



CONFERENCE PROCEEDINGS



12 - 14 July 2009
Port Elizabeth - South Africa

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PREFACE

The *First TG59 People in Construction* conference provides an international forum for researchers and practitioners from developed, developing and underdeveloped nations to address fundamental problems and constraints that affect people in construction. The broad objectives of the conference are:

- To provide a forum for multi-disciplinary interaction between built environment academics and practitioners;
- To provide an internationally recognized, accredited conference;
- To disseminate innovative and cutting edge practices, and
- To contribute to the people in construction body of knowledge.

The conference organizers aim to bring together researchers, academics, administrators and practitioners representing educational institutions, government agencies, contracting organizations, consulting enterprises, financial institutions, and other construction related organizations from all over the world.

The conference has a broad scope and topics are organized around the conference theme of *People in Construction* and include, inter alia, the following main topics, namely

- Career promotion;
- Cultural diversity impacts;
- Education and training;
- Employment and poverty reduction;
- Employment relationships;
- Ergonomics;
- Gender and gender equity;
- Health and well being;
- Human resources management;
- Human rights issues;
- Industrial relations and employee representation;
- Integration of people and technology;
- Labour market issues;
- Multi-cultural issues;
- Multi-lingual issues;
- Older workers and age-related issues;
- Persons with disabilities;
- Procurement strategies;
- Respect for people;

- Role of labour in the construction process;
- Skills development and transfer;
- Worker engagement and empowerment;
- Working hours and shiftwork; and
- Work organization.

In particular, the conference seeks responses to the following critical questions:

- What changes would lead to improvements?
- How can worker rights be promoted?
- How can informal technology contribute to improvement?
- What are the barriers to change?
- What economic levers can be used?
- How can informal construction sector and SMME problems be addressed?
- How can education, training, and professional development be improved?
- How can skills better be developed and transferred?
- How can communication and management difficulties be addressed?
- How can safety and health risks be better recognized, understood and avoided?
- How can diversity and inclusivity be promoted?
- How can the regulatory environment be more effective?

These internationally peer reviewed and edited proceedings are aimed at contributing significantly to the body of knowledge relative to the science and practice of construction and the improvement of construction health and safety on sites not only in South Africa but everywhere that construction is being done.

Theo C Haupt and John Smallwood
Port Elizabeth, South Africa
July 12, 2009

ACKNOWLEDGEMENTS

The organizing committee of *The First People in Construction* conference, held in Port Elizabeth, South Africa, wish to thank Construction Research Education and Training Enterprises (CREATE), the Nelson Mandela Metropolitan University, Cape Peninsula University of Technology (CPUT), the Southern African Built Environment Research Center (SABERC) at the Cape Peninsula University of Technology, and the Unit for the Study of Construction Processes (USCP) at the Nelson Mandela Metropolitan University for supporting this conference through their valued contributions.

Our thanks are extended to Professors Theo Haupt (SABERC) and John Smallwood (NMMU) as joint international co-ordinators of CIB Task Group 59 with focus on People in Construction who worked tirelessly on every aspect of the conference. Together with the Scientific and Technical Committee and additional reviewers to whom special thanks are extended they worked hard and long to prepare refereed and edited papers and published proceedings of the highest standard that satisfy the criteria for subsidy by, for example, the South African Department of Education.

Special mention is necessary of Ms. Charlene May and Mr. Ruben Ndiokubwayo for their sterling efforts in ensuring that every aspect of putting together this conference was addressed despite the severe economic meltdown that affected their work,

Finally, the contribution and efforts of Ms Ferial Michaels and her staff at RFM Design to the success of this conference is acknowledged for preparation of the conference proceedings and related aspects.

CONFERENCE ORGANISERS

Prof T C Haupt, Joint CIB TG 59 International Co-ordinator and Academic Program Chair, and
Prof John Smallwood, Joint CIB TG 59 International Co-ordinator and Overall Conference Program Director

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PEOPLE IN CONSTRUCTION 1

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PEER REVIEW PROCESS

In order to maintain and ensure the highest quality in these proceedings and comply with the requirements for subsidy of the South African Department of Education, a rigorous two-stage system of peer review by no less than two acknowledged experts has been followed. In terms of this process, each abstract received was blind reviewed in terms of:

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- Originality of material;
- Academic rigour;
- Contribution to knowledge; and
- Research methodology.

Authors whose abstracts were accepted after review process was completed were provided with anonymous reviewers' comments and requested to submit their full papers noting and addressing these comments. These resubmitted papers were blind reviewed again in terms of:

- Relevance to conference theme and objectives;
- Originality of material;
- Academic rigour;
- Contribution to knowledge;
- Research methodology and robustness of analysis of findings;
- Empirical research findings; and
- Critical current literature review.

Authors whose papers were accepted after this second review were provided with anonymous reviewers' comments and requested to submit their revised full papers. The editors of the proceedings did not participate in the actual review process but ensured that the final papers incorporated the reviewers' comments and arranged the papers into the final sequence as captured on the CD-ROM and Table of Contents. Of the 45 abstracts originally received, only 27 papers were finally accepted for presentation at the conference and inclusion in these proceedings, representing a rejection rate of 40%.

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CONSTRUCTION

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INTERNATIONAL COUNCIL FOR RESEARCH AND INNOVATION IN BUILDING AND CONSTRUCTION

The International Council for Research and Innovation in Building and Construction (CIB) was established in 1953 with support of the UN as an association whose objectives were to stimulate and facilitate international collaboration and information exchange between governmental research institutes in the Building and Construction sector. CIB has since developed into a worldwide network of over 5000 experts from over 400 organisations active in the research community, in industry or in education, who collaborate and exchange information in approximately 60 Commissions extending over all fields in building and construction related research and innovation.

PURPOSE, SCOPE AND OBJECTIVES

The purpose of CIB is to provide a global network for international exchange and cooperation in research and innovation in building and construction in support of an improved building process and of improved performance of the built environment. The scope of CIB covers the technical, economic, environmental, organizational and other aspects of the built environment during all stages of its life cycle, addressing all steps in the process of basic and applied research, documentation and transfer of the research results, and the implementation and actual application of them.

The objectives of CIB are to be: a relevant source of information concerning research and innovation worldwide in the field of building and construction; a reliable and effective access point to the global research community; and a forum for achieving a meaningful exchange between the entire spectrum of building and construction interests and the global research community.

MEMBERS

CIB currently numbers over 400 members originating in some 70 countries, all with an interest in the programming, funding, management, execution and/or dissemination and application of research and technology development for building and the built environment, but with very different backgrounds including: major public or semi-public organisations, research institutes, universities and technical schools, documentation centres, firms, contractors, etc..

ACTIVITIES

Today's globalisation of world economies is creating unprecedented challenges and demanding new technologies. Now more than ever, international cooperation and communication are essential and CIB is uniquely able to facilitate this. It does this through its network of international Tasks Groups and Working Commissions. Their scope extends over the broadest possible spectrum as the following division into main areas shows:

- Research, Education and Innovation
- Construction Materials and Technologies
- Building Physics
- Design of Buildings
- Design of Built Environment
- Organisation, Management and Economics
- Legal and Procurement Practices

Each Task Group and Working Commission consists of individual experts in the respective area who meet annually, cooperate in voluntary international research projects, produce state-of-the-art publications and organise global conferences.

PRIORITY THEMES

In addition to its traditional Commission Activities, CIB prioritises its Commissions Projects, Collaborative Member Projects and Strategic Partnerships on selected Themes, which are:

- Sustainable Construction
- Performance Based Building
- Revaluing Construction

Per Priority Theme CIB organises worldwide programme development, RTD agenda's, externally funded programmes and projects plus the incorporation of voluntary commission projects series of state-of-the-art conferences and whatever else is required to take the theme forward. Programmes per theme may also include externally funded projects, like the EU funded Thematic Network PeBBu – Performance Based Building.

AN UNRIVALLED NETWORK

The Task Groups and Working Commissions are composed of appointed representatives of CIB Organizational Members and CIB Individual Members. Membership of these Groups provides access to and active involvement in this world wide network of experts that is the prime benefit of belonging to CIB.

<http://www.cibworld.nl>



THE CONSTRUCTION INDUSTRY DEVELOPMENT BOARD (CIDB)

The Construction Industry Development Board (cidb) of South Africa remains committed to the Task Group 59 conference theme of 'People in Construction' held in Port Elizabeth, South Africa from July 12-14, 2009. The Conference will bring together researchers, academics and business to discuss built environment: construction-related research, development and education from different parts of the world.

The First International People in Construction Conference will discuss critical topics that include career promotion, diversity, education and training, employment and poverty reduction, employment relationships, ergonomics, gender, health and well being, human resources management, human rights issues, industrial relations, integration of people and technology, labour market, multi-cultural issues, multi-lingual issues, older workers/age-related issues, people with disabilities, procurement, respect for people, role of labour in the construction process, skills development and transfer, worker engagement and empowerment, working hours, work organization, and other important topics.

Support and commitment by cidb South Africa to the conference and the development of the industry at large is not only expressed through sponsorship but also through the keynote address to be delivered at the Conference by cidb's CEO Mr Ronnie Khoza titled "Towards Improved Public Sector Infrastructure Delivery through the Infrastructure Delivery Improvement Programme (IDIP)".

"Our support to the First TG59 International People in Construction Conference is part of our effort and is in keeping with our motto-'development through partnership' to collaborate with various stakeholders and colleagues, locally and internationally towards contractor development.

The cidb was established in terms of the CIDB Act (Act 38) of 2000 to regulate and develop the construction industry for improved performance in infrastructure delivery and aims to provide leadership to stakeholders and to stimulate sustainable growth, reform and improvement of the construction sector for effective delivery and the industry's enhanced role in South Africa's economy.

For more information please contact:

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Coordinator(s)

- Prof Theo Haupt, Cape Peninsula University of Technology, South Africa and Mississippi State University, U.S.A
- Prof John Smallwood, Nelson Mandela Metropolitan University, South Africa

Objectives/Scope

The Task Group will focus on human resource issues in the construction industry. Construction is a labour intensive activity and the behaviour of people has an enormous influence upon the organisation and performance. The Task Group aims to involve representatives of employers, workers and governments, and researchers in both developed and developing countries, and to foster dialogue and collaboration.

The Task Group will bring together researchers with one of two aims:

- Those who will be primarily seeking to improve the performance of the industry and with focus on people
- Researchers whose aim is primarily to improve the lives of the people who work in the industry.

Against this background the Task Group objectives are:

- to create a network of members who are interested and involved in research into labour issues in the construction industry
- to bring into the network researchers from outside the construction disciplines who are working on construction labour issues
- to provide a forum for the exchange of ideas on social and labour issues in construction amongst those in the network
- to identify key issues for future research and possible sources of funding
- to disseminate research findings within the network and to a broader group of academics and practitioners working in the field

Work Programme

The main activities of this work programme are:

- Anthropological type studies of the working lives of builders will address the role of labour in construction process: what tasks are undertaken by labour, how is the work organized, who are the actors involved and how do they relate to each other? The answers will provide insights and might give into ways of improving safety, welfare or productivity.
- Clarify employment relationships: It is not always clear who is the employer. In the construction industry 'triangular employment relationships' (with three parties involved) are becoming more common as labour is increasingly 'outsourced'. A sound understanding of employment relationships in the various sub-sectors of the construction industry is needed before attempting to design policies to ensure the health, safety, welfare and security of the construction workforce.
- Construction labour supply: the labour is not homogeneous but differentiated by trade, skill level, nationality, tribe, sex, etc. An adequate supply of labour at the right time and place and of an appropriate type and level of skill is required for the smooth functioning of the industry. It is therefore important to understand how the construction labour market operates, how buyers and sellers of labour make contact with each other, as well as the factors that affect the supply of labour of different categories (including secondary issues influencing training and migration). Understanding these issues is an essential prerequisite to labour market interventions to correct deficiencies in supply or expand demand in order to create employment.
- Construction employment and poverty reduction: It is frequently argued that the construction industry can contribute to poverty reduction. But jobs in construction in any one location are generally temporary. Long term impact of temporary employment opportunities upon poor households and communities in the rural areas of developing countries needs to be addressed. The linkage between migration for employment in construction (rural-urban and international) and poverty alleviation at the household and community level is a further area requiring investigation.

In addition to the broad areas of research outlined above, there are other more specific issues of interest and concern to construction researchers, practitioners, policy makers and activists, including international agencies such as ILO, NGOs and trade unions:

- Labour's occupational safety and health.
- Technology in construction projects in developing countries and the

- implications for employment generation
- Women in construction and the promotion of equal opportunities.
 - Organization and industrial relations in the construction industry

Internal Structure

- Members of this Task Group must be members of CIB.
- Coordinators may be appointed for Africa, Asia, Latin America, Europe, etc.
- Sub-coordinators will be appointed for sub-themes such as:
 - Women in Construction
 - Labour migration in construction
 - Labour practices
 - Construction Labour & Poverty issue

External Relations

The objective is to develop this Task Group into a full Working Commission of CIB

Membership

Members of this Task Group will be Individual CIB Members or appointed representatives of CIB Organizational Members.

The Task Group was established in October 2004 and has an extended mandate until 2010.

Publications

- 2006 Construction in Developing Economies: New Issues and Challenges, January 18 – 20, 2006, Santiago, Chile
Proceedings

Meetings

- 2010 Manchester: U.K. CIB Task Group Meeting on People in Construction, in conjunction with the CIB World Building Congress, May 10
- 2009 Port Elizabeth, South Africa First International Conference on People in Construction, July 12-14
- 2008 Shanghai, China PR CIB Task Group Meeting on People in Construction, in conjunction with the International conference on Multinational Construction Projects: Securing high Performance through Cultural Awareness and Dispute Avoidance, November 21-23
- 2008 Gainesville, Florida CIB Task Group Meeting on People in Construction, in conjunction with the International Conference on Health and Safety in Construction, March 9
- 2006 Dubai, U.A.R. CIB TG59 meeting on People in Construction, in conjunction with the International Conference: "Sustainable Development through Culture and Innovation", November 26-29
- 2006 Bahamas Island CIB Task Group meeting on People in Construction, as part of the CIB Co-sponsored: 2nd Specialty Conference on Leadership and Management in Construction and Engineering "International Perspectives," May 4-6
- 2006 Santiago CIB Task Group meeting on People in Construction, in conjunction with International Symposium on Construction in Developing Economies: New Issues and Challenges, January 18-20
- 2005 Helsinki CIB Task Group meeting on People in Construction, in conjunction with the CIB International Symposium Combining Forces - Advancing Facilities Management and Construction through Innovation, June 13-16



9 July 2009

Dear Author

PEER REVIEW PROCESS: TG59 'People in Construction' Conference
Port Elizabeth, South Africa, 2009

I confirm that the following peer review process was strictly followed relative to this conference.

In order to maintain and ensure the highest quality in the conference proceedings and comply with the requirements for subsidy of the South African Department of Education, a rigorous two-stage system of peer review by no less than two acknowledged experts in the field has been followed. In terms of this process, each abstract received was twice blind reviewed in terms of:

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- Academic rigour;
- Contribution to knowledge; and
- Research methodology.

