was collected from a total of 43 medium to large construction firms in Australia. The target population of the survey in this study was contractors, architects, consultants and owners involved mostly in infrastructure, residential and commercials projects.

Table 1: Summary of respondents' profile

Filed of work		*Experience (years)*		*Project budgets ($ million)*	
Contractor	*58%*	*<3*	*21%*	*<5*	*2%*
Architect	*10%*	*3-5*	*24%*	*5-20*	*11%*
Consultant/Designer	*19%*	*6-10*	*29%*	*21-50*	*8%*
Owner/Developer	*13%*	*11-21*	*22%*	*51-100*	*47%*
		>20	*4%*	*>100*	*32%*

Table 1 shows the respondents profile in terms of field of work, years of experience and project size. Total 150 questionnaires were mailed out or hand delivered to target participants involved mostly in the senior management teams and 97 valid responses were returned. Among the 97 respondents, 56 are contractors, 10 are architects, 18 are consultants or designers and 13 are owners or developers. A response rate of 64% has been considered as extremely successful as this exceeds the 37% threshold of the suggested response rate of a survey of this kind (Stevens 2002). Such a response rate was primarily due to the selection of the sample and the interaction between the researcher and the respondents in confirming willingness and participation in the study. The valid dataset was then analysed on SPSS software.

4. Data analysis

Determination of a suitable analytical tool for testing the data is an important first step for achieving research success. In order to derive the advantages and limitations in relationship agreements, a number of analytical tools were used namely descriptive analysis, bi-variate correlation, independent t-test and factor analysis. However, due to sake of brevity, the analysis and results of descriptive analysis and independent t-test are only discussed in the following sections.

4.1 Descriptive analysis

A descriptive analysis was used to graphically represent the breakdown in respondents, and demonstrate the basic statistical distributions of the responses on selected variables. Based on the past literature, a range of variables were identified across both Relationship Agreements and Traditional Procurement Methods. The review of the mean values of the respondent's responses from Relationship Agreements and Traditional Procurement methods indicates the importance of each variable and highlights any advantages or opportunities for improvement for each procurement technique.

Table 2: Top five Mean Scores

Rank	*Relationship Agreements*		*Traditional Agreements*	
	Variable	*Mean*	*Variable*	*Mean*
1	*Team member build a broad range of skills*	*4.25*	*Team member pro-active in resolving problems*	*3.61*
2	*Team Environment = informed decision making*	*3.94*	*Team member understand Risks*	*3.55*
3	*Delivery method = best for project outcome*	*3.89*	*Team member build a broad range of skills*	*3.48*
4	*Team member understand Risks*	*3.78*	*Delivery process = high quality workmanship*	*3.39*
5	*Team member pro-active in resolving problems*	*3.78*	*Delivery process = high quality individuals work*	*3.26*

Table 2 shows the list of the five variables in the survey with the highest mean scores from both Relationship Agreements and Tradition Procurement methods and therefore could be interpreted, on a basic level, as the most important variable for each procurement method. Although some variables appear to be common to both Relationship Agreements and Traditional Procurement Methods, an adequate contrast was also found among each management technique. Although some variable were same for both management techniques, their mean scores were quite different. Thus, a comparison of mean score has been reviewed using the T-test analysis. It is also noted that all five mean scores from Relationship Agreements are larger than the means displayed for the top five Traditional Procurement variables.

The results in Table 2 support the literature by Ross (2006), as the most important variable for Relationship Agreements, with a mean score of 4.25 (above agree), was "team members are able to build on a broad range of skills". This result highlights the benefit of the integrated project team established by Relationship Agreements and suggests that in removing the adversarial nature present in many Traditional Procurement methods, team members are able to learn important skills from one another.

The second most important variable was that the "team environment consistently resulted in informed decision making" with a mean score of 3.94 (agree). One would expect that constant interaction between team members is an advantage of Relationship Agreements as it not only results in informed decision making but also enables team members to build on a broad range of skills. The third ranked variable for Relationship Agreements was "The project delivery method consistently results a best for project outcome" with a mean score of 3.89 (agree). This variable is an obvious advantage in the agreement structure and the result confirms its importance in comparison to other believed advantages (Ross 2006).

"Team members understanding the project risks" was the forth most important variable, with "team members being proactive in resolving disputes" the fifth with means of 3.78 and 3.78 respectively. While both variables ranked in the top five of importance for Relationship Agreements, it is difficult to see any particular advantage for the management technique as both variables also ranked in the top five for Traditional Procurement Methods, with the mean scores being relatively similar for both. From the above, it is difficult to confirm the findings of Rahman & Kumaraswamy (2004) as members in Relationship Agreements didn't report to have any greater knowledge of the project risks than participants in Traditional Procurement Methods.

The traditional procurement column in Table 2 suggests the two most important variables for Traditional Procurement Methods are "team members being pro-active in resolving disputes" and "team members understanding project risks" with mean scores of 3.61 and 3.55 respectively. As discussed above, both variables were also ranked of importance by participants from Relationship Agreements with the mean scores being similar for each. It is difficult to draw on any specific advantage, however it should be noted that participants from Traditional Procurement Methods perceive both variables as the most important in terms of ranking means.

The third most important variable identified in Table 2 was "team member building on a broad range of skills with a mean score of 3.48. Again, this variable was included in the top five for Relationship Agreements, however, the mean scores are considerably different. The mean score for Relationship Agreements was 4.25, considerably higher than the mean score of 3.48 from Traditional Procurement Methods. The results suggest that while the variable is important to both management techniques, it is considerably more important for Relationship Agreements than Traditional Procurement Methods.

The forth and fifth most important variable for Traditional Procurement Methods related to "quality of workmanship" and "quality of the individuals work", with mean scores of 3.39 and 3.26 respectively. The findings regarding quality did not support the previous studies by Jones (2001), who suggested the quality of work in Traditional Procurement Methods suffers due to method of selecting a preferred tenderer.

Table 3: Limitations and Opportunities

Rank	*Relationship Agreements*		*Traditional Agreements*	
	Variable	*Mean*	*Variable*	*Mean*
1	*Lack of communication leads to inefficiencies in project delivery.*	*2.09**	*Lack of communication leads to inefficiencies in project delivery*	*2.26**
2	*Project delivery process could be reviewed to be more time effective*	*2.33**	*Lack of trust leads to inefficiencies in project delivery.*	*2.32**
3	*Project delivery process could be reviewed to be more cost effective*	*2.42**	*Project delivery process could be reviewed to be more cost effective*	*2.77**
4	*Lack of trust leads to inefficiencies in project delivery.*	*2.78**	*Milestones are delivered on budget*	*2.97*
5	*Disputes arise from a difference of opinion in the project team*	*3.00**	*Project objectives are achieved through the use of incentives*	*2.98*

* Inverse of actual mean score recorded due to structure of question on the survey.

Table 3 highlights the five variables that received the lowest response from the participants. From the table we can identify the three variables that were common for both Relationship Agreements and Traditional Procurement Methods. They are 'Lack of communication leads to inefficiencies in project delivery', 'the project delivery process could be reviewed to be more cost efficient' and 'lack of trust leads to inefficiencies in project delivery'.

Reviewing the above suggests that the integrated project team established by Relationship Agreements does not necessarily lead to reliable communication between the project team, and therefore, could not by identified as an advantage of the delivery method. Further to the above, Table 3 suggests that Relationship Agreements are not necessarily more cost efficient than Traditional Procurement methods and the mean difference indicates that Traditional Procurement Methods may, in fact, be the most cost efficient delivery process. While Table 3 suggests both methods could improve the level of trust between project team members to increase efficiency, the mean difference of 0.46 indicates that lack of trust generates more inefficiency in Traditional Procurement Methods than Relationship Agreements. The findings regarding lack of trust influencing project efficiency support those of Ngowi (2007), who suggested partners in Relationship Agreements will be venerable to project inefficiencies in project delivery due to lack of trust.

In addition to the above, the results for Relationship Agreements indicate that the delivery process could be reviewed to be more time efficient and that disputes regularly arise from a difference of opinion by the project Team. It is expected that "disputes" in this case may relate to problems that are resolved internally rather than referring to issues that may require legal intervention, to resolve a stand off between two or more parties.

Table 3 also highlighted that a further two limitations in Traditional Procurement Methods were "delivering the project on budget" and "objectives are achieved through the threat of non-performance

rather than use of incentives". The mean score for "achieving project objectives" was expected and had been previously highlighted by Jones (2001), who suggested the structure of Traditional Procurement Method relies on the project teams meeting the requirements set out in an agreement or contract, failure to do so would then result in punishment through contractual repercussions. If Relationship Agreements are successful in achieving objectives through the use of incentives, one could consider the variable as an advantage.

The descriptive analysis performed on the survey included independently testing and comparing data sets to indicate the advantages and disadvantages of Relationship Agreements. While testing the means will indicate the trend in responses on the survey, the independent T-test highlights the significance of each variable comparison and indicates if the data is reliable.

4.2 Independent T-Test

The independent T-Test is used to compare means between two groups of people (Field 2005). For the purposes of this study, the two groups are respondents from projects managed by Relationship Agreements and respondents from projects managed by Traditional Procurement Methods. The independents T-test has been selected for the study as it is used in situations in which there are two experimental conditions (Relationship & Tradition Procurement methods) and different participants have been used in each condition (Field 2005). The test is conducted by comparing the means from two samples of data from a consistent variable. It is assumed that samples come from different populations but are typical of their respective parent population, therefore, the difference between sample means represent a genuine difference between the two group opinion.

Table 4 highlights the mean comparisons with a two tailed significant value less than 0.05. The significant value indicates that the data is reliable and the mean is a true representation of the variables importance, in regards to each procurement method. As seen, we can make a number of assumptions regarding the advantages and limitations of Relationship Agreements. The mean difference of 0.80 for the first variable in the table suggests that Relationship Agreements could be reviewed to be more time efficient. The mean score from Traditional Agreements was 2.87 indicating that most participants were neutral or disagreed with the statement, however, the mean score from Relationship Agreements of 3.67 therefore indicating that a higher percentage of participants agreed with the statement. From the above we can conclude that Relationship Agreements may not be the most time efficient way to deliver a project and can assume the agreement structure could be modified in most cases to be more time efficient.

Table 4: Independent T-Test Results

Variable	*Traditional Mean*	*Relationship Mean*	*Variance*	*Significance (two-tailed)*
The project delivery process could be reviewed to be more time efficient	*2.87*	*3.67*	*0.80*	*0.000*
The team environment consistently results in informed decision making	*3.23*	*3.94*	*0.72*	*0.001*
Working with other member of the project team enabled the individual to build on a broad range of skills	*3.48*	*4.25*	*0.77*	*0.002*
Current delivery process consistently produces a best for project outcome	*3.23*	*3.89*	*0.66*	*0.002*
Project Milestones are consistently achieved on program	*3.06*	*3.56*	*0.49*	*0.014*
Disputes are resolved quickly and efficiently	*3.26*	*3.69*	*0.44*	*0.041*

The second variable noted with a high significant value was the "team environment consistently results in informed decision making". The mean score for Relationship Agreements was 3.94 (Agree) and therefore 0.72 higher than the mean score for Traditional Procurement Methods. This data supports the findings by Ross (2006) who proposed informed decision making as an integral advantage of the Relationship Agreement structure. The results suggests that constant interaction between the project team will result in the significant advantage, that team members are well informed before making decisions, and will therefore make decisions that consistently benefit the project.