Authors whose abstracts were accepted after the review process was completed were provided with anonymous reviewers' comments and requested to submit their full papers noting and addressing these comments. Evidence was required relative to the action taken by authors regarding the comments received. These resubmitted papers were twice blind reviewed again in terms of:

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- Relevance to conference theme and objectives;
- Originality of material;
- Academic rigour;
- Contribution to knowledge;
- Research methodology and robustness of analysis of findings;
- Empirical research findings; and
- Critical current literature review.

Authors whose papers were accepted after this second review were provided with additional anonymous reviewers' comments and requested to submit their revised full papers. These final papers were included into both the conference presentation schedule and the conference proceedings, having been multiple peer-reviewed for publication. At no stage was any member of the Scientific and Technical Committee or the editor of the proceedings involved in the review process relative to their own authored or co-authored papers. The role of the editor was to ensure that the final papers incorporated the reviewers' comments and arrange the papers into the final sequence based on the conference presentation schedule as captured on the CD-ROM and Table of Contents. Of the 63 abstracts originally received, only 36 papers were finally accepted for presentation at the conference and inclusion in these proceedings, representing a rejection rate of 43,9%. To be eligible for inclusion these papers were required to receive a minimum score of 3 out of 5 allocated by the peer reviewers during the final review process.

Regards

Ferial Michaels

Conference Organiser

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TG592009-31

Human resource management practices in Eastern Cape architectural practices

Xabiso Sidloyi and John Smallwood
Nelson Mandela Metropolitan University

ABSTRACT AND KEYWORDS

Purpose

Increased work load due to major infrastructure investment projects has lead to an increased demand for architectural services. Architectural practices need to consider their human capital as their most important asset in delivering quality services. This research was conducted to determine the implementation of human resource management (HRM) in architectural practices.

Methodology

A questionnaire was designed to acquire primary, factual and attitudinal data from architectural practices while secondary data was acquired through a survey of literature.

Findings

The main findings were that practices are making an effort to reduce staff turnover and to retain employees, they were implementing recruitment strategies and considered recruitment to be important, and that training and developing employees was undertaken. However, the quality of the training was in question, employee remuneration is considered important, and employees are offered opportunities for cross-training and career development.

Research limitations

The survey was limited to architectural practices registered with the Eastern Cape Institute of Architects. The scope of future research could be expanded to include the Border-Kei Institute of Architects.

Practical implications

The literature revealed that it is important for practices to implement effective HRM strategies. Survey results revealed that practices need to invest more in training and development of employees, the frequency of

salary review needs to be considered and be based on performance, and that employee advancement should be given more attention.

Value

The paper will be valuable to architectural practices and any other professionals looking to implement or evaluate HRM.

Keywords: Human Resource Management, Architectural practice

1. INTRODUCTION

Cull (2004) reports that the South Africa (SA) construction industry would be required to double its output over the next 10 years. This is due to major infrastructural investments by SA government, and construction of 2010 World Cup stadiums, infrastructure projects and maintenance.

In order for the construction industry to double its output it will need to invest in its human resources in order to attract and retain new personnel. The architectural profession is an integral part of the construction industry's supply-chain, and will have a major impact on the construction industry's performance. Increased workload has necessitated a research into HRM interventions and strategies implemented by architectural practices.

2. HUMAN RESOURCE MANAGEMENT

Various authors have different definitions for HRM, Köster (2007) defines it as the function within an organisation that focuses on recruitment, management, and providing direction for the people who work in the organisation. Boxall and Purcell (2003) define it as all those activities associated with management of employee relationships in firms.

Cherrington (1995) states that HRM plays a central role in creating organisations and helping them survive. The basic objective of HRM is to attract qualified employees, to retain them, and to motivate them to perform their duties in the most effective way.

Therefore human capital is one of the most critical components of strategic success for many organisations and HRM ensures that organisations attract and retain personnel.

Demkin (2000) describes the core functions of HRM as: retaining human resources, recruitment, training and development, compensation, and advancement options.

2.1 Retaining employees

Calhoon (1999: 262) defines employee turnover as “the rate of change in working staff during a definite period” in other word it signifies the shifting of workforce into and out of an organisation. Calhoon (1999) further states that employee turnover is the cause and effect of instability of employment. Calhoon (1999) and Demkin (2000) note that employee turnover is an outcome of resignations and dismissals. Resignations may be due to such causes as dissatisfaction with working conditions, insufficient wages, bad health, sickness, old age, and family circumstances and so on. Dismissals may occur due to misconduct, insubordination, and inefficiency.

Cherrington (1995) lists the following strategies for successful retention of employees:

- Perception of fairness and equitable treatment;
- Management taking time to meet with new employees to learn about talents, abilities and skills;
- Humour as a major factor contributing to the retention of valued employees;
- Staffing adequately in order to reduce overtime;
- Providing opportunities for career and personal growth through training and education, and challenging assignments, and
- Exit interviews with employees provide valuable information, which can be used to retain the remaining staff.

Inyang (2008) states that key employee retention is critical to long term health and success of any business; retaining best employee ensures client satisfaction, effective organisational knowledge and learning. Therefore a high rate of turnover is bad both for the workers and the practice.

2.2 Recruitment

Boxall and Purcell (2003) state that recruitment and selection is the most important human resource function. Hendry (2003) states that recruitment is important because its reduces the probability that job applicants will leave the organisation only after a short period of time, and it increases the success rate of the selection process by decreasing number of under qualified or overqualified job applicants.

Cherrington (1995) states that making informed hiring decisions depends on two principles, first principle is that past behaviour is the best predictor of future behaviour. Second principle is the collection of reliable and valid data of applicants; this could be achieved through behaviour based testing and competency screening. Hendry (2003) states that on

many occasions, an employee leaves simply because they do not feel that the position is right for them, which could have been avoided through a thorough interview process.

According to Hiltrop (2005), the right recruitment, interviewing, skills training and the right people in place, the business can thrive towards success. Another strategy is the hiring of new employees and subjecting them through a probation period.

2.3 Training and development of employees

Cherrington (1995) defines training and development as a process that enables people to acquire new knowledge, learn new skills, and perform behaviours in a new way. Inyang (2008) further distinguishes between training and development by stating that training refers to the acquisition of specific skills or knowledge, and development refers to the improvement of intellectual and emotional ability needed to perform better at a specific job.

Hendry (2003) states that training and development is important for organisations for the following reasons:

- It optimises the utilisation of human resources by increasing job knowledge and skills, and enabling employees to achieve organisational goals, and
- It creates a learning culture within the organisation, and keeps employees abreast of developments relative to knowledge and practice.

Therefore, investment in training and development of employees improves profitability, organisational culture and effectiveness.

2.4 Compensation and advancement options

Byars and Rue (1991) note that compensation refers to all intrinsic rewards that employees receive for their work. Boxall and Purcell (2003) state that compensation is composed of a basic salary, bonuses, and benefits. Byars and Rue (1991) emphasise that compensation should be: legally adequate, motivating, equitable, provide security, and be cost-benefit effective.

Hendry (2003) states that compensation is important because the majority of employee problems are centred around it; and that compensation must fulfil the expectations and aspirations of employees. According to Inyang (2008), attractive compensation enables organisations to attract, retain and motivate competent people. Köster (2007) observes that employees are motivated to perform better when their past

performance is rewarded adequately. Hiltrop (2005) notes that compensation is the only human resource activity that has impact on all other functions regarding personnel i.e. job evaluation, recruitment, incentive payments, etc.

Köster (2007) defines employee advancement as the movement of an employee into a job requiring greater skill and experience, usually with higher compensation. Hiltrop (2005) states that there is a correlation between employee dissatisfaction, disciplinary problems, poor product quality, and the lack of advancement options in organisations.

3. RESEARCH METHOD

Primary data for this research was collected through the use of a questionnaire survey, and secondary data through a survey of the literature.

A quantitative research approach was adopted for the questionnaire survey. The questionnaire survey was conducted in the Eastern Cape amongst architectural practices registered with the Eastern Cape Institute of Architects (ECIA).

Walliman (2001) notes that survey research ultimately aims to solve problems and that survey must obtain data that can be analysed and interpreted to get information for strategic decision-making. Therefore data for this research were analysed using simple descriptive statistics, namely frequency and percentages in Excel software.

A comprehensive survey of literature was undertaken and was used to establish criteria and theories against which the primary data was measured.

3.1 Survey results

Questionnaires were distributed to 47 practices, 24 responded, which equates to a 51% response rate.

3.2 Retaining employees

Table 1 indicates the extent to which practices implement HRM strategies to limit staff turnover in terms of percentage responses to a scale of 1 (never) to 5 (always), and a mean score (MS) ranging between 1.00 and 5.00. It is notable that all MS scores are above the midpoint score of 3.00, which indicates that in general, the majority of practices can be deemed to implement HRM interventions to limit staff turnover. The intervention with

the highest MS, namely that practices allowed employees to have flexible working hours (3.88), is followed by the promotion of humour (3.79), the latter reflecting the findings of literature. The intervention with the third highest MS is the adequacy of staffing within practices in order to reduce pressures of work loading and overtime (3.75).

The findings from the data indicate that, in order for practices to retain staff they should have flexible working hours, promote humour and treat employees fairly, and reduce overtime.

Table 1: Frequency at which Human Resource Management interventions are implemented in practices to limit staff turnover

Intervention	Unsure	Response (%)					MS	Rank			
		Never.....	Sometimes.....	Always	1	2			3	4	5
		1	2	3							
Employees are treated fairly and equitably.	0.0	0.0	4.2	45.8	29.2	20.8	3.67	4			
Management takes time to meet with new employees to learn about their talents and skills.	0.0	0.0	20.8	20.8	37.5	20.8	3.58	5=			
Management promotes humour as part of the organisational culture.	0.0	0.0	8.3	20.8	54.2	16.7	3.79	2			
Employees are allowed to have flexible starting times and flexible ending times.	0.0	8.3	4.2	12.5	41.7	33.3	3.88	1			
The practice staffs adequately as to minimise overtime.	0.0	0.0	4.2	37.5	37.5	20.8	3.75	3			
The practice provides opportunity for career and personal growth through challenging assignments.	0.0	0.0	12.5	25	54.2	8.3	3.58	5=			
Exit interviews are conducted with departing employees.	8.3	4.2	12.5	20.8	33.3	20.8	3.29	7			

3.3 Recruitment

Table 2 indicates the frequency of implementation of recruitment strategies in terms of percentage responses to a scale of 1 (never) to 5 (always), and a MS ranging between 1.00 and 5.00. It is notable that all MSs are above the midpoint score of 3.00, which indicates that in general, the majority of practices can be deemed to implement recruitment strategies. However, given that all the MSs fall within the range of $> 3.40 \leq 4.20$, the implementing of recruitment strategies can be deemed to be between sometimes to often / often. The recruitment strategy with the highest MS is hiring of new employees through competency screening and behaviour testing (3.88), followed by appointing of new recruits on a probation basis (3.54). The strategy with the third highest MS is that of managers taking time to interview new applicants and getting to learn about talents and skills (3.50).

Table 2: Frequency at which practices implement recruitment strategies

Strategies	Unsure	Response (%)					MS	Rank
		Never.....	Sometimes.....	Always				
		1	2	3	4	5		
New employees are hired through behaviour- based testing and competency screening.	0.0	0.0	12.5	20.8	33.3	33.3	3.88	1
Management takes the time to interview each applicant and get to learn about their talents and skills.	0.0	0.0	16.7	33.3	33.3	16.7	3.50	3
New recruits are appointed on a probation basis.	0.0	4.2	4.2	45.8	25.0	20.8	3.54	2

3.4 Training and development of employees

Table 3 indicates the practices' degree of concurrence relative to statements regarding the implementation of training and development of employees in terms of percentage responses to a scale 1 (strongly disagree) and 5 (strongly agree), and a MS ranging between 1.00 and 5.00. It is notable that all MSs are above the midpoint score of 3.00, which

indicates that in general, the majority of practices can be deemed to train and develop employees. The statement with the highest MS is practices provide opportunities for employees to share knowledge (3.71), and the statement with the lowest MS is practices provide training programs for employees (3.29). Given that the MSs of the top three statements are $3.40 \leq 4.20$, the concurrence can be deemed to be between neutral to agree / agree.

Table 4 indicates the percentage of annual business volume invested by practices in training of employees. It is notable that 46% indicated that they were unsure, that 29% invested $> 0.1 \leq 0.5$ %, 17% invested $> 0.5 \leq 1.0$ %, and 8% invested $> 1.0 \leq 5.0$ %. It is notable that no practices invested more than $> 5\%$, indicating that the practices were not investing substantially in training. It can be concluded that practices were either not training all their employees or that they are sending them to inferior training programmes.

Table 3: Extent to which practices implement training and development

Statement	Unsure	Response (%)					MS	Rank
		Strongly disagree	Neutral			Strongly agree		
		1	2	3	4	5		
Your practice provides training programs for Employees.	0.0	4.2	12.5	41.7	33.3	8.3	3.29	4
Your practice solicits ideas and provides an environment in which employees are comfortable providing feedback.	0.0	0.0	4.2	41.7	41.7	12.5	3.63	2
Your practice provides opportunities for employees to share their knowledge via training sessions, presentations and team assignments.	0.0	0.0	12.5	25.0	41.7	20.8	3.71	1
Your practice provides the opportunity for career and personal growth through training and education.	0.0	4.2	12.5	45.8	12.5	25.0	3.42	3

Table 4: Percentage of annual business volume practices invest in training employees

Percentage of annual business volume	Responses		Rank
	No.	%	
0 %	0	0%	5=
> 0.1 ≤ 0.5 %	7	29%	2
> 0.5 ≤ 1.0%	4	17%	3
> 1.0 ≤ 5.0 %	2	8%	4
> 5% (Please state):	0	0%	5=
Unsure	11	46%	1
Total	24	100%	

3.5 Compensation and advancement options

Table 5 indicates the degree of concurrence relative to statements regarding the compensation of employees in terms of percentage responses to a scale 1 (strongly disagree) and 5 (strongly agree), and a MS ranging between 1.00 and 5.00. It is significant that all MSs are above the midpoint score of 3.00, which indicates that in general, the majority of practices can be deemed to consider compensation as important and that it is given consideration. The statement with the highest MS, namely practices offer attractive benefit packages (3.63), is followed by recognition and linking of pay to performance (3.38). The statement with the third highest MS is addressing of compensation and benefits during hiring processes (3.31).

Table 5: Compensation of employees

Statement	Unsure	Response (%)					MS	Rank
		Strongly disagree	Neutral	Strongly agree	MS	Rank		
		1	2	3				
Your practice clearly addresses compensation and benefits during hiring processes	8.3	8.3	12.5	29.2	16.7	25.0	3.13	3
Your practice offers an attractive, competitive, benefit packages	0.0	4.2	12.5	25.0	33.3	25.0	3.63	1
Your practice recognises excellent performance, and links pay to performance	4.2	0.0	20.8	25.0	29.2	20.8	3.38	2

Other findings from the survey revealed that 88% of practices reviewed salaries of employees > once every six months ≤ yearly, and that 12% did so > once every three months ≤ once every six months. The findings also revealed that all practices (100%) did not distribute corporate profits to employees.