The third variable highlighted in Table 4 indicates that the integrated project team established by Relationship Agreements enables team members to build on a broad range of skills. The mean score for Relationship Agreements was 4.25 indicating the average response was between "Agree" and "Strongly Agree" and represented a 0.77 increase on traditional responses. The data suggests that team members working on project managed by Relationship Techniques will be more likely to build on a broad range of skills than team members working on projects managed by Traditional Agreements. We expect that the adversarial contractual relationship established by Traditional Procurement Methods would result in lack of confidence and trust between each party, therefore reducing any chance of learning or developing skills from interaction with each other. Relationship Agreements however, establish an environment in which

the team members work together, therefore presenting opportunities to learn from one another. The findings again support the studies complete by Ross (2006), who also suggested that by undertaking roles not normally available within their organisation, team members of a Relationship Agreement will build on a broad range of skills.

While being relatively open ended, the forth variable in Table 4 suggests that Relationship Agreements are more consistent in producing a "best for project" outcome that Traditional Procurement Methods. The mean response to the variable from Relationship Agreements was 3.89 compared to the mean response from Traditional Procurement Methods of 3.23. We can therefore assume that the variance of 0.66 indicate that Relationship Agreements are more consistent in producing a best for project outcome. Further to the two previously reviewed variables, these findings support the publication by Ross (2006), who suggested the "commercial framework (of Relationship Agreements) creates a joint best for project focus among all participants by creating incentives that align all participants' objectives".

The fifth variable highlighted in Table 4 suggests Relationship Agreements are more likely to deliver project milestones on program than Traditional Procurement Methods. In reviewing the variable it is important to remember that we are not actually comparing past project performance, but rather studying participants perception of the variables. While the participant's perception would lead to believe that Relationship Agreements are more successful in delivering a milestone on program, a direct case study comparison of projects adopting Relationship and Traditional principals might provide more evidence on the matter.

The final variable in Table 4 indicates that disputes are resolved more quickly and efficiently in Relationship Agreements than Traditional Procurement Methods. It is not surprising that the 0.44 variance in mean scores is significant as the structure in Relationship Agreements involves project teams working towards a shared profit margin, compared to traditional Procurement Methods where the outcome of a dispute could significantly impact of one parties profit.

4.3 Comparing Means

Although many of the means compared in the T-Test received significant vales greater than 0.05 and are therefore deemed to have occurred "by chance", it is important to compare means and identify any variance that contradict or complement those means deemed significant. Comparing the means generated by independent t-test suggests that the traditional agreements are not only more time efficient, but comparing means indicates that they are also more cost efficient (variance 0.36). Relationship Agreements are more likely to deliver project Milestones on budget with a variance of 0.31 and the pricing of project costs is more transparent fair and reasonable in Relationship Agreements than Traditional Procurement Methods with a variance of 0.30. The structure of Relationship Agreements encourages a higher quality in the individuals work than Traditional Procurement Methods. The allocation of risks is more appropriate in Relationship Agreements than Traditional Procurement Methods and the

team members in Relationship Agreements have a clearer understanding of the project risk than members in Traditional Procurement Methods (variance 0.23). More disputes are perceived to arise from a difference in opinion in Relationship Agreements than Traditional Procurement Methods (variance 0.23). Lack of communication between team members is perceived to leading to more inefficiencies in Relationship Agreements than Traditional Procurement Methods with a variance of 0.17. Team member in Relationship Agreements are more pro-active in resolving disputes than team members in Traditional Procurement Methods with a variance of 0.16.

As mentioned above, the two-tailed significance value for the above comparisons was greater than 0.05, therefore it is likely that the result occurred by chance, however, it should be noted that there is a positive trend in mean score for Relationship Agreements when making a direct comparison to the mean score from Traditional Procurement Methods.

5. Conclusions

Comparing the mean score ranking for Relationship Agreements and Traditional Procurement Methods highlighted a number of variables that were critical in delivery of both management techniques. Variables such as building skills, understanding risks and being pro-active in resolving problems were important to both management techniques, while cost efficiency, trust and communication between the project team require improvement under both Relationship Agreements and Traditional Procurement Methods. Comparing the significance and mean scores for each variable in the independent T-test will outline further advantages and limitations in Relationship Agreements.

On reviewing the means comparison deemed significant by SPSS, it was concluded that while Relationship Agreements may not be as time efficient as Traditional Procurement Methods, the integrated management team has a number of advantages. In the relationship agreement, the team environment consistently results in informed decision making and working with other member of the project team enabled the individual to build on a broad range of skills. Current delivery process consistently produces a best for project outcome and the milestones are consistently achieved on program across the projects. Disputes are resolved quickly and efficiently.

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How Adequate is Adequate? A Case of the Adequacy in Determining Client Requirements in the Construction of Four Public Hospitals in Malaysia

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Abstract

Success of any construction project is contingent upon the accurate determination of the client requirements in the early project stage. While the information on the client's requirements is derived primarily from end users, because of time and cost constraints, this process is often not carried out thoroughly and with limited end user participation. Often especially in complex building, evidence of inadequacies in the Needs Analysis surface only when the building is completed, typically in the form of defects when the building is handed over to the end user. To circumvent this, many project management organisations have developed their own system to capture as much information as possible to design and construct the project.

This paper presents the research carried out to assess the extent of this problem in the construction of four public design and build hospitals in Malaysia. Planned to be implemented carefully to fulfil the needs of efficient hospitals, the projects were managed by the Public Work Department and constructed by different contractors. Concerned that the defects during the Defects Liability Period cannot be effectively identified and rectified, an independent consultant was appointed to manage this. The findings suggest that while an improved guideline to better capture client needs was in place, 'gaps' still persist. Findings from the research provided very useful insights to identify to root cause of the problems how this can be improved in future projects.

Keywords: client requirements design and build, adequacy, public hospital, Malaysia

1. Introduction

The concept of customer satisfaction adopted in construction emanates from the conviction that client satisfaction will add value to the organisation or the product. Kamara *et al* (1999) suggests that, this however depends on how well the requirements of the facility are defined and communicated to the design team during the briefing process, and how well this is translated into the actual facility during the construction process. The functional and procurement relationships between different project parties within the project can significantly influence the outcome of the design and construction process. However, despite the emergence and application of design and build (DB) procurement system which can effectively integrate the design and construction teams, many problems associated to meeting the client's needs still persist (Yu *et al*, 2007). This has left many clients short of realising the full value for money from their investments (Chinyio *et al*, 1998).

Within this context, a research was mooted to investigate the extent of this problem in the construction of public projects in Malaysia. Aimed to assess the adequacy of the current approach adopted in Malaysia to capture the client's requirements in building projects, four DB hospital projects were chosen as the case study. This paper presents and discusses the findings of the research. The research theoretical framework, project background, methodology to operationalise the research is discussed. Results from the research investigations identified many design, material, workmanship and lack of protection defect problems in these projects. The root cause of the problems was traced to the Needs Analysis and this provided useful insights from where the problems originate. This is discussed and suggestions for improvements to the current process are provided at the end of the paper.

2. The theoretical framework

2.1 Client's requirements and needs analysis in design and build projects

Lam *et al*, (2001) and Jergeas and Fahmy (2006) define DB as a procurement method where one entity or consortium is contractually responsible for all aspects of facility design, equipment selection and construction to produce a specific output in accordance to the clients need and requirements (Seng and Yusof, 2006). King *et al*, (2001) considers DB as a `family of procurement options' due to their integrated approach.

Clients needs analysis and procurement strategy are very significant in satisfying the client business needs (Kamara *et al*, 1999) and the approach have changed significantly with the emergence of the DB procurement system which promotes the integration of the design and construction process by a single management entity (Grobler and Pretorius, 2002). Lam *et al*, (2008) believed that the DB procurement approach should be able to facilitate the client needs analysis process better. However, in many circumstances, due to time and cost constraints

coupled with inadequate process to capture and translate the client brief requirements, weakness still exist and evidence suggest that there is lack of a comprehensive framework for identifying the requirements of clients during briefing stage(Wilkinson, 2001; Yu *et al,* 2007; Elf and Malmqvist, 2009; Pemsel *et al*, 2010).

Kamara *et al,* (2000) underline that client requirements refer to the objectives, needs, wishes and expectations of the client. Mbachu and Nkado (2006) add that this can be categorised into design, management and construction services. All these requirements should be well captured during the briefing process. However, briefing is a complex and dynamic process which necessitates the identification of the client's requirements accurately to the project team during the early design stage (Smith and Love, 2004; Othman *et al*, 2005; Yu *et al*, 2007). Satisfaction as defined by Kotler, in Mbachu and Nkado, 2006, is the feeling of pleasure or disappointment resulting from comparing a product's perceived outcome in relation to the end users expectations.

Kamara *et al* (1999) maintain that the briefing and procurement strategy are very significant in satisfying the client business needs. Much have changed to improve this especially with the emergence of the design and build (DB) procurement approach (Grobler and Pretorius, 2002). Lam *et al* (2008) note that that the DB approach which promotes the integration of the design and construction process managed by a single management entity, should be able to facilitate briefing process and capture the client's need better.

2.2 Design and build in Malaysia

DB in Malaysia has become popular with the increase in demand for infrastructure and building projects especially during the construction boom periods in the 1980s and 1990s. DB features to focus on combining the design, permit, and construction schedules in order to streamline the traditional design-bid-build environment (Griffith, 2003; Foo *et al,* (1999). The perceived benefit of increased accountability by the service provider, single source project delivery, and a value based project feedback system in contrast to the traditional procurement system which was populated with cost, time and quality problems (Seng and Yusof, 2006) made DB more attractive.

Public projects in Malaysia are managed by the Public Work Department (PWD) and a typical project implement process would initially involve the end-user which is usually a department or ministry identifying a project and applying to secure a budget. Once approved, PWD would manage to implement the project until completion and hand to the end user. The outline of DB projects practised by PWD is shown in Figure 1, 2 and 3. The involvement of the end user is usually at the beginning of the project where representatives from the end user organisation are invited to outline their requirements (PWD, 2009). The briefing process is a complex and iterative activity, within which the business strategy, building requirements, operations and management must integrate (Yu *et al,* 2007). Hassan (2009) observes that most of the briefing practices in Malaysian public projects are still patterned after the conventional procurement

approach which is fragmented. He notes that most problematic elements of this activity especially in DB projects is when it involve inexperienced client with little knowledge of the process which consequently lead to unclear client's needs identification.