Table 6 indicates that 38% of practices offered employees opportunities for cross-training and career progression, and 29% did not.

Table 6: Opportunities offered by practices to employees for cross-training and career progression

	Responses		Rank
	Total	%	
Yes	9	38%	1
No	7	29%	3
Unsure	8	33%	2
Total	24	100%	

4. CONCLUSIONS

The review of the literature revealed that for practices to succeed, it is important that they practice and implement effective HRM. The review also highlighted the importance of retaining human resources, recruitment, training and development, compensation, and advancement options.

The following can be concluded from the survey results:

- Practices are making an effort to reduce staff turnover and to retain their workforce;
- Practices are implementing recruitment strategies and consider recruitment to be important;
- Practices are training and developing their employees. However, the quality of the training is in question due to the low amount of investment in training and development;
- Practices consider employee remuneration as important, that majority of salaries were reviewed annually and no distribution of corporate profits to employees, and
- The majority of practices are offering employees opportunities for cross-training and career progression.

It is recommended that practices should invest more in training and development of employees, the frequency of salary review should be considered and be based on performance, and that employee advancement should be given more attention.

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Doing what works in a tough industry: Providing integrated occupational health support in a construction industry context

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Purpose of this paper

This paper examines The OzHelp Foundation workplace based early intervention suicide prevention and social capacity building program. It is built on a vision to enhance the resilience of apprentices and workers in the Construction and Building Industry and strengthens the leadership and support roles of the Industry leaders.

Approach

The approach of the OzHelp service is an industry embedded and integrated service that flexibly meets the client needs related to suicide prevention and mental health promotion.

Evaluation Findings

The paper discusses the evaluation of the services provided by the OzHelp Foundation since its inception in 2002 as a pilot program to becoming a national mental health service for the construction Industry in Australia

Practical implications (if applicable)

The industry embedded services examined in this paper provide a blue print for true occupational mental health safety.

What is original/value of paper?

This paper describes an exciting and innovative service which has not only been shown to be best practice worldwide but is applicable to a wide range of industries. The paper is of value to both practitioners and researchers wanting to implement an innovative social capacity building program to their industry.

Key words: Apprentices, Mental Health, OzHelp, Suicide Prevention

1. BACKGROUND - WHAT IS OZHELP?

Following the tragic death of three apprentices through suicide there was a mutual recognition among key construction industry stakeholders of the need to protect workers against the risk of suicide and other negative health outcomes.

The OzHelp Foundation was established through a unique partnership between the ACT branches of the Construction Forestry Mining and Energy Union (CFMEU) and the Master Builders Association (MBA). Funding for certain services to be provided has been obtained from the State and Federal governments. Suicide mortality rates in the construction industry are 75% higher than the Australian male rate (De Leo & Heller, AISRAP 2004).

The OzHelp Foundation has developed a broad vision to become a work-based suicide prevention and social capacity building program. It essentially provides a range of both training services and counselling/support services. The organisation commenced in Canberra with four staff in the roles of Executive Director, Training Coordinator, Field Officer and Executive Assistant. The organisation is now a National one with some 16 staff in the National Office and offices in four other states

OzHelp was initially set up to support apprentices in the construction industry, and this remains its primary purpose. There has, however, been an expansion of this purpose and the program now also addresses the support needs of other workers in the construction and other identified industries.

OzHelp provides a range of services that fall broadly under the headings of:

- Accredited training for apprentices and industry leaders
- Outreach support and mental health promotion
- Individual counselling and support including advocacy

2. ACCREDITED RESILIENCE TRAINING SERVICES FOR APPRENTICES AND WORKERS

OzHelp delivers training known as *Life-skills Toolbox* to apprentices in the industry in their first two years of training. The training has been integrated as an essential component of their trade training. The program comprises 12 modules (48 hours in total). The training is now provided by the Training Coordinator and the Field Officer, as the service has adopted the approach of greater integration of the training and support roles.

Training courses offered to the trainers/supervisors/field officers and management involved with apprentices in the construction industry have included the following;

- Suicide Intervention Training including
 - Applied Suicide Intervention Skills Training (ASIST)
 - SafeTALK
 - General Awareness Training
- Bullying Prevention workshops
- Workplace Mental Health Training
- Trauma and Serious Incident Management

3. OUTREACH SUPPORT AND MENTAL HEALTH PROMOTION

The OzHelp Field Officer regularly visits apprentices on worksites to build rapport and identify those who need further support or ongoing counselling. The role of the OzHelp Field Officer is a proactive and effective way of connecting with apprentices and facilitating the acceptance of talking to someone about problems.

The OzBarbeques initiative run by the OzHelp Foundation is another example of outreach mental health promotion. The collective participation of free lunchtime barbeques enhances peer support as well as places the services of OzHelp clearly within the industry environment.

4. INDIVIDUAL COUNSELLING

OzHelp also provides personal counselling services to apprentices, family members, trainers, employers, employees and other construction industry members. OzHelp currently employs one person with formal qualification in counselling and another who is being supported during the process of obtaining qualifications. If and when problems arise for apprentices or

others in the industry, OzHelp staff will offer support, referral and will also play an advocacy role if this seems to be required.

5. PROGRAM EVALUATION

5.1 Objectives

The Hunter Institute of Mental Health (HIMH) have been involved in several evaluations of the OzHelp program, providing earlier reports to the board and government in 2005 and 2007

The purpose of the latest evaluation report was to review the current operations with a view to determining progress with the major issues identified in the January 2007 report.

Specifically, the current evaluation sought to:

- identify and describe the major developments of the service since the last evaluation;
- determine the extent to which the OzHelp service has been promoted to the industry;
- determine the extent to which the OzHelp service has been accepted by the industry;
- determine the views of the individual services provided by OzHelp;
- gather further evidence of the benefits for apprentices and others in the industry from the OzHelp program;
- determine the extent to which earlier barriers to referral for support have been addressed;

5.2 Data collection

The evaluation has employed two main sources of data to reach conclusions about the program:

- Semi-structured interviews with key informants
- Apprentice focus groups

HIMH staff conducted face-to-face semi structured interviews with key informants, including representatives from:

- OzHelp staff
- OzHelp board members
- Employers
- Construction industry executives, and
- Staff working with apprentices

The interviews have been analysed to identify areas of consensus between interviewees with regards to the key evaluation questions. Focus groups were conducted with apprentices who had received the life skills training. The focus groups have been analysed to identify areas of consensus or contradiction between apprentices and other interviewees.

6. EVALUATION RESULTS

6.1 Developments in the service

6.1.1 Lifeskills Toolbox

The *Life-Skills Toolbox* has further developed since the last evaluation, benefiting from modifications in the content and from being presented in a published format. Further a trainer's manual has been produced. It does not require the apprentices to take copious notes, undertaken long written assignments or to do homework, but does include certain writing tasks and exercises to encourage learning.

In the industry, the Toolbox is presented over twelve four-hour sessions, during the first two-years of the formal in-class training of apprentices. Apprentices are progressively assessed based on individual participation in conversation and understanding of concepts.

The training program now reaches more apprentices than in previous years. A recent development has seen the inclusion of a one-day course in suicide intervention for apprentices attending the program

6.1.2 Support services

OzHelp barbeques continued to be held at the training centres and have been restructured into "Oz Connect" with funding from government and industry that has seen the dissemination of health promotion information a formal feature of the barbeques.

6.1.3. Promotion of the Service

Generally, it appears that efforts to promote the service to all sectors of the industry have been successful, although informants indicated that not all in the industry are aware of all aspects of the OzHelp services.

6.1.4 Promotion to apprentices

Apprentices in the industry are now well aware of OzHelp services, according to the apprentices interviewed. Some felt, however, that apprentices in areas where OzHelp is yet to be established are missing out on the training and knowledge of OzHelp.

“They are definitely missing out compared to what we have” (2nd Year Apprentice)

The fact that training staff are now providing a one-day course in suicide intervention to apprentices not receiving full training will provide an opportunity for greater promotion of OzHelp to this audience.

It was pointed out by apprentices and others that the service will continue to be promoted as time goes by those apprentices who have already completed the OzHelp training. These young men will promote the service to other apprentices and, as they themselves become employers and hire apprentices, they will encourage them to access OzHelp services.

Apprentices did express some concerns regarding the availability of the services to them after the completion of their apprenticeship. This issue has since been more clearly defined for apprentices in the future.

Training staff also play a promotional role through providing contact details and encouraging referrals.

6.1.5 Promotion to employers

There was disagreement among the informants as to the extent to which OzHelp has been promoted to employers.

Apprentices felt that employers have limited knowledge of the service, and when they are aware it is through the field workers' visits to a work site to visit an apprentice. They did not believe that employers in the industry would see the service as something they themselves would utilise.

“Most of our bosses are so proud they wouldn't do it anyway (go to counselling)”

Those involved in training felt that employers would be aware of the existence of the service, may have limited knowledge of what the service offers. Other informants in the industry felt that those employers who worked with the group scheme would be very aware of OzHelp, and that others not participating in the scheme should at least know about the service due to promotional activities of the staff. One employer interviewed was himself very aware and supportive of OzHelp, but did believe that the service needs to be further promoted to employers.

6.1.6 Promotion to the broader industry

Members of industry indicated that there was general awareness of the services of OzHelp, including that the counselling services not being limited to apprentice's but available to all people within the industry.

Some interviewees said that promotion was behind the scenes with OzHelp representatives attending industry functions and trade shows and getting to know people in the industry on a social level. This approach to promotion was regarded as appropriate and not pushy.

Overall, interviews revealed a significantly greater awareness of the service across the board, compared to previous reviews. Some in the training sector calling for an even more detailed understanding, particularly of the content of the *Life-Skills Toolbox*. Some also requested further information about the extent to which the other services of OzHelp are accessed by the industry.

6.2 Acceptance of OzHelp by the Industry

In earlier evaluations, it was apparent that some sections of the industry did not fully accept the OzHelp service. There were those in the training sector who remained resistant to the introduction of the life skills training, and those in the broader industry who remained sceptical of the counselling and support services being offered.

This latest evaluation revealed that general opinions of the service were much more accepting and it would seem that much has been done to increase the credibility and necessity of the range of services. This was Credible in such a short time frame given the nature of the construction industry in Australia to new services

6.2.1 Acceptance by apprentices

Staff indicated that there was no resistance whatsoever from apprentices themselves, with new apprentices seeing the staff from OzHelp and the services they offer as simply part of the environment that they have entered when commencing their apprenticeship.

This view was confirmed by the older apprentices themselves, who indicated that, if a younger apprentice expressed negative views of, say, the training, they would speak up and promote the service and the staff who deliver it.

Interviews from the industry also reinforce the view that there has been a growing acceptance on the OzHelp program amongst the apprentice's.

Some Trainers also reported that the *Life-Skills Toolbox* classes can cause some disruption to the program and, that in past years; apprentices did not attend classes on the day that the *Life-Skills Toolbox* was scheduled. This seems to have been the case only during the first year the Toolbox training was introduced and mainly involved older apprentices.

Avoiding behaviour during the current training year has not been reported. These points indicate quite an improvement in the extent to which this training has become embedded in the training calendars of the two group apprenticeship schemes.

6.2.2 Acceptance by those in the training sector

Staff believed that most trainers are supportive and accepting of the OzHelp program, although one or two of the trainers are still not fully

supportive and may send conflicting messages to the apprentices about using the service and how to deal with problems.

Field officers and managers from the training schemes are generally accepting and the organisations' referral rates have increased steadily over the past 2 years.

6.2.3. Acceptance by employers

Most interviewees indicated that employers are aware of and accepting of the OzHelp program. OzHelp has increased its direct service provision to employers in the last 18 months and this is part of its sustainability strategy

6.2.4 General

It is quite clear that any increase in acceptance across the board is attributed, by those interviewed, to the qualities of the staff employed by OzHelp.

"I thought 'this is not going to work'. But he proved me wrong...he has a good rapport with the apprentices" Long Term Industry trainer

6.3 Awareness of and attitudes towards OzHelp services

6.3.1 Life Skills Toolbox- Apprentices

Focus groups with apprentices indicate a strongly positive view of the life skills training that they had received.

Asked to identify the topics covered they reported the following: managing money and time; communication; drug and alcohol; gambling; self-esteem and confidence building; depression; relationships with friends and family; loss and grief; and working as a team.

Apprentices also appreciated the presenters' skills as well as the content of the material. They enjoyed the multiple ways in which the material was presented. For example there were games to go with material, never any home work set or copious amounts of writing. They also appreciated that there were no exams and a relaxed and flexible approach. The following comments reveal the value placed by apprentices on the course:

"The course is good, the money section in particular".

"It's not just about being a carpenter it's about life skills. The self-awareness training and skills in planning remind you of what you are working towards".

"The course also gives you a chance to make friends and get to know each other because of having to work together on exercises in classes".

This later comment was quite meaningful in that further discussion indicated that prior to the life skills training; apprentices did not get to know

each other and remained isolated. The relationships formed through the life skills training extended beyond the classes and carries on to social encounters also. This would not otherwise have occurred.

The trainers also reinforced this view of apprentices that apprentices are initially reluctant and not keen to attend the *Life-Skills Toolbox* classes for the first one or two classes but after that it becomes a “rite of passage”.

6.3.2 Life Skills Toolbox Trainers

Trainers are generally very supportive of the life skills training, while a small number remember to bring up that it has reduced the time available for the teaching of occupational theory and skills.

It is interesting to note that one interviewee reported that some of the older trainers were somewhat resentful of the time taken by OzHelp whereas some of the younger trainers were able to manage the time loss well. Trainers are aware of the handbook and may even have a copy but have generally not read it or looked at it in any great detail.

“I’ve had a quick look through it, relevant, relevant, relevant, relevant...”

All trainers believe that the apprentices benefit from the life skills training and that they enjoy the sessions. The Toolbox encourages sharing of opinions amongst the apprentices, and this appears to lead to a more cohesive group. In this way, at least one of the trainers saw that this made it easier for him to work with the apprentices and might have improved learning outcomes.

6.3.3 OzBarbeques

All apprentices have the chance to attend Mental Health promotion events in the form of an “Aussie” BBQ

The barbeques are seen very positively as a break from study and also have a social aspect. Apprentices indicated that, if not for the barbeques, they would eat their lunches as individuals or possibly in pairs.

The apprentices and OzHelp staff agree that the open communication style, which is encouraged in the life skills training transfers to the barbeques, with apprentices sharing openly with the staff and with each other. To reinforce this, one of the trainers interviewed said that he was surprised at the relaxed way in which the apprentices spoke about sensitive lifestyle issues in such a casual and free way, not only with OzHelp staff but with other apprentices, trainers and industry workers.