To confront this problem and further strengthen the DB process, PWD produced two standard guidelines to complement and support the DB Condition of Contracts used in public projects (Isa and Shamsuddin, 2002) namely (i) Guidelines for Management of Design and Build Projects in 2007 and (ii) Guidelines for Project Brief Preparation. The Guidelines for Management of Design and Build Projects was produced in 2007 and outlines that the DB project implementation as divided into six main stages with three different teams involved with different roles and responsibilities during each stage (Figure 3). In addition, detail descriptions for activities involved and forms of checklist for every stage are also provided by PWD. Supporting the Guidelines for Management of Design and Build Projects is the Guidelines for Project Brief Preparation which was introduced to facilitate the end user to transcribe their real needs into the standard form provided. This is to enable the design consultants to transform them into conceptual drawings. (* For the purpose of this paper the Guidelines for Project Brief Preparation cannot be included in this paper)

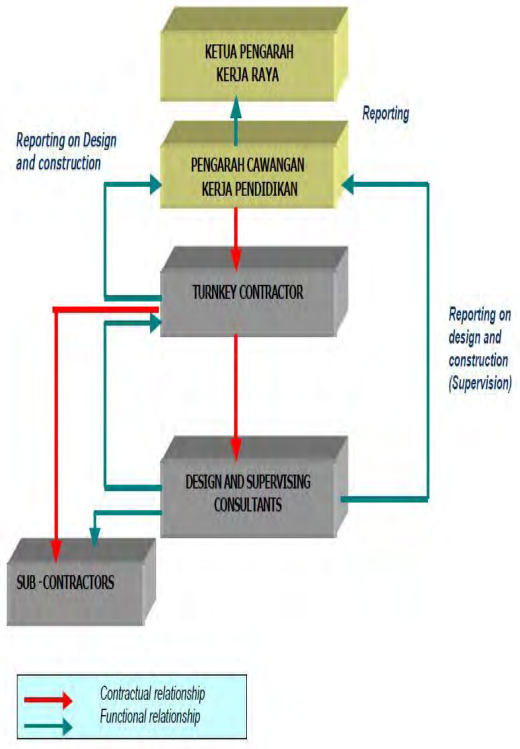

Figure 1: Implementation structure for PWD DB projects (Isa and Shamsuddin, 2002)

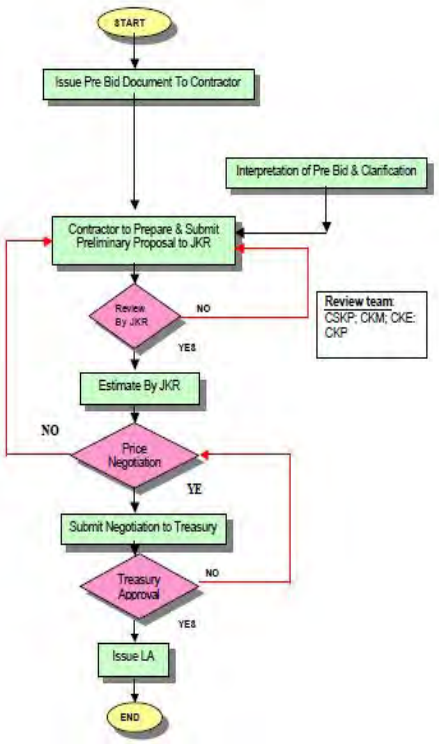

Figure 2: Flowchart of PWD DB pre-bid process (Isa and Shamsuddin, 2002)

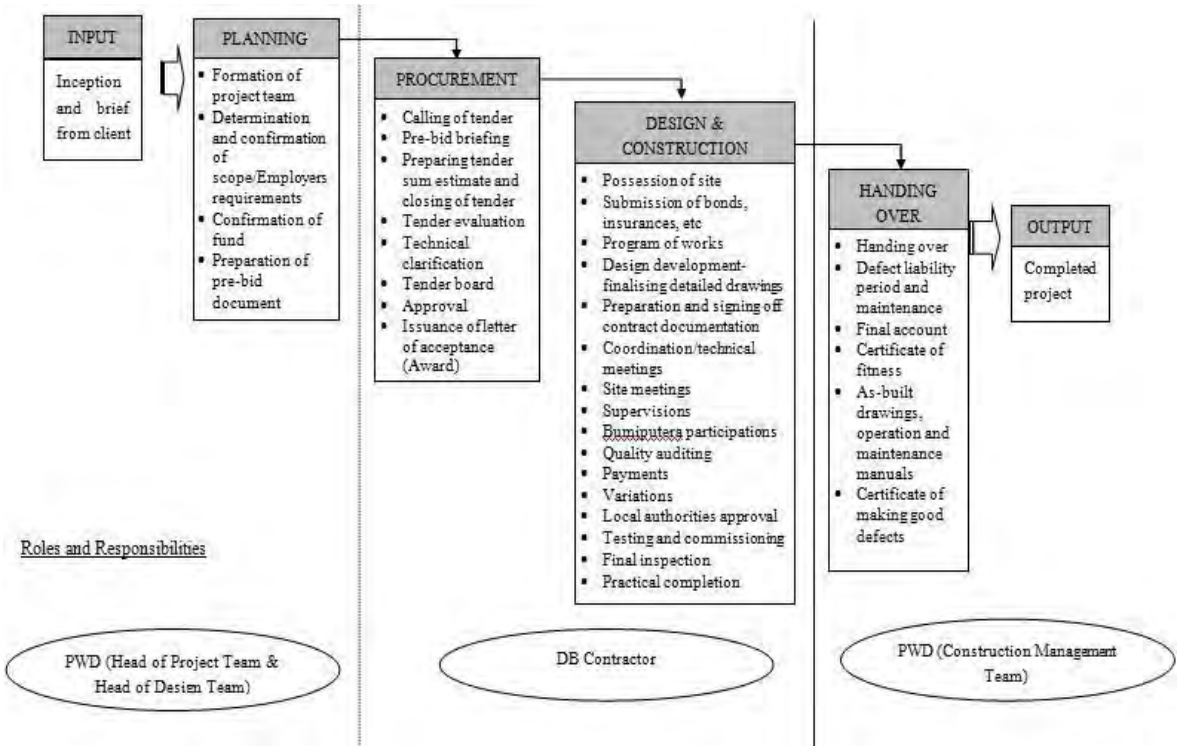

Figure 3: DB implementation process in Malaysia (PWD, 2007)