Whilst most people were of the strong opinion that the barbeques promoted a group bonding and mateship, one trainer believed that after the feed they broke into those small groups anyway and did not tend to make lasting bonds with each other. This view was not supported from the overall evaluation of this part of the service.

6.3.4 Counselling and Support Services

The availability of support is promoted through posters, and plastic cards which each apprentice is given to keep in their wallet. Apprentices interviewed indicated that they carried their card with them. Apprentices valued this support.

The focus groups revealed a surprising level of acceptance of the counselling and support role of OzHelp, with a number of apprentices revealing that they had used the service.

"I've talked to them after hours a fair bit, their pretty good."

"You can call someone if you are in trouble or you have a problem both with work and non-work related things".

One apprentice mentioned receiving a visit from one of the OzHelp field workers when he was in hospital, and another that he had been helped through a period of severe financial difficulty.

Apprentices expressed a high level of confidence in the fact that the OzHelp workers will maintain their confidentiality. This is reassuring for the apprentices. There is also the belief that OzHelp is responsive, being readily available most of the times and never taking long to return a call.

Over apprentices revealed a surprising openness about talking their problems through with OzHelp staff, and that doing so had given them an understanding that other people have similar problems so you are not so alone.

Apprentices believed that they had developed these views partly because of the relationship with OzHelp staff that had developed through the training and partly because they felt they were a more open generation. They believed that other people in the industry would also be willing to access the service.

Trainers are fully aware of the OzHelp counselling service and most are happy to make referrals and pass on information about the apprentices to the field workers and also pass on the contact details of the service to the apprentices. Most trainers felt that apprentices in general seem happy to access the counselling service.

Mostly, trainers thought that the field workers had built excellent rapport with the apprentices and this has been of benefit in apprentices sharing their thoughts and feelings amongst themselves and with the trainers and feeling like they can contact the field workers if they need to.

A Number of interviewees expressed relief in having the service available so that the pressure was relieved from the trainers and other training organisations members to provide this type of support in their personal life.

There is good knowledge that the OzHelp service is available to all people who work in the industry, and not just apprentices. Some employers indicated that he had referred employees who were not

apprentices to OzHelp counselling services for help. In these cases the employer was given feedback regarding the outcome with the employee's permission and was very happy with the outcome.

There is a general consensus that OzHelp is so successful due to the quality of staff they have. Most people interviewed reported a respect for the field workers on both a personal and professional level.

6.4 Benefits of OzHelp

There is a general consensus that the *Life-Skills Toolbox* training has had many benefits for apprentices. Apprentices themselves see the skills in financial management are readily applicable in the present moment. Other aspects are less immediately relevant but are nevertheless valued by the apprentices.

Apprentices have developed a range of social skills as a result of their exposure to OzHelp. This appears to be attributed to a number of contributing factors:

- the life skills training has created an environment in which open communication is encouraged;
- the experience of hearing the experiences of other apprentices has led individuals apprentices to be more sharing;
- OzHelp staff have modelled open and mature communication;
- OzHelp barbeques have provided opportunities for apprentices to meet each other on a more social level, leading to formation of friendships;
- Open communication is reinforced by some trainers.

The acquiring of these individual and group social skills has derived benefits for other aspects of their training, as some trainers have commented that the groups are easier to work with and have greater capacity for teamwork.

Apprentices have indicated that learning about social issues, and hearing others express difficulties has normalised open communication about personal problems. This has resulted in a greater openness about personal problems and increasing the likelihood that they will look for and access sources of help in the future.

Apprentices have accessed OzHelp for support and are very positive about the value of the support that they have received. This view is supported by trainers, other industry officials and by the one employer interviewed, all of whom have indicated a high level of satisfaction with the support that apprentices and other workers have received following a referral to OzHelp.

Trainers expressed that a flow-on benefit for them is that the knowledge that OzHelp is there to provide support to apprentices, relieves them of the pressure of having to provide support themselves.

This is an area where they do not have sufficient training and knowledge, even to make an effective referral. A more general and less

tangible benefit derives from the fact that in this industry, issues which may have previously been ignored or not addressed are now being addressed and dealt with, sometimes without anybody even knowing. The OzHelp service operates in the background and takes the pressure off the trainers and other industry representatives.

There is a consensus that one of the main impacts OzHelp has had has been an increased awareness across the whole industry for the need for a group like OzHelp to help build life skills and provide support. OzHelp highlights that there is a problem and that the first step in taking action is relatively easy.

“They have made a hell of an impact” in such a short period of time.

7. CONCLUSION - THE CHALLENGE OF GROWTH

This review identified a successful service, operated by a dedicated, competent and resourceful staff. Many of the challenges facing the organisation in late 2007 have been addressed and have either been resolved or reduced in importance. The success of OzHelp in the building and construction industry in the Canberra resulted in pressures on the organisation to expand in a number of ways:

- provision of a full training and support service to apprentices and workers in this and other industries
- expansion of the support services to workers and employers and others in the industry other Regions
- expansion to nearby geographic areas;
- expansion to other states.

OzHelp has addressed these pressures and is now successfully operating

- Australian Capital Territory (National Office)
 - Building and construction
 - Utilities
 - Community Health Industry
 - Public Service Industry (Graduate Development programs)
- New South Wales
 - Building and construction Industry (Operated by National Office)
- Tasmania
 - Building and construction Industry
- Queensland
 - Building and construction Industry

- Western Australia
 - Building and construction
 - Mining (Operated by National Office)

This dynamic service continues to expand by providing a proactive industry responsive service. Going Forward there are some key principles that all persons representing OzHelp are required subscribe to these are

7.1 Proactive service approach

The unique and successful core principle of the OzHelp program is its proactive effort to establish and maintain relationships with Apprentices and Workers in the construction industry. OzHelp Field Officers (or their equivalent) ensure that:

- Relationships are developed and maintained between Apprentices and Workers and the Oz Help program.
- Apprentices and Workers develop help seeking behaviours to access Oz Support services.
- General and mental health awareness is promoted consistently and regularly.

7.2 Unique Support Model

The OzHelp program must provide Oz Support services as follows:

- A support service for Apprentices, Workers, their partners or carers within the Building and Construction industry.
- Resources who are available to discuss any issues that may be of concern to Apprentices or Workers, whether they are personal, work or home related at workplaces, if necessary.
- Oz Support Counsellors to conduct private and confidential counselling discussions onsite or offsite at any time.

7.3 Industry based

The OzHelp program was designed for the Building and Construction Industry and is a work place based program. Therefore, OzHelp Programs must primarily focus on industry work places.

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ANALYSIS OF THE DRAFT POLICY ON OCCUPATIONAL SAFETY AND HEALTH (OSH): Tanzanian Construction Industry

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ABSTRACT

Purpose of this paper

The objective of this study was to assess the viability of the Tanzanian Occupational Safety and Health Authority (OSHA) draft policy on health and safety and propose for OSHA to be effective.

Methodology

Interviews were chosen because they could be used in situations where the interviewee was not informed and the researcher could repeat unclear questions to the respondents. Open ended questions could be extended to brainstorming to get a wider perspective of the response. *Literature review was used as* It is important that a research is conducted while relating to documentary methods. *Observations* were done during site visitation and Issues to be observed were carefully listed in form of a checklist to enable consistency in observation. Questionnaires used for the research were formulated under 3 basic categories (contractors, Workers and Statutory Authorities) to capture on basic conceptualisation of basic elements of a safety programme.

The study focussed on Occupational Health and Safety in Tanzania, analysis of the draft policy on OSH and the concentration was limited to the formal Construction sector.

Findings

Findings show awareness is still low on Health and Safety. Legal framework on Health and safety practices is considered adequate but there is poor enforcement of the rules. The Government should take more efforts to involve Workers in the Tripartite Commitment, Institutional Development and proper strategic implementation of the policy statement. Government should incorporate the basic ILO-OSH standards in the strategic implementation plan and looking into the Feasibility of giving Health and Safety attention in Pre-contract stages.

Practical implications

The biggest challenge in the implementation of the policy is instilling a Health and Safety culture in stakeholders especially workers and a general framework for enforcement.

Value of paper

The study identified priority areas where the building team can emphasize OSH, in contrast to letting the burden on a single party. It showed the growing need of having a policy directed towards guiding the Acts, regulations and also suggest on strategic implementation which can be used by agencies like OSHA.

Keywords: Occupational Safety and Health , OSH Policy.

1. BACKGROUND

The Construction Industry is one of the most hazardous settings worldwide. In Tanzania, the construction industry is one of the key sectors of the economy. It accounts for more than 50% of the capital formation, 5% of the Gross Domestic Product and 9% of the employment¹. The industry permeates through all other sectors of the economy, thereby stimulating their growth.

Needless to say, it is an economic sector associated with proportionately many accidents, injuries and diseases compared to others.

¹ ILO -NCC Study, 2004.
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Safety and Health

It comes third after mining and quarrying industries² implying that workers in the construction industry face many health and safety hazards in their work sites everyday. The government established the Occupational Safety and Health Authority (OSHA) under the Executive Agencies Act 1997, replacing the Factories Inspectorate. If well facilitated, OSHA can greatly help in improving Safety and Health.

Apart from having OSHA empowered, there is a need to come up with legislations that can be implemented to suit the present situation of which are inherent of a comprehensive national policy and proper strategic implementation.

2. OBJECTIVES OF THE STUDY

The major objective of this study was to assess the viability of the Tanzanian Occupational Safety and Health Authority (OSHA) draft policy on health and safety and propose for OSHA to be effective. Specifically, the study aimed:

- To look at the current situation regarding safety and health in construction and the problems associated with the Factories (Building Operations and works of Engineering Construction) Rules 1985.
- Evaluate the draft OSH policy and assess its strengths and weaknesses and propose what should be done to make the OSHA be effective in safety issues in construction works

3. RESEARCH QUESTIONS

- 1 What are the weaknesses in The Factories (Building Operations and works of Engineering Construction) Rules 1985?
- 2 Is the policy which is in pipeline, directed towards occupational Safety and Health attainable?
- 3 What could be the challenges associated with implementation of OSH policy both at National and Company/Enterprise level (i.e. Building team)?
- 4 Could there be a relationship between the general policy (in pipeline³) and the OSH policy at Company level (as per 2003 (OSH Act), Part X, S.96)?

² Ibid

³ Refer to Appendix 2

4. METHOD AND STUDY AREA

The study was compelled to contain both qualitative and quantitative data in the need to analyse the OSH policy and also focusing on the OSH situation itself in the Construction Industry. Qualitative data focused on the studying of the draft policy and the Factory Rules in the light of coming up with various conclusions and on the other hand, the quantitative data collection mainly focused on the tabulated data collection in relation to the study of safety in the Construction Industry.

(a). *Interviews*

This entailed a question and answer encounter with the respondents in which the researcher tried to get information from interviewees. Respondents here were normally different consultants in the Construction Industry. Interviews were chosen because they could even be used in situations where the interviewee was not informed and in any case the researcher could repeat unclear questions to the respondents.

Open ended questions could be even extended to brain storming in order for the researcher to get a wider perspective of the response.

(b). *Literature review and documentary study*

Literature review was also used as a source of information in the research. It is quite extraordinary that a research is conducted independently without relating to some documentary methods. Thus various documents were used including News letters, journals theses, written reports, conference papers, internet and News paper articles.

(c). *Observations*

Issues to be observed were carefully listed down in form of a checklist to enable consistency in observation. This was mainly applicable upon site visitation where key issues could be observed.

(d). *Questionnaires*

Questionnaires were formulated under three (3) basic categories i.e. to contractors, Workers and Statutory Authorities. The ones to Contractors and workers were designed on a basic conceptualisation of three basic elements of a safety programme namely Policy and Strategy; Procedures, Materials and Methods; and Performance Evaluation.

The structured questionnaires included questions on Safety policy, the position of the highest ranking Safety officer, accident reporting and investigation, Safety training and meetings, the use of safety incentives, the use of protective materials and equipment, causes of accidents and accident records among others. The other form of questionnaire to statutory Authorities collected vital information on policy, regulations and Acts from various players on OSH.

RESULTS, CONCLUSIONS AND RECOMMENDATIONS

5. FINDINGS

5.1 ANALYSIS OF VARIOUS HEALTH AND SAFETY ISSUES

5.1.1 Availability of Safety Policy

Eight of all the firms studied had formal policies guiding their safety programs, with the exception of two local ones which did not have any safety policy (Table 1). The lack of a safety policy in two of the local firms meant that their safety programs are not guided by any principles in the pursuit of their safety goals.

Table 1: Use of a Safety Policy

Response	Local		Foreign		Total	
	No.	%	No	%	No	%
Yes	3	60	5	100	8	80
No	2	40	0	0	2	20
Total	5	100	5	100	10	100

Source: Author's Fieldwork, April 2006.

5.1.2 Accident reporting and investigation procedures

Ideally, every firm should have formal procedures for accident reporting and Investigation for any kind of accident and investigations for the cause. Only 6 of companies studied (60%) had them. Of the foreign firms, 80% had formal procedures while only 40% for the Local had.

5.1.3 Training Programmes and Safety Meetings

Only three firms did not have established training programmes and safety meetings for their workers. The foreign firms were better than the Local ones in this respect with 80% and 60% foreign and local firms respectively incorporating training and safety meetings in their programmes.

5.1.4. Provision and Use of Protective Materials

Table 2: Availability of Protective Materials

Response	Local		Foreign		Total	
	No.	%	No	%	No	%
Yes	2	40	5	100	7	70
No	3	60	0	0	3	30
Total	5	100	5	100	10	100

Source: Author's Fieldwork, April 2006.

It is clear from Table 2 that the effectiveness of the use of safety materials was below average in most of the firms due to either lack of strict enforcement or irresponsible and uncooperative behaviour of workers.

5.1.5. Accident Records of the Firms

Only one of the firms (Foreign) achieved an ideal state of zero accident in 2005 period. The best record was 2 accidents for the period (achieved by one foreign firm and one Local firm) and the worst was 10 recorded by a Local firm.

Overall the foreign and Local firms recorded a total 19 accidents and 25 accidents respectively in the period. This represents an average of 9.5 accidents and 12.5 accidents per firm for the foreign and local firms respectively.

5.1.6 Safety Performance evaluation of the Firms

An aggregate analysis of the various safety elements(and others not included in this brief) discussed above was carried out in order to obtain the overall safety performance of the firms relative to each other. By a measure of this, it implied that the firms could even be ranked.

The Safety Performance Index SPI of each firm (Table 3) was calculated and the top three firms were all foreign while the best local firm was ranked 4th . A local firm had the lowest performance ranking as well as the worst accident record probably because of the fact that it had no policies to guide its safety programme as the data showed. Also in general, firms in slightly higher classes performed better than the ones in lower classes with the exception of a few.

Table 3: Safety Performance assessment and ranking

FIRM	CLASS	PERFORMANCE INDICATORS/SCORE				
		Policy W=5	Protective materials W=3	Accident Record W=2	SPI	Rank
L1	1	25	5	-2	13.8	4
L2	2	15	10	-6	9.3	7
L3	3	0	5	-10	-0.5	10
L4	3	5	5	-3	3.4	9
L5	2	10	5	-4	5.7	8
R1	3	25	10	-4	14.7	3
R2	1	30	10	-2	17.6	2

R3	2	25	5	-4	13.2	5
R4	1	35	10	-3	19.9	1
R5	3	20	10	-6	11.8	6

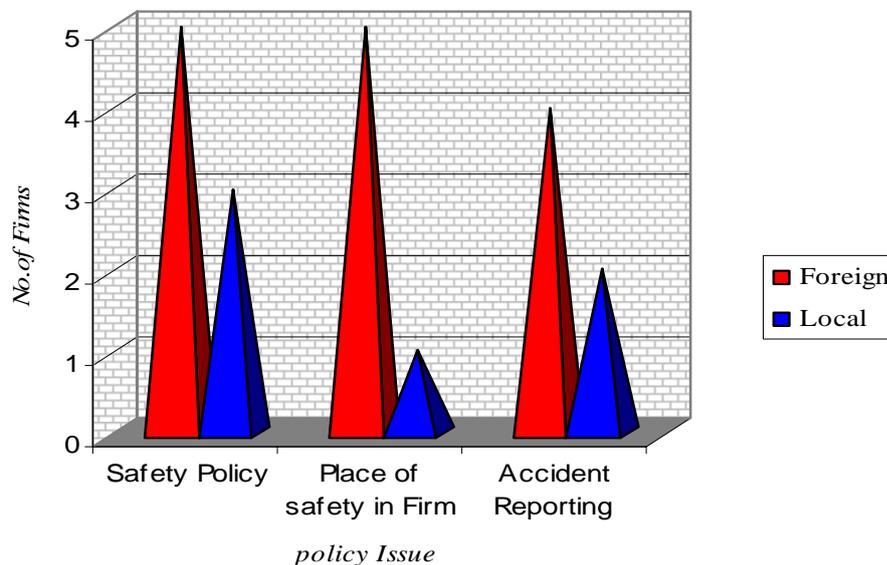
Source: Author's compilation as analysed from various tabulations

5.2 SITUATION REGARDING HEALTH AND SAFETY IN THE CONSTRUCTION INDUSTRY

5.2.1 Health and safety performance

The Safety practices and performances in a sample of five foreign and five local firms in the Construction industry. A miscellaneous finding was that the foreign firms were slightly better than their Local counterparts in almost all the elements of safety practice analysed. For example, none of the local firms had its highest-ranking safety officer at the top management level. This may be indicative of lack of management interest and commitment to construction safety, which in turn could deprive the safety department of the needed resources for effective safety management. Since the link between safety and productivity/profitability has been well established, the comparatively poor safety performance of Local firms may be one of the reasons for their low productivity and profitability relative to the foreign firms.

Figure 3.1: Adherence of firms to Policy issues



Source: Author's Construct from Tables 4, 5 and 6.

Also from these findings about the situation regarding Health and safety, another relationship may be established. This relationship provides a response to research question number four. The question was referring to whether there could be a relationship between the general policy (in pipeline) and the OSH policy at company level (as per OSH Act, 2003 Part X, and Cl.96)? Almost all foreign firms complied with all the requisites of the Policy. Four of those firms are rooted from countries like South Africa and the like, which have a National Occupational Safety and Health policy (revealed from the study) that enforces a Policy at Company level and that could be a reason as to why policy issues are a culture of those companies. The local firms may not have been doing well in policy issues because the country at current lacks a National policy and of course not neglecting the possibility of poor enforcement of the Law (i.e. Act 2003).

5.3 EFFECTIVENESS OF THE FACTORIES RULES, 1985

These rules may be cited as the Factories (Building Operations and Works of Engineering Construction) rules, 1985 and as discussed earlier, they are the main legislation making provision for safety, health and welfare of people employed in factories and other places (i.e. like construction sites) and for matters incidental to, and connected with it.

Rule 5 of the Factories Rules requires that the main contractor within seven days of commencing or undertaking building construction or works of engineering construction shall make notification in writing to the chief inspector of the existence of the construction sites. However during the survey, it was revealed that many of the visited construction sites did not notify their operations to the chief inspector. Based on that finding, one could conclude that possibly most construction companies lack knowledge of the existence of the legislation, weak enforcement mechanism on the part of the Government and perhaps negligence on the part of the contractors.

5.4 POLICY STATEMENTS ANALYSED

5.4.1 Tripartite Commitment and Cooperation

This endeavour is aimed at seeing the Government, Employers and Workers organisations as complementary and mutually reinforcing to promote occupational health and safety.

The study revealed that the tripartite cooperation has been initiated but the framework itself not yet realised. This was further escalated by a finding that workers themselves seem far apart from the other two parties, issues being that they remain so ignorant and not informed of what really they are supposed to do or entitled to. An observed possible reason for that was the fact that employers tend to take advantage of the workers in the quest to rip

profits. Also being desperate for employment to some extent silences workers' would have been expressions of dissatisfaction.

5.4.2. Institutional Development and Capacity Building

Various interviews revealed a lot of inadequacy in the standards of services offered by some existing OHS institutions and the subjects being analysed here were as regards human, technical and financial resources. Although there is a need for the government to create more Institutions, the available ones lack adequate financial resources to the available human resource and also in adequate technical personnel. On top of existence of limited institutions directed towards institutionalising the basic Health and Safety knowledge, the study revealed that most of people dealing with safety issues have not had basic drilling in H&S but rather they perform by virtue of their professions.

5.4.3 Awareness campaigns initiated

The above statement of the policy is aimed at creating awareness mainly aimed at creating a safety culture in order to eliminate hazards, accidents and diseases. The study revealed that the level of awareness on OHS among management and workers in work places is considerably still low. Some awareness campaigns are already in place for example an interview with OSHA revealed that it introduced an award ceremony effected 2005, which shall be taking place every year during the World day for Occupational Health and safety. Best performers from competitors in field of Health and safety are awarded prizes but still, the would have been participants are still reluctant.

Awareness between employers and workers is still a problem because employers still strongly perceive Health and safety with a lot of cost implications thus depriving the workers of the basic knowledge.

5.4.4 Preventative principles and OSH services promoted.

This statement is based on the old saying that "Prevention is better than cure". The study revealed that most work places are characterised by efforts to control hazards rather than eliminating and preventing them, in fact an interview with workers further revealed that measures are always put in place after an incident occurring.

A challenging finding was that provisions of the Workmen's Compensations Ordinance (1949) purport compensation being cheaper than prevention. The Quantum of compensation under this ordinance is even far below what would be recoverable as compensation in courts for the same injury. Possibly this is one of the main reason as to why the employers are rigid to employing preventative techniques knowing that after all they can compensate an injured party.

5.4.5 Legal framework and compliance

As regards the above statement, the Government's intention mainly is to ensure efficient implementation of legal instruments. The shortfall to this was found out to be limited resources, inadequate enforcement and coordination coupled with the fact that OHS regulations and laws are not quite explicit on the specific standards of compliance. The basic ILO OHS standards are also missing.

It was found out that OHS laws, regulations and guidelines are managed by several Ministries and departments at national and local levels. This creates a lot of uncoordinated approaches leading to duplication of efforts and duties as well as inefficient use of the already insufficient staff. E.g. Site inspections are done by different bodies (i.e. CRB, AQRB e.t.c) with limited or no coordination. In fact in the questionnaire response, it was revealed that a big percentage of professionals in many Professional Associations had no exhaustive knowledge on The Factories (Building Operations and works of Engineering Construction) Rules 1985 which on the contrary are used as a tool of inspection by OSHA.

A drawn set back realised within this policy statement was that it provides no course of action like prosecution to those who do not abide by the policy itself. It is only the Law which provides for such course of action⁴. This vital finding questions the strategic implementation of the policy itself.

6. CONCLUSION

6.1 Health and Safety awareness

The level of Health and Safety awareness is still low, for one reason or another. Mainly the perception of Health and Safety as a cost burden is still a big hiccup. Clients still have a marginal awareness on Health and safety issues. This perhaps has been among the greatest cause for less concern on Health and Safety in pre-contract stages

6.2 Health and Safety performance

The fact that out of 10 firms, no firm had the ideal performance of SPI equalling 25 means that Health and safety performance is still tardy. However, the analysis depicted some good performance although it was higher class firms and mainly foreign firms. A conclusion can reasonably be drawn that foreign firms are slightly better in Health and Safety Performance than their Local counterparts and that also the class of a firm has a effect on the level of Health and Safety performance.

⁴ 2003 (OSH Act), i.e. Part IX: Offences, penalties and Legal proceedings

6.3 Legal framework and enforcement

The legal framework on Health and safety practices in the construction industry is to a great extent considered adequate; putting in the mind that some is out of print and under amendment. However, there is poor monitoring and enforcement of the rules thus subjecting the majority of the workers to humiliation, injury and lack of compensation for severe injuries. The government and its agencies have been weak in monitoring Health and Safety practices on construction sites and enforcing the laws and regulations designed for enhancement. At the same time, workers are generally not aware of their rights and entitlements under the law and the contract

7. ANSWERS TO RESEARCH QUESTIONS

Some of the weaknesses on the Factories rules have been identified of which include the lack of its awareness to the Construction Industry in general and lack of clients' involvement as an important stake holder in ensuring Health and Safety. One of the biggest challenges in the implementation of the policy is instilling of safety culture in stakeholders and a frame work for enforcement. The relationship between the general policy (in pipeline) and the OSH policy at company level (2003 (OSH Act), Part X, S.96), in response to research question number four. It lies in the fact that the lack of a National occupational Safety and Healthy policy is one of the major causes for many firms not having Healthy and Safety policies as required by 2003 (OSH Act), Part X, S.96

8. RECOMMENDATIONS

8.1 Tripartite Commitment and Cooperation

A tripartite cooperation is aimed at creating a link among the Government, Employers and Workers. Although the tri partite framework has been initiated, this framework has not yet been realised, since it was observed that one group (i.e. workers) are still lagging in the tripartite commitment and cooperation. A bottom top approach rather than a top bottom should be emphasised in the strategic implementation because in the actual sense, workers them selves are the people who are highly directly affected by Health and Safety effects.

8.2 Institutional Development and Capacity Building

The strategy here should not only be encouraging a safety and Health committee but rather a Joint Safety and Health committee such that the internal responsibility of OSH system can be put into practice.

8.3 Awareness campaigns initiated

In order to effect a good awareness level of Health and Safety all social partners and stakeholders should be involved and also the campaigns should become more decentralised to address sector issues i.e. Construction, Agriculture, e.t.c but rather not so general as they are at present because they only address four categories i.e. Female, Male, small/medium enterprises and large enterprises. A specific recognition should be made to all parties involved.

8.4 Preventative principles and OSH services promoted

For a proper strategic implementation of the above policy statement, techniques to combine OSH improvements with higher productivity, introduction of low and no cost options and use of worker friendly flexible machinery and tools should be introduced

In line with implementation of the policy in relation to encouraging preventative measures, the current Workmen's Compensations Ordinance (1949) needs amendment. The amendment of this legislation should be expected to make a provision for a compensation system that encourages prevention of accidents as opposed to the current situation where compensation is cheaper than prevention.

8.5 Legal framework and compliance

Much as the government is looking forward to furthering the strength of the OHS regulations and getting relevant ILO convention ratified and existing or upcoming regulations enforced, it should find a way of incorporating the basic ILO-OSH standards in the strategic implementation plan.

8.6 Feasibility of giving Health and Safety attention in Pre-contract stages

Currently it has been learned from interviews carried out, that the Public Procurement Regulatory Authority (PPRA) has intentions of taking up the above issue in its process of developing standard documents.

9. AREAS FOR FURTHER RESEARCH

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It can be appreciated that that the field of Occupational Safety and Health is wide and would require broad cross section studies in order to appreciate its impacts on the Construction Industry at large. However, this study concentrated on the practices in the Formal Construction sector, yet the importance of the Informal sector also can not be overlooked. Thus a study has been recommended to investigate the extent to which the regulatory framework of Safety and Health accommodates the Informal sector.

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The Impact of the Maputo Development Corridor on Socio- economic Development: A Review of the Legislative and Regulatory Framework

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ABSTRACT AND KEYWORDS

Purpose of this paper

From a South African point of view, and more generally an African point of view corridor development is current and important for future socio-economic growth as also seen in the fact that the South African Developing Community (SADC) is interested in the possible positive outcomes of corridor development. The objectives of this study included the following:

- A literature review on economic wealth creation within the broader region that the Maputo Development Corridor currently serves;
- A theoretical overview on development corridors;
- South African legislative and policy overview in respect to corridor development.

Design/methodology/approach

The research method comprised of a literature review on economic wealth creation within the broader region.

Findings

Areas closer to the N4 corridor had higher growth in terms of economic output as measured by Gross Valued Added than those further removed.

Research limitations/implications

An empirical research phase comprising of qualitative interviews with the business sector needs to be done in a following phase.

Practical implications

An entire region must take part in the development process and for a Development Corridor the two primary development centres must be linked by means of a communication axis, preferably with other secondary development centres in between. There must be mutual dependency between the centres, the interaction must have the potential for further development and the corridor must grow both economically and physically.

Value of paper

As nodal points are important to the development of a corridor and provide economic activities/ employment opportunities that stimulate growth and spatial interaction within the corridor, one can now make recommendations on what is possibly needed and what can be looked into from an economic, social and environmental point of view as to realize the sustainability of such a development.

Keywords: Development Corridor, spatial development initiatives

1. INTRODUCTION

In mid-2008 Trans African Concessions (Pty) Ltd (TRAC) requested a multi-disciplinary research team of the University of the Free State and the Council for Scientific and Industrial Research (CSIR), Built Environment Division to initiate a socio-economic impact study on the Maputo Development Corridor (MDC) along the N4 toll road. TRAC is since 5 May 1997 the Concessionaire of the R3 Billion (1R=10\$) projects to build, finance, operate, maintain and expand the 630 km N4 toll road stretching from Pretoria in the Gauteng Province, in South Africa, through the

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Mpumalanga Province to Maputo in Mozambique (Figure no 1 refers). It runs through some of the more industrialised and productive regions in Southern Africa, including mining and agricultural areas and large concentrations of manufacturing, processing, mining and smelting industries, which are located in Johannesburg and Pretoria on the western end of the corridor (Nathan Associates Inc 2008).

The vision of the MDC is to rehabilitate the core infrastructure, i.e. road, port and dredging, electricity and the border post within the Corridor, through public/ private partnerships, thereby re-establishing key linkages and opening up inherent under and unutilised economic development opportunities. Underlying the vision is the desire to see this initiative contributing to other key policy areas – notably regional economic integration, international competitiveness and a broadening of the ownership base in the economy of the Corridor. In order to facilitate the implementation of the project in partnership with the private sector, protocols were signed between the two Governments of South Africa and Mozambique (TRAC N4 Toll Road: online).