2.3 Issues of design and build projects in Malaysia

While much has been done by PWD to improve the DB process, much more appear in need to be done to improve the situation. Several researches and case studies show that DB approach in Malaysia has persisted with many problems. It was observed that many DB projects, particularly involving public buildings have lately suffered many critical problems and are not successful (Judin, 2009; Samad, 2001; Hassan *et al*, 2009 with late project completion, cost overruns, low project quality, low client satisfaction and high number of defects for completed works recurring (Jaafar and Abdul Aziz, 2009).

In studying the issues relating to shortcomings of DB projects, Lim and Mohamad (2000), Hassan (2009) and Abdul Rashid (2009) attributes the 'failures' in DB projects as resulting from unclear client brief, specification and statement of needs; insufficient time allocated during briefing, tender documentation and evaluation process; and ineffective communication among project teams including sub-contractors and suppliers. Hassan *et al*, (2009) adds that these often translate to problems of poor supervision and workmanship, maintenance, and rectification works during the Defects Liability Period (DLP).

3. Research aim, objectives, and methodology

The aim of this research is to assess the adequacy of the current approach adopted to capture the client requirement in case study projects through the analysis of defects. In line with the aim, the research objectives were to;

(i) identify and classify the that occurred

(ii) trace their root cause, and

(iii) identify the necessity/advantage of a third party to manage the DLP

A combination of qualitative and quantitative methods was adopted for the research. The quantitative research was focused to achieve objective (i) and (ii), whilst the qualitative research sought to achieve objective (iii). The quantitative enquiry data which was drawn from the records of defects identified by the DLP management consultant was sorted, grouped and transferred into the SPSS software. The measure of central tendency using the frequency analysis was used to understand the pattern of responses within the results. Clustered pie charts were employed to summarise the data. The second stage of the research enquiry involves semi-structured interviews with senior and experienced hospital management representatives from the four hospitals studied. The respondents were chosen on the basis that they were centrally involved with the hospital management and the hospital DLP. The qualitative data were converted and transcribed into Microsoft Word format and analysed manually.

4. Findings

The quantitative findings from the data collection were divided into the following themes for the analyses: (a) defects identified based on scope of works, and (b) classification of defects. These are presented as follows:

4.1 Defects identified based on scope of works

The analysis on the types of defects based on the scope of works was carried out for each hospital and the findings are shown in Table 1 and Figure 4.

Table 1: Number of defects based on scope of works

Scope of works	No of Defects			
	Hospital A	Hospital B	Hospital C	Hospital D
Architecture	2164	2315	2301	1302
Civil & Structural	894	393	443	32
Mechanical	2584	1208	1121	681

Electrical	1172	2262	1510	651
Bio-medical	1704	83	98	77
TOTAL	8518	6261	5473	2743

Table 1 above shows the number of defects based on the scope of works for the four identified hospitals. Sultan Abdul Halim Hospital was observed to record the highest number of final defects, followed by Sultanah Bahiyah Hospital and Sungai Buloh Hospital. Cameron Highlands Hospital has recorded the lowest number of final defects.

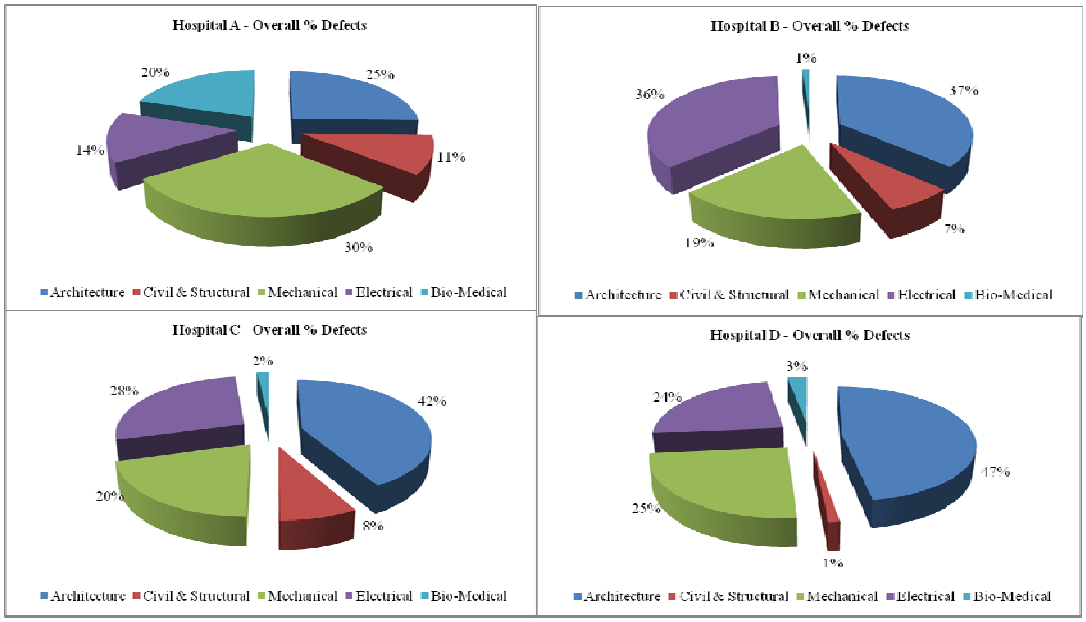

Figure 4: Percentage of defects based on scope of works

As can be seen in Figure 4, majority of the identified defects are due to the architectural works, followed by electrical works and civil and structural works, with the exception of Hospital A which recorded a slightly different result with civil and structural works more than electrical works defects.