The Southern African Developing Community (SADC) is interested in the possible positive outcomes of corridor development: "The SADC Secretariat intends to undertake a study to develop the Corridor/SDI program as a development strategy to accelerate regional economic integration and development. The success of this development is dependent on the cooperation and political commitment of member states on the Corridor/SDI Program" (SABC News: Online 05/06/2007).

The idea of the National Physical Development Plan (RSA, 1975:17) of 1975 was to link existing metropolitan areas with identified or future growth poles by means of development axes. Geyer (1986:163) found that some of these axes were not supported by secondary development centres or were stretching over too long distances to make development realistically viable. The greater the distances between centres, the stronger these secondary centres must be as a propelling force. In some cases these so-

with South Africa as a whole. The analysis did however indicate that areas closer to the N4 corridor (axis) had higher growth than those further removed. This is the case for total output as well as for several sectors. GVA per capita also indicated a similar situation – areas close to the road corridor had a higher growth rate than those further removed.

2. DELIMITATION OF THE STUDY

Figure 1 provides an indication of the physical extent as geographically defined at the start of the Maputo Corridor Project (initiated by the National Department of Transport). The Maputo Development Corridor is a major import/export route that connects the north-east provinces of South Africa with the capital and main port of Mozambique. It also serves Gauteng, Swaziland and South West Mozambique.

3. RESEARCH METHODOLOGY

This research eventually aims to determine the effect the Maputo corridor project and in particular the road (N4) has had on social-economic development and subsequent economic 'wealth' creation within the broader region it currently serves. This report is the first activity in this process and provides a review of available (desktop) literature dealing with the Maputo Development Corridor (MDC). It must be emphasized that the list of literature reviewed is not exhaustive; instead it attempts to focus on the most appropriate material given the stated objective. In addition, it also contains theoretical concepts related to development corridors and regional development.

This paper revisits concepts related to corridors and their theoretical foundation. Some sectors and components of socio economic development have been included as well as main activities that occurred since the inception of the MDC. Although some studies investigated the impact of the MDC it is clear that subsequent deductions are matters of interpretation. Some changes cannot clearly be related to the MDC. There are clear deficiencies and con-strains (example: the coverage of Mozambique and Swaziland) in the picture currently. This research should therefore be seen as an initial scan of only what is available and it must be emphasised that the focus was also on the road component of the MDC.

4. THEORETICAL ASPECTS OF REGIONAL DEVELOPMENT

From a regional point of view the Development Bank of Southern Africa (DBSA), in Coetzee, Geringer and Thompson (1985:viii) points out that the theory of economic development has not evolved in isolation from

developmental thinking, but generally reflects the underpinnings of the latter, where the modernization or diffusionist paradigm and dependency approach hold different views on regional development.

Bingham & Mier (1993:28) point out that there are two schools of thought on regional development. Firstly, the development-from-above approach, which views regional development as essentially emanating from the core and growth centres, and then trickling down to the periphery and hinterlands. Secondly, the development-from-below approach argues that regions should take control of their own institutions to create the standard of living desired in the region.

The difference between the two views is that the Modernisation Paradigm in regional economics includes regional growth theories as well as Spatial and Industrial Location Theories, while the Dependency Theory has not yet developed a full Spatial Theory of development, since their Spatial Theory is derived from a historical description of the development of the World Capitalist System. (DBSA, in Coetzee *et al.* 1985: viii).

For the scope of this paper only the Modernisation Theories, will be applicable in the region along the N4 Route, with much attention being devoted to regional growth. Fair (1982:5) argues that the essence of the Modernisation Paradigm is that, if underdeveloped countries are to develop, then these countries must follow the path taken by the advanced industrial countries over the past 100 to 200 years. However, this paradigm sees underdevelopment as merely an initial stage from which countries or regions can escape, implying that the cause of the underdevelopment of regions lies within themselves.

4.1 Regional Growth Theories

The DBSA, (Coetzee *et al.* 1985:30) states that, in an attempt to reconcile Regional Theories with the more general Growth Theories, a number of scholars have endeavoured to formulate Regional Growth Theories, mostly to explain what happened in regions. The most influential amongst these theories are the Export-Based Theory and Leven's Stages Theory of Exports, and these theories will be discussed briefly below.

4.1.1 Export-Based Theory

Glasson (1978:80-81) refers to this theory as an economic-based theory, and argues that it's the simplest and probably the best-known theory in view of its focus on basic and non-basic services. On the other hand, the DBSA, in Coetzee *et al.* (1985:30) holds the view that the Export-Based Theory was the first attempt to formulate a Regional Economic Growth Theory. This theory divides the economy of a region or city into export and residential sectors (or basic and non-basic sectors).

Export activities are considered to be the prime mover of the economy and the economic growth of a region or city is thus mainly

determined by the ability of the region or city to export to other regions, cities or countries. From a regional planning viewpoint, Glasson (1978:82) states that a rise in the level of basic activity within a region will increase the flow of income into the region, thus leading to a greater demand for goods and services within the region and a corresponding increase in the volume of non-basic activity.

In addition, it must be mentioned that - even though this theory is a popular tool in the analysis of regional development - it has been criticised severely for its limitations as a Growth Theory, since it uses employment as the unit of measurement in the identification of basic and non-basic activities, as well as the choice of study areas (Glasson, 1978:83).

4.1.2 Sector Theory and Leven's Stage Theory

The Sector Theory arises from empirical observations by Clark and Fisher (Coetzee et al. 1985:31). It has been argued that an increase in per capita income in different areas at different times is generally accompanied by a resource reallocation and a decline in the labour force proportion employed in primary (agricultural) activities, as well as a rise in secondary (manufacturing) activities, followed by a rise in tertiary (service) activities.

The DBSA, (Coetzee et al. 1985:31) points out that "the shift in the importance of the different sectors is determined by the income elasticity of the demand for their products and by the rates of change of labour productivity." However, Leven's Stages Theory of Exports is an extension of the Simple Sector Theory and Glasson (1978:104) referred to it as the Stage Theory, which suggests that regional development is primarily an internal evolutionary process. The DBSA, (Coetzee et al. 1985:32) argues that, "Leven's theory has expanded by applying Rostow's theory within a regional context." He identified five stages of development, namely the Period of Isolation, the Colonization Period, the Diversification Stage, the Industrialization Phase and the Developed Stage. Leven regarded productivity as the single most important factor determining economic growth.

Therefore, Glasson (1978:104) identifies the following five stages of development, which suggest that regional development is primarily an internal evolutionary process:

- "Self-sufficient subsistence economy, with little investment or trade".
- "With the improvements in transport, the region develops trade and specialisation".
- "With increasing inter-regional trade, the region progresses through a succession of agricultural crops ..."
- "With increasing population and diminishing agricultural returns, the region is forced to industrialise".
- "The final stage is the development of tertiary industry producing export".

In view of the above-mentioned stages of development, the DBSA, (Coetzee *et al.* 1985:32) states that “the magnitude of exports was related to the particular stage of development of a country or region at a specific point in time, because an increase in exports is viewed at least partly as a consequence (and not a cause) of increased growth in per capita real income.”

If development essentially concerns people and their needs then regional development cannot be narrowly focused on the demarcation of regions or the location of industry, but the emphasis should be placed on the people in the region. Besides, the industrial revival of a region may be promoted by restructuring certain factors, i.e. improving the standard of living, providing labour training, improving communication and transport, improved standards and financial aid to new industries, as well as intervening in behavioural-type patterns, in order to enhance the image of a region.

5. THEORETICAL PERSPECTIVE OF REGIONAL DEVELOPMENT AND DEVELOPMENT CORRIDORS

Development Corridors are difficult to define spatially as they are often based on the use of transport infrastructure such road or rail connections, though Development Corridors can not be restricted to the narrow band where such infrastructure is located. Its developmental linkages are much broader than the area adjacent to the transport infrastructure. It is clear, looking at the literature, that different approaches exist. For the purpose of this study it is important to consider the corridor as originally envisaged and conceptualised. Geyer (1988:123) sees the Development Corridor or axis as a dynamic phenomenon that evolves in different stages over time. He identifies four stages shown in Figure 2, namely:

- The potential axis (Figure A) or the development finger with the potential for the establishment of a development centre at the other end (Figure B);
- The axis in an infant stage with a well established communication axis between two primary centres (Figure C);
- The mature stage with the corridor or axis having one or more secondary centres in between (Figure D) and
- The axis in its old age or dormant stage where an over-concentration on the axis may lead to the development of agglomeration diseconomies or polarization reversal (Figure E).

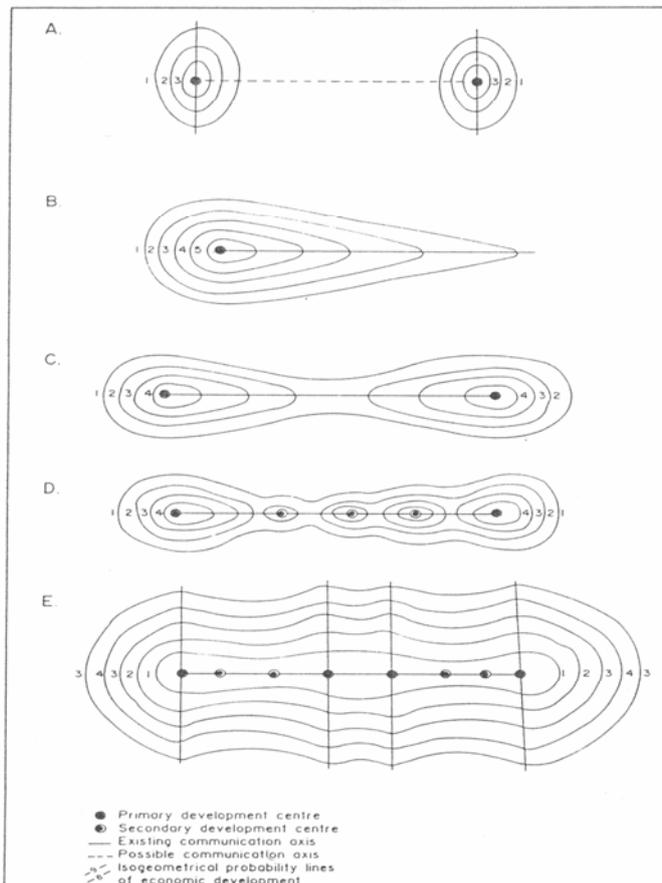


Figure 2: The evolution of the Development Corridor (Geyer, 1988:123)

A Development Corridor can be seen as a concept to elevate an area to a certain level of development. The area must have the potential to develop, on the condition that the entire area must take part in the process (Infrastructure Development Corridor, 2004). The National Physical Development Plan (RSA, 1975:17) of 1975 refers to various existing and future development axes. The idea was to link existing metropolitan areas, as in this case Pretoria or Gauteng, with identified or future growth poles, such as Maputo, by means of development axes. Geyer (1986:163) found that some of these axes were not supported by secondary development centres or were stretching over too long distances to make development realistically viable. The greater the distances between centres, the stronger these secondary centres must be as a propelling force. In some cases these so-called axes were not axes at all but rather a finger

development with no equilibrant pole at the other end. The development of a good road network which provides better interaction with the hinterland in many cases led to the decline of economic activities in small towns as the threshold “time” to bigger centres was changed. An understanding of economic forces is vital to any development planning as people and businesses will only locate in areas where it is economical viable. The MDC could presently be rated as a Figure D corridor development.

6. GOVERNMENT INITIATIVES: SPATIAL DEVELOPMENT INITIATIVES (SDIs)

The regional Spatial Development Initiatives (SDIs) are projects identified on the basis of their inherent unutilised economic potential. Their developmental objective is to create sustainable jobs in these areas by identifying and facilitating new investment. The mechanism by which this is achieved is focused, co-ordinated action at all levels of government and by all relevant line functions within the spatially defined area, in order to remove blockages to investment. The SDIs are part of the Growth Employment and Redistribution (GEAR) strategy. This macro-economic strategy developed by the South African government in 1996 aims to strengthen economic growth in the country while broadening employment opportunities as well as the redistribution of economic opportunities and income to the advantage of the poor (Du Plessis and Landman 2002: 64). Therefore as part of GEAR the SDIs fit into a broader macro-level strategy of simultaneously expanding the economy, stabilising conditions for sustained growth and opening up economic opportunity and employment prospects for previously disadvantaged sectors of the South African population (Jourdan, 1998:717). Spatial Development Initiatives is a key industrial policy committed to foster sustainable industrial development in areas where poverty and unemployment is at its highest. This objective is carried out through the SDI which focuses high-level support in areas where social-economic conditions require concentrated government assistance and where inherent economic potential exists (South Africa 2007: online).

Primarily all the major projects in the SDI are based on a partnership between the public and private sectors such as the MDC, and are set to provide opportunities for participation in sectors such as agriculture, mining, tourism, environment, forestry, infrastructure and ports. These projects were expected to create more than 68 000 new jobs. A key component of this initiative is the move towards international competitiveness, regional co-operation, and a more diversified ownership base (South Africa Information/doing business/economic development 2007: online).

Certain SDIs are also beyond the confines of South Africa's borders where the economic imperatives of the strategy dictated that the SDI includes part of a neighbouring country. Examples are the Maputo Development Corridor between South Africa and Mozambique (but it also affects Swaziland, Zimbabwe and Botswana), and the Lebombo Initiative between South Africa, Mozambique and Swaziland. Under consideration is the extension of the Rustenburg SDI to include the Trans-Kalahari transport corridor between Namibia and Botswana.

Ten development initiatives have been designated such as the regional development programmes or Development Corridors and have already generated around 400 investment projects valued at R83-billion (\$8,3 billion) (South Africa 2007: online) such as the Maputo Development Corridor where the key infrastructure projects are the N4 Maputo Corridor toll road, the upgrading of the railway line from Ressano Garcia to Maputo, the upgrading of the Maputo Port, the dredging of the harbour and finally, telecommunications. The first phase of the corridor, the N4 toll road construction was launched on June 6, 1998. The transport axis between Gauteng, the industrial heart of South Africa, and Maputo offers the shortest link to an export harbour.

The South African SDIs all matured in the early 2000's and either became provincial initiatives (like the IDZs, for example the Lebombo as referred to above) or fizzled out – like the West Coast Investment Initiative and Platinum SDI. None of the old South African SDIs are being pursued as part of the 2001/2+ Regional SDI Programme. However, one or two of the provinces appear to have adopted the methodology and refer to corridors in their Provincial Growth and Development Strategies (Perkins 2009: personal communication).

7. MAIN FINDINGS AND DEDUCTIONS OF LITERATURE REVIEW PROCESS

Only 29 000 tons of goods passed through the border post between South Africa and Mozambique by road in 1997. By 2007 this has increased to approximately 2.25 million tons per year. The estimated number of trucks (2007) per day according to the Mpumalanga freight data bank is approximately 400 (200 per direction). The main eastbound cargo groupings are sugar, cement, maize, fruit, chemicals, and machinery and general freight. The annual number of vehicles crossing the border is 168,780, with an average of about 560 vehicles per day (USAID, 2008).

The following figure contain a spatial analysis of the economic output of Mpumalanga, using GIS technology and drawn from the study. The concept of Gross Geographic Value Added (GVA) – which is used by the firm Global Insight as a basis for making estimates of regional economic activity – is broadly similar to what is more generally known as Gross Geographic Product (GGP). In essence: *GVA (factor cost) =*

Compensation of employees + Gross Operating Surplus (GAP 2007). From this "All sectors" figure (Figure no 3 refers), areas revealing a high annual growth for a given indicator are awarded a darker shade than areas with a lower growth. This makes it possible to visually detect spatial patterns over the analysis period. For each spatial entity (district), growth for that area is also shown in the form of bar charts, the first bar indicating the indexed value at the start and the second bar the value at the end of the analysis period.

On this figure it is clear that areas in close proximity of the transport infrastructure spine grew at a higher rate than areas further removed from the Corridor. As regards the individual sectors of the economy this pattern is less pronounced in the case of agriculture and mining, as they are location/resource-dependent and therefore less dependent on an intervention such as the MDC. In the case of the other sectors, this figure shows that growth in the vicinity of the MDC outperformed growth in areas further removed from the Corridor.

The analysis of first phase study (Schutte & Fransisco, 2004) involved an analysis of the breakdown of employment in Mpumalanga by economic sector and spatial area. The change (increase/decrease) in employment for the most important sectors of the economy was then compared with the corresponding figures for South Africa's average. As regards this comparison the following was shown: a growth rate in employment in Mpumalanga's trade sector, with an annual increase of more than 15 per cent p.a. that is well above the South African average

growth rate of about 2per cent p.a.

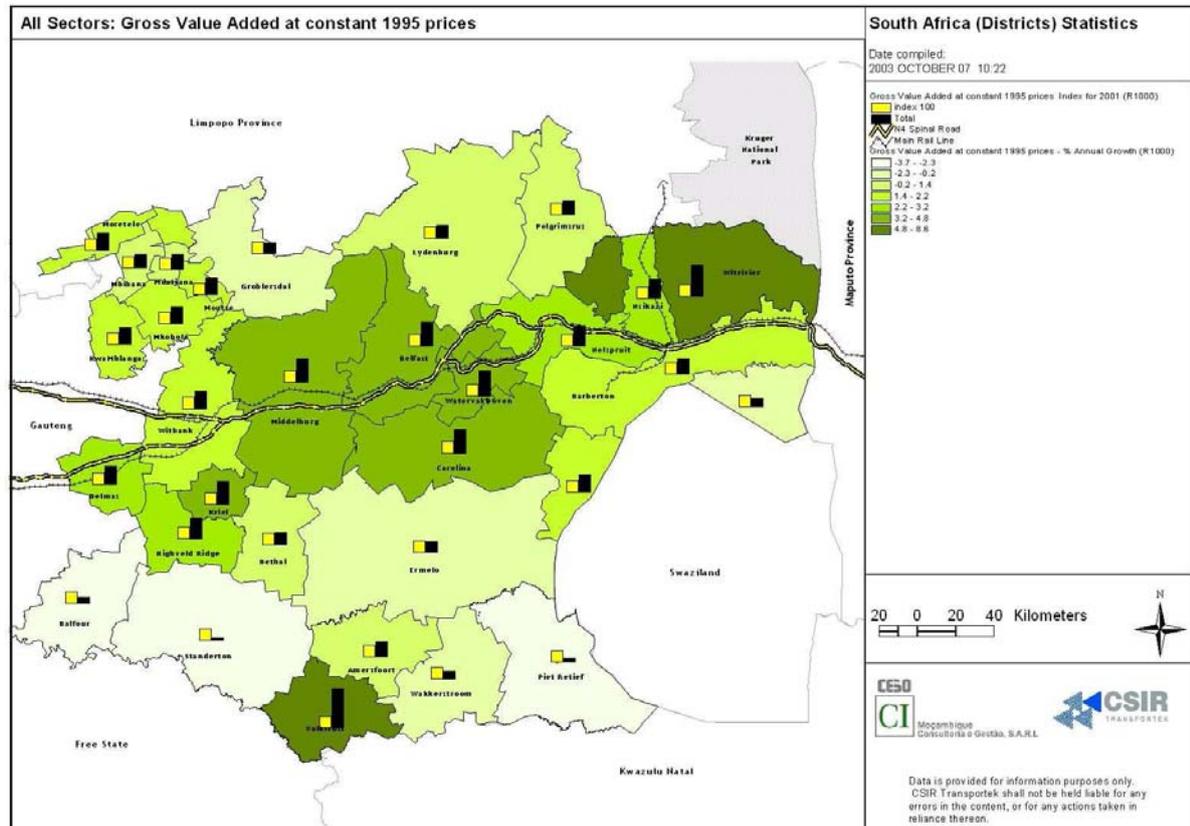


Figure no 3: Rate of change during the analysis period: Gross Value Added (all sectors)
(Source: Schutte & Francisco. 2004)

As regards the relative importance of economic sectors, Figure 4 shows the dominance of trade in terms of employment. This is followed by the community service, manufacturing and agriculture sectors, each approximately half of the size of the trade sector. As with regards to the relative importance of districts, Figure 5 confirms the dominance of Nelspruit, Witbank, Middelburg and Highveld Ridge as major employment centres. It is notable that these areas are all located on the N4-road. This supports Geyer's theory (1988) that such secondary development centres are imperative for the viability of Development Corridors. The construction

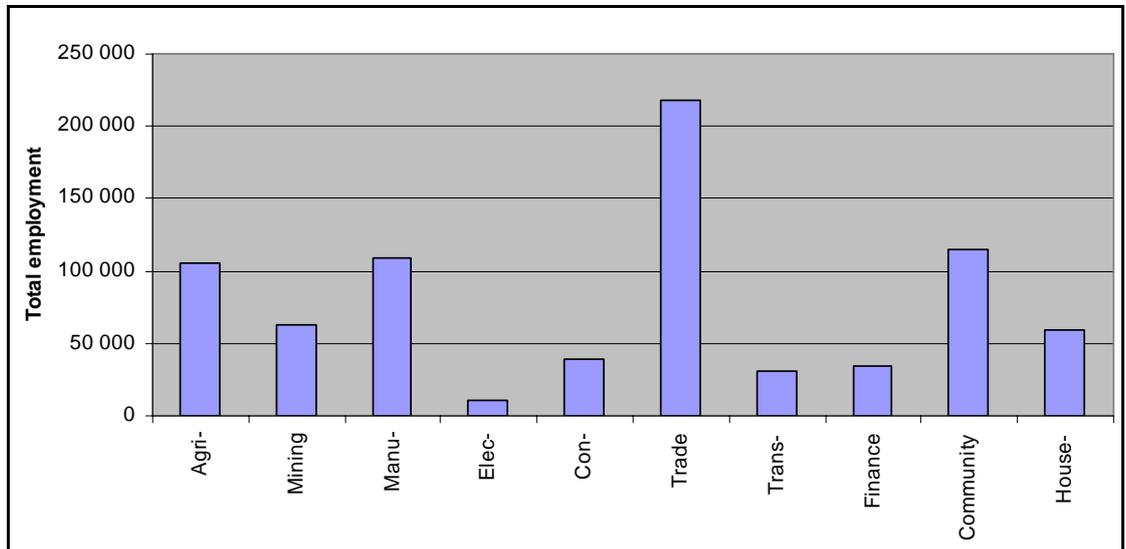


Figure 4: Mpumalanga employment per economic sector, 2001(SSA 2001)

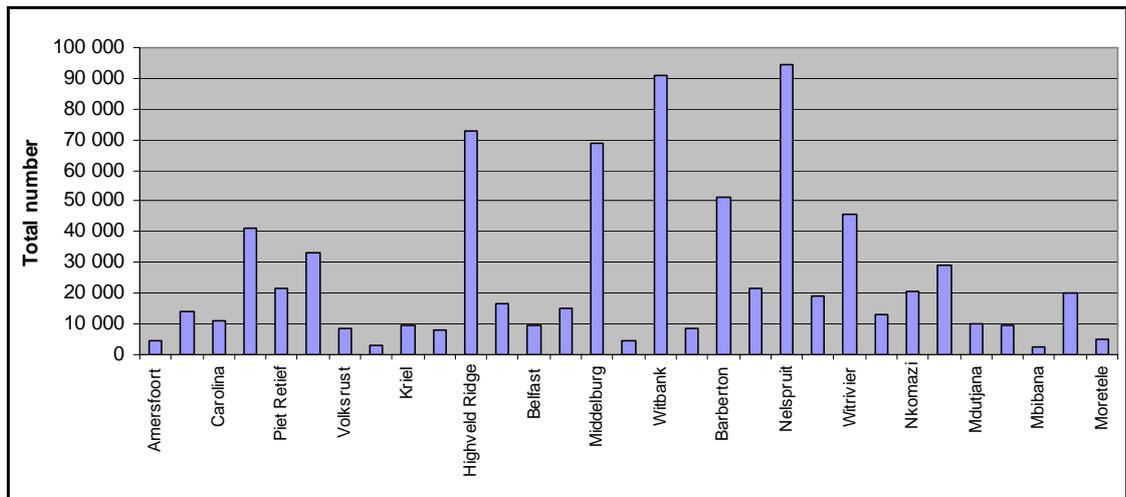


Figure 5: Mpumalanga employment by local municipality, 2001(StatsSA 2001)

sector also showed strong employment growth along the corridor (road) municipalities. This could be attributed partly to the construction of the N4 as well as growth in the main towns along the N4. The primary table comparison of Statistics South Africa (StatsSA, 2005) indicates labour participation rates for Mpumalanga for 1996 and 2001. These tables show that in 1996 the labour participation rate in Mpumalanga was 55,7%

(606000 employed, 297000 unemployed and 718000 not economically active). In 2001, the labour participation rate was 56,1% (630000 employed, 439000 unemployed and 838000 not economically active).

8. CONCLUSIONS

It is difficult to relate directly to the successes of the Maputo development corridor, as some effects/ impacts are indirect. Some local municipalities (especially those on the N4 corridor) see the MDC as an important component in their planning and marketing. The positive effects of the corridor are therefore used as an attraction for further investment within these areas.

Major changes occurred in the Mpumalanga Province. The most obvious deductions relate to freight and people movements directly related to the usage of the road and port. Other implications are indirect and thus assumed. The socio-economic issues addressed do not clearly point to the Maputo Development Corridor as the main contributor to changes in socio-economic conditions. This review of existing literature included mostly quantitative items, and utilized statistics sourced from various reports. Therefore the way forward has to comprise of an empirical research phase when qualitative interviews with the business sector will be done.

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An Exploratory Study into the Influence of Construction Clients on Construction Health and Safety Performance

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ABSTRACT AND KEY WORDS

Purpose/objectives

The purpose of the paper is to present the initial results of an investigation conducted among client entities in South Africa to identify and determine the level of their influence on construction health and safety.

Design/Methodology

A descriptive survey was used to conduct this research using a structured questionnaire. The data was analyzed using Statistical Package for the Social Sciences (SPSS) and data reduction using factor analysis. The reliability for internal consistency of the health and safety performance indicators was determined using Cronbach's alpha test. The sample frame consisted of 128 client entities in South Africa. Thirty-three questionnaires were included in the analysis of the data, which constitutes a net response rate of 25.8%.

Findings

The research identified areas where clients could influence health and safety across the different phases of a project. The results show that generally health and safety is included as part of the project parameters but that more effort is required to afford health and safety the same status as the other project parameters.

Research limitations

The research mainly concentrates on clients that are registered with the Construction Industry Development Board (CIDB) and Investment Property Databank (IPD). It is, therefore, possible that there could be a sample selection bias in the findings. It is possible that a number of key performance/influence areas that were identified in the literature did not emerge during the data reduction process.

Value

This paper suggests that in order for health and safety to be considered significantly important to clients, there is a need to highlight the relationship to other project parameters. The findings of this research project provide the basis for further development of research into client influence on health and safety performance.

Key words: Health and safety; clients; influence and performance improvement

1. INTRODUCTION

Due to the nature of a construction site and the construction industry in general, individuals employed on construction sites find themselves confronted with dangerous, life threatening work conditions on a daily basis (Anderson, 1997:29). Smallwood (2004:02) points out that relative to other industries in South Africa and construction industries worldwide, the South African construction process generates a disproportionate number of fatalities, injuries and disease, the direct and indirect cost of which contributes to the cost of construction. Serious accidents and injuries resulting in personal injury and wrongful death occur with alarming frequency at construction sites in the U.K. for example (Griffith and Howarth, 2000:01). Baxendale and Jones (2000) suggested that the majority of accidents are not caused by careless workers but rather by failure to control. Baxendale and Jones (2000) citing Coleman (1991) go on to state that out of the 90% of all construction accidents leading to death 70% could have been prevented by positive management actions and interventions.

2. LITERATURE REVIEW

Client influence has an impact on construction health and safety (Haslam, 2005:410). Hislop (1999:57) argues that architects and design engineers

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often disavow responsibility for health and safety issues associated with the construction of their work. Arguably, this denial will only change if clients insist that construction health and safety is addressed on their projects. Health and safety begins with the attitude that accidents are preventable and that requirements for healthy and safe work practices must be followed (Hislop, 1999:18). Health and safety should not be left solely under the control of the workers if injuries are to be curtailed or diminished, because the health and safety environment consists of many factors over which workers have little or no control of (Hinze, 1997:50). Baxendale and Jones (2002:367) show that an underlying belief is that the majority of accidents are not caused by careless workers but by failure in controls. Although the best site management of health and safety cannot prevent all accidents, entities other than those actually performing the work do have an important role to play in enforcing proper safety standard measures (Toole, 2002:205). The promulgation of the Construction Regulations (Republic of South Africa: 2003) was intended to realize optimum multi-stakeholder contributions to health and safety by clients, designers, project managers and quantity surveyors (Smallwood, 2005:21).

Clients must realise that influence on health and safety decreases with project evolution as suggested by Farooqui et al. (2008:134) citing (Szymberski: 1997). Figure 1 represents the Time/Safety Influence Curve (Szymberski: 1997). The most effective time to consider project health and safety and eliminate potential hazards is in the design process, during the project feasibility and outline conceptual development (Griffith and Howarth, 2000:159).