4.2 Classification of defects

Defects identified in 4.1 were traced and analysed. These were categorised as (i) Design defects, (ii) Workmanship Defects, (iii), Materials Defect, (iv) Maintenance Defects, and (v) Lack of Protection Defects. The emergent findings are shown in Figure 5 and Table 2 below.

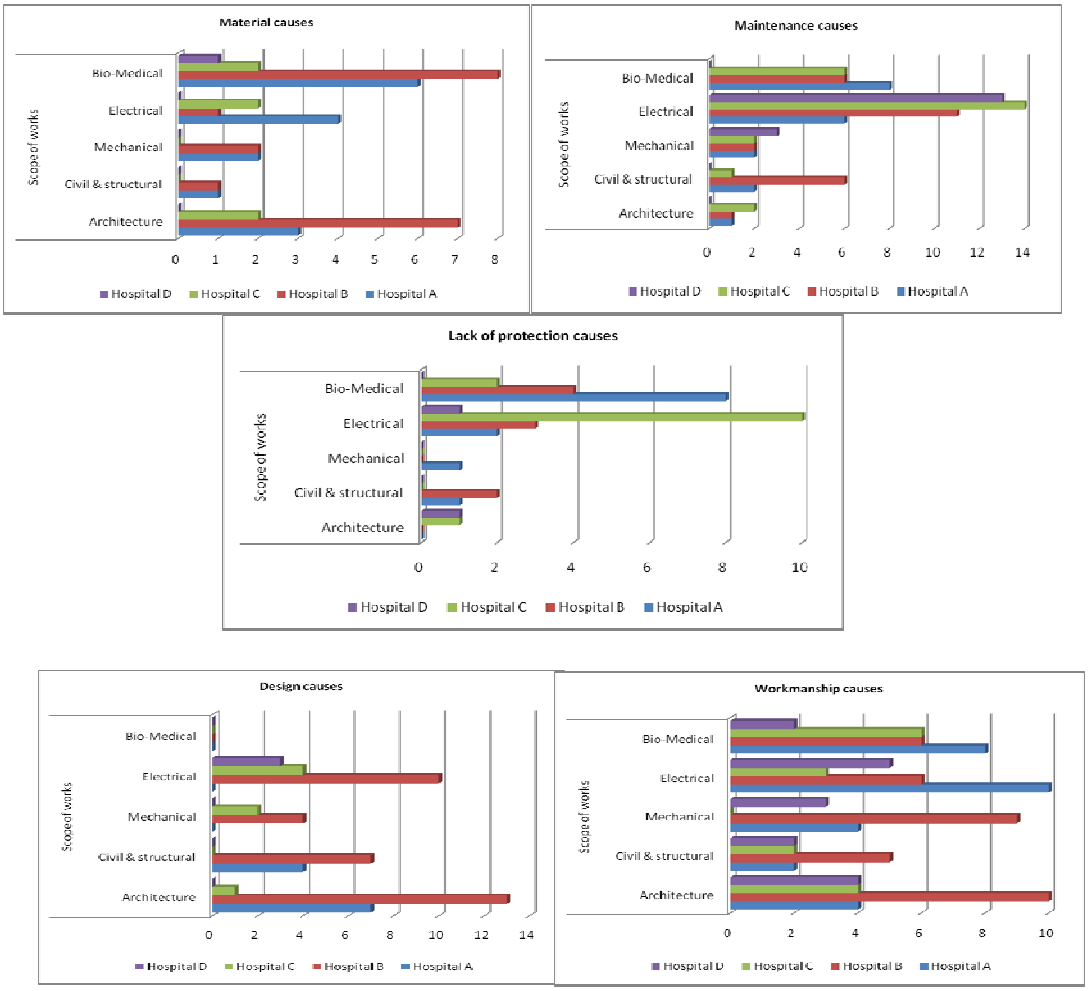

Figure 5: Defects categorisation based on scope of works

It was observed that workmanship defects constitute to the most number of defects and this is followed by maintenance, design and maintenance and lack of protection. Elements which were found to be most defective according to the scope of works are tabulated in Table 2.

Table 2: Description of defect works

Hospital	*Scope of Work*	*Classification of Defects*	*Element*
Hospital A	*Architectural*	*Workmanship*	*Doors, loose-furniture, walls, ceilings, floors, sanitary fittings*
	Civil and Structural	*Design*	*Access roads, nurse station, planning & entrance of the building*
	Mechanical	*Workmanship & maintenance*	*Plumbing, air-conditioning, mechanical & ventilation system, fire protection*
	Electrical	*Workmanship, maintenance*	*Lighting system, genset, UPS room, alarm system*

	Bio-medical	*Maintenance, protection*	*Bio-medical & non bio-medical*
Hospital B	*Architectural*	*Design, workmanship, material*	*Doors & ironmongery, ceiling, wall, floor and finishes, signages, sanitary fittings, roof, crack*
	Civil and Structural	*Design, workmanship, maintenance*	*Waterproofing, blockage, leakage, pipe installation, anti termite, drainage*
	Mechanical	*Workmanship, design*	*Air-conditioning, ventilation & exhaust system, mechanical gas pipeline system, pneumatic tube building supervisory system*
	Electrical	*Design, maintenance, workmanship & protection*	*High voltage equipments, communication & audio visual system, electrical installation & equipment, lighting, genset room*
	Bio-medical	*Workmanship, maintenance, protection,*	*Bio-medical & non bio-medical*
Hospital C	*Architectural*	*Design, workmanship, maintenance, materials*	*Ironmongery, sanitary installation, finishes, ceiling, built-in and loose furniture, fitting,*
	Civil and Structural	*Workmanship and maintenance*	*Blockage and leakage, waterproofing, low water pressure/no water supply*
	Mechanical	*Maintenance*	*Transportation, mechanical equipment, pneumatic tube system, fire protection*
	Electrical	*Workmanship, design, maintenance, protection*	*Consumable items, electrical supply interruptions, electrical fittings/diffuser,*
	Bio-medical	*Workmanship, maintenance*	*Motor system breakdown*
Hospital D	*Architectural*	*Workmanship, protection*	*Doors & ironmongery, ceiling, wall, floor & finishes, built in & loose furniture,*
	Civil and Structural	*Workmanship*	*Drainage, roadworks, fence, soil waste treatment, slopes, waterproofing*
	Mechanical	*Workmanship, maintenance*	*Pipe installation & leakages, water supply, sanitary pipe system, fire protection*
	Electrical	*Maintenance*	*Defective lighting, electrical supply installation, defective electrical fittings*
	Bio-medical	*Workmanship, material*	*Electrical defects*

4.3 End-user feedback

To understand the underpinning reasons for the defects identified in the qualitative enquiry, a qualitative research was carried out. The focus was to: (iii) trace the root cause of the defects, and (ii) identify the necessity/advantage of a Third Party to manage the DLP. The findings that emerge were as follows:

4.3.1 Root Cause of the defects

Following the results obtained from 4.2, data analysed to suggest the root cause of the defects were recorded as follows:

a) Overall feedback towards the building defects:

There were variable satisfaction levels between the respondents from the different hospitals but only one hospital respondent stating general satisfaction over the works. The rest of the respondents are generally unhappy with the works

- *"There were minor defects like cracks and leakages …."*

Respondent 1

- *"…many components especially the ceiling was not fixed according to specification..... hung on pipes underneath the floor..."*
- *"The wiring for the PA system is not satisfactory"*
- *" the defects occur as soon as the DLP is over"*

Respondent 2

- *"... I have problems with defects in the doors and floor finishes …"*
- *"... the main problem is with the mechanical and electrical system...."*
- *"..... chiller, boiler and generator are not functioning as it should"*

Respondent 3

- *"The floor finishes sunk, leakages on the roof and toilets, and air con."*
- *"The spaces are limited... especially the car park"*
- *"What about the spaces required in future....."*
- *"Leakages in the air-con system.…….……..……..……..…...."*

Respondent 4

b) Wrong choice/poor specification:

There was a general dissatisfaction over the selection and procurement of some of the materials, equipments and specifications.

- *"There are some Bio-medical equipments which is obsolete...."*

Respondent 1

- *"… purchase of the equipments are not co-ordinated between hospitals.... we have a problem when our medical staff are transferred..."*

Respondent 2

- *"... the purchasing is done by someone else and the installation is done by others...."*

Respondent 3

- *" The purchase is done too early ....."*

Respondent 4

c) Contractual issues

There was a common dissatisfaction over ambiguity/discharge of contractual obligations

"... the hospital authorities should be given a written warranty by the contractors "

Respondent 1

"... JKR and the DLP management consultant should make sure that the contractor fulfils their obligations."

Respondent 2

"... there were some works in the contract that was not carried out.."

"….this forced us to use our own money to rectify the defects"

Respondent 3

"... there are some confusion regarding the responsibility to rectify and make good some of the defects"

"... there are discrepancies between the what is actually put up and the As-Built Drawings…"

Respondent 4

d) Need for a Third Party to manage the DLP

There was a common agreement on the need for a special party to manage the DLP.

"We are very happy with the performance of the DLP management consultants ....."

Respondent 1

"... the hospital management cannot solve the defects problems on our own"

Respondent 2

"... the DLP management consultant was very useful as a Third Party,..... I don't think JKR would be able to do this all by themselves"

" this need to be supported with an audit by the Ministry of Health...."

Respondent 3

"... we are happy with the contribution of the DLP management consultant ...."

Respondent 4

5. Discussions and conclusions

Evidence from the research suggests that current client's needs analysis process is still insufficient to effectively capture and translate these needs in the project implementation. The findings that emerged from this study underline the significance of a comprehensive Defects Liability Management input in identifying and rectifying defects in design and build hospital projects. The numbers of defects identified from each hospital were very large at the on-set of the DPM management but almost all the defects identified were rectified and the Certificates of

Making Good Defects can be issued. Within the current design and build system practiced in Malaysia, the results suggest the existence of 'gaps' within the DB implementation process that necessitates a special designated party is to be assigned to capture and manage all the defects, propose the rectification method and monitor closely the works undertaken by the contractor.

Whilst clearly there were strong evidence of connectivity between defects and capturing the clients' needs, the causal relationships between these two elements are still distant. There tends to be many intervening variables which may have a significant impact on this relationship. This shall be the next focus of the research.

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