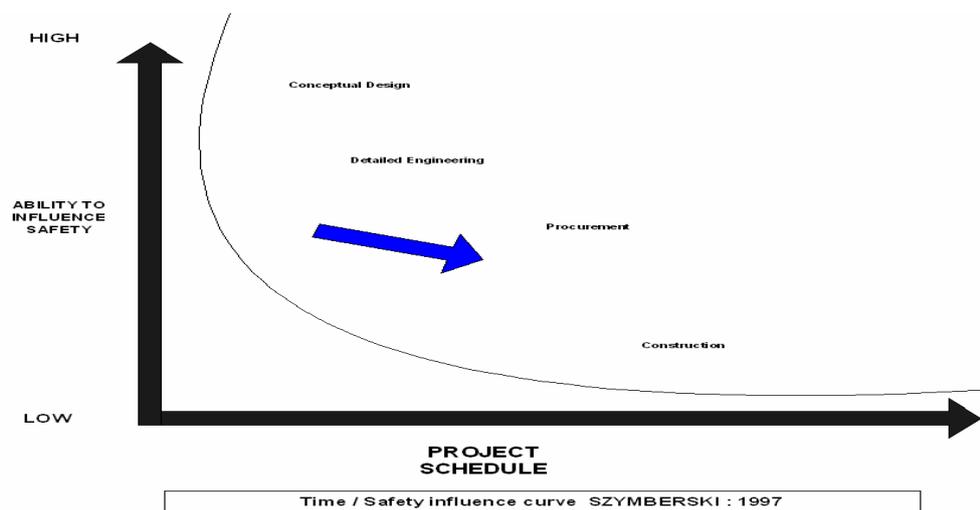


Figure 1 Time /Safety curve

Construction industry stakeholders can either negatively affect or make a contribution to improving the construction work environment (Haupt and Smallwood, 2005:02). According to Smallwood (2002:41) client influence may manifest itself in the form of project requirements that are clearly defined at tendering. Several easily overlooked factors such as lack of pre-planning, inadequate selection of contractors, and laissez faire attitudes are significant contributors to poor H&S Hislop (1999:03).

Clients do not believe that health and safety of employees are their responsibility (Smallwood, 2002:02). Clients often assume that it is the contractor's responsibility to comply with the relevant environmental, safety, and health regulations (Hislop1999:09). They have historically delegated their duties and regarded this as completion of their responsibilities (Smallwood, 2002:07). According to Haupt and Smallwood (2005:02) clients, designers, project managers, and quantity surveyors influence and can contribute to health and safety. It should be borne in mind that the issue relative to the cost of accidents is that ultimately clients incur the cost thereof (Smallwood and Haupt, 2006:03). However, if getting a rock bottom price means that people will be killed or seriously injured, then the price is too low (Enshassi and Mayer, 2004:80). Clients have a vested interest in assuring that an effective construction safety program is in place on their job sites and that they ultimately pay for all losses (Hislop, 1999:06).

Successful construction projects are the result of effective planning and execution (Hislop, 1999:39). Ridley and Channing (2003:246) state that consideration of health and safety aspects at the initial stages of building projects is vitally important in order to ensure that health and safety are built in, rather than bolted on. The root cause of accidents can be broadly split into three classes, namely those due to design decisions, those due to lack of planning and those due to construction methods and procedures (Mackenzie et al., 1999:420). Mackenzie et al. (1999:420) citing a study by Churcher and Awani-Star (1996) found that 63% of fatalities were traceable to pre-construction activities. The significance and purpose of the research is to identify influence of construction clients on construction health and safety performance.

3. RESEARCH

A questionnaire survey instrument was developed from relevant literature to establish client perception of health and safety. Participants in the survey were presented with 35 statements addressing health and safety. The final part of the questionnaire was designed to ascertain the frequency of clients addressing site accidents and incidents.

The sample was drawn from the CIDB and IPD databases. Client entities not forming part of the CIDB and IPD register were also included in the sample together with governmental parastatals and the four major banks in South Africa. The Statistical Package for the Social Science

(SPSS) was used to conduct descriptive statistical analysis of the data and exploratory factor analysis.

Findings

Project Initiation and Briefing phase

Respondents were presented with three statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 1 presents the means of their responses. Respondents agreed mostly that they should bear the responsibility for health and safety while agreeing that they are responsible for health and safety. They further tended to agree that this phase was the most effective one relative to consideration of health and safety.

Table 1 *Client involvement in project initiation and briefing phase*

Statement	Mean Score	Standard Deviation
Clients should bear the responsibility for health and safety	4.06	1.17
The client is responsible for health and safety	4.00	1.17
Most effective phase to consider project health and safety and eliminate potential hazard	3.97	1.21

Respondents were presented with fourteen statements to which they were required to indicate the frequency of addressing such statements on a 5-point Likert scale where 1 = never, 2=rarely, 3=sometimes, 4= often and 5= always. Table 2 presents the means of their responses. Respondents agreed mostly that they should set health and safety culture for a project while insisting on being involved/play a role with regards to health and safety. They further tended to address the following eleven statements with regards to health and safety.

Respondents also indicated providing financial support to contractors health and safety efforts as only being addressed sometimes.

Table 2 *Frequency of client actions during the initiation and briefing phase*

Statement	Mean Score	Standard Deviation
Set health and safety culture for a project	4.15	1.06
Insist on being involved/play a role with regards to health and safety	3.91	1.33
Schedule and prioritise health and safety requirements	3.88	1.22
Ensure information about what has been built is issued to enable to manage health and safety over its life	3.88	1.16
Schedule health and safety requirements prior to the bidding process	3.76	0.97
Set goals for construction health and safety	3.70	1.31
Input adequate resources in construction health and safety	3.67	1.36
Request/produce a checklist of possible health and safety hazards	3.64	1.48
Give information about the site and/or premises in advance	3.61	1.22
Afford health and safety same status as other project parameters	3.58	1.48
Take reasonable steps to ensure that arrangement for managing client duties are suitable	3.58	1.41
Include health and safety as a pre-qualification criteria to design approval	3.55	1.48
Provide consultants with special health and safety requirements/guidelines	3.52	1.37
Provide financial support to contractors health and safety efforts	3.00	1.44

Respondents were presented with four statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 3 presents the means of their responses. Respondents agreed that skill and experience or lack thereof brought to the job by the client is the cause of health and safety incidents/accidents on site. They also agreed that control and supervision of work by the client during this phase of a project as a causation of accidents. Respondents tended to be neutral on availability of technical resources and care and attention by clients relative to the causation of accidents.

Table 3 Clients level of agreement on the causation of accidents during the initiation and briefing phase

Statement	Mean Score	Standard Deviation
Skill and experience brought to the job by the client	3.58	1.30
Control and supervision of work by the client	3.30	1.26
Availability of technical resources	3.09	1.36
Care and attention by clients	3.06	1.17

Respondents were also requested to indicate the importance of health and safety during this phase of a project on a 5-point Likert scale where 1= very important, 2= important, 3= fairly important, 4= slightly important and 5= not important. A mean score of 3.09 was achieved. In general the respondents can be deemed to perceive the importance of health and safety as fairly important to important during this phase of a project.

Concept/Feasibility phase

Respondents were presented with three statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 4 presents the means of their responses. Respondents agreed mostly that they should bear the responsibility for health and safety while agreeing that they are responsible for health and safety. They further tended to agree that this phase was the most effective to consider health and safety and that consultants should bear the responsibility thereto.

Table 4 Client involvement in project initiation and briefing phase

Statement	Mean Score	Standard Deviation
Clients should bear the responsibility for health and safety	4.15	0.94
The client is responsible for health and safety	4.09	1.04
Most effective phase to consider project health and safety and eliminate potential hazard	3.79	0.96
Consultants should bear the responsibility for health and safety	3.27	1.26

Respondents were presented with fourteen statements to which they were required to indicate the frequency of addressing such statements on a 5-point Likert scale where 1 = never, 2=rarely, 3=sometimes, 4= often and 5= always. Table 5 presents the means of their responses. Respondents agreed mostly that they should set health and safety culture for a project while insisting on being involved/play a role with regards to health and safety. They further tended to address the following eleven statements with regards to health and safety.

Respondents also indicated providing financial support to contractors health and safety efforts as only being addressed sometimes.

From Table 2 and Table 5 it is evident that clients are reluctant to invest in health and safety. It is also notable that relative to 'Set health and safety culture for a project', the highest mean score of 4.12 was achieved. Having regarded ownership to health and safety culture, clients should be seen to afford health and safety same status as other project parameters.

Table 5 Frequency of client actions during the initiation and briefing phase

Statement	Mean Score	Standard Deviation
Set health and safety culture for a project	4.12	0.86
Insist on being involved/play a role with regards to health and safety	3.79	1.24
Ensure information about what has been built is issued to enable to manage health and safety over its life	3.76	1.32
Schedule and prioritise health and safety requirements	3.73	1.18
Request/produce a checklist of possible health and safety hazards	3.70	1.36
Include health and safety as a pre-qualification criteria to design approval	3.67	1.14
Take reasonable steps to ensure that arrangement for managing client duties are suitable	3.58	1.20
Schedule health and safety requirements prior to the bidding process	3.58	1.20
Give information about the site and/or premises in advance	3.52	1.09
Set goals for construction health and safety	3.48	1.37
Afford health and safety same status as other project parameters	3.48	1.42
Input adequate resources in construction health and safety	3.42	1.32

Provide consultants with special health and safety requirements/guidelines	3.24	1.30
Provide financial support to contractors health and safety efforts	3.09	1.42

Respondents were presented with eight statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 6 presents the means of their responses. Respondents agreed that availability of technical resources, control, care and attention by the consultant as the cause of accidents. Respondents tended to be neutral on skill and experience, control, care and attention by the client, and skill and experience by the by the consult with regards to the causation of accidents. Respondents also tended to be neutral on site conditions relative to the causation of accidents.

Table 6 *Clients level of agreement on the causation of accidents during the concept/feasibility phase*

Statement	Mean Score	Standard Deviation
Availability of technical resources	3.97	1.16
Control and supervision of work by the consultant	3.64	0.96
Care and attention by consultants	3.58	1.30
Control and supervision of work by the client	3.39	1.30
Skill and experience brought to the job by the consultant	3.30	1.26
Site conditions (eg. access to work)	3.24	1.23
Skill and experience brought to the job by the client	3.09	1.36
Care and attention by clients	3.06	1.17

Respondents were also requested to indicate the importance of health and safety during this phase of a project on a 5-point Likert scale where 1= very important, 2= important, 3= fairly important, 4= slightly important and 5= not important. A mean score of 3.09 was achieved. In general the respondents can be deemed to perceive the importance of health and safety as fairly important to important during this phase of a project.

Design development phase

Respondents were presented with four statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 7 presents the means of their responses. Respondents agreed mostly that this was the most effective phase to consider health and safety while agreeing that they are responsible and should bear the responsibility for health and safety. They further tended to agree that the consultants bear the responsibility for health and safety.

Table 7 *Client involvement in the design development phase*

Statement	Mean Score	Standard Deviation
Most effective phase to consider project health and safety and eliminate potential hazard	4.15	0.94
The client is responsible for health and safety	3.79	1.22
Clients should bear the responsibility for health and safety	3.76	1.17
Consultants should bear the responsibility for health and safety	3.58	1.25

Respondents were presented with fifteen statements to which they were required to indicate the frequency of addressing such statements on a 5-point Likert scale where 1 = never, 2=rarely, 3=sometimes, 4= often and 5= always. Table 8 presents the means of their responses. Respondents agreed mostly that they should schedule, prioritise and set a culture relative to health and safety while insisting in being involved. They further tended to sometimes addressing the following eleven statements with regards to health and safety.

Respondents also indicated the lowest mean score of 3.09 relative to providing financial support to contractors health and safety efforts.

Table 8 *Frequency of client actions during the design development phase*

Statement	Mean Score	Standard Deviation
Schedule and prioritise health and safety requirements	3.91	1.16
Insist on being involved/play a role with regards to health and safety	3.88	1.11
Provide contractors with special health and safety requirements/guidelines	3.85	1.33
Set health and safety culture for a project	3.85	1.06
Include health and safety as a pre-qualification criteria to design approval	3.85	1.00
Ensure information about what has been built is issued to enable to manage health and safety over its life	3.82	1.16
Request/produce a checklist of possible health and safety hazards	3.79	1.32
Afford health and safety same status as other project parameters	3.70	1.29
Input adequate resources in construction health and safety	3.64	1.37
Schedule health and safety requirements prior to the bidding process	3.55	1.03
Give information about the site and/or premises in advance	3.55	1.15
Set goals for construction health and safety	3.45	1.25
Take reasonable steps to ensure that arrangement for managing client duties are suitable	3.42	0.98
Provide consultants with special health and safety requirements/guidelines	3.30	1.09
Provide financial support to contractors health and safety efforts	3.09	1.40

Respondents were presented with eight statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 9 presents the means of their responses. Respondents agreed that availability of technical resources, control, care and attention by the consultant and skill and experience brought to the job by the client as the cause of accidents. Respondents tended to be neutral on control and supervision, care and attention by the client, and skill and

experience by the by the consult with regards to the causation of accidents. Respondents also tended to be neutral on site conditions relative to the causation of accidents.

Respondents were also requested to indicate the importance of health and safety during this phase of a project on a 5-point Likert scale where 1= very important, 2= important, 3= fairly important, 4= slightly important and 5= not important. A mean score of 2.69 was achieved. In general the respondents can be deemed to perceive the importance of health and safety as important to fairly important during this phase of a project.

Table 9 Clients level of agreement on the causation of accidents during the design development phase

Statement	Mean Score	Standard Deviation
Availability of technical resources	4.00	0.97
Care and attention by consultants	3.85	1.18
Control and supervision of work by the consultant	3.73	1.04
Skill and experience brought to the job by the client	3.73	1.07
Site conditions (eg. access to work)	3.67	1.27
Control and supervision of work by the client	3.64	1.37
Skill and experience brought to the job by the consultant	3.61	1.09
Care and attention by clients	3.27	1.26

Procurement/Tender documentation phase

Respondents were presented with four statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 10 presents the means of their responses. Respondents agreed mostly that they are responsible for health and safety while agreeing that they should bear the responsibility for health and safety. They further tended to agree that this phase was the most effective one relative to consideration of health and safety. They further tended to agree that the consultants bear the responsibility for health and safety

Table 10 *Client involvement in project procurement/tender documentation phase*

Statement	Mean Score	Standard Deviation
The client is responsible for health and safety	4.00	1.20
Clients should bear the responsibility for health and safety	3.91	1.13
Most effective phase to consider project health and safety and eliminate potential hazard	3.79	1.19
Consultants should bear the responsibility for health and safety	3.61	1.14

Respondents were presented with fourteen statements to which they were required to indicate the frequency of addressing such statements on a 5-point Likert scale where 1 = never, 2=rarely, 3=sometimes, 4= often and 5= always. Table 11 presents the means of their responses. Respondents agreed mostly that they should pre-qualify, schedule, prioritise and set a culture relative to health and safety while insisting in being involved giving information about the site and/or premises. They further tended to often addressing the following ten statements with regards to health and safety.

Respondents also indicated the lowest mean score of 3.27 relative to providing financial support to contractors health and safety efforts

Table 11 *Frequency of client actions during the design development phase*

Statement	Mean Score	Standard Deviation
Include health and safety as a pre-qualification criteria to design approval	4.12	1.11
Schedule and prioritise health and safety requirements	4.09	0.95
Take reasonable steps to ensure that arrangement for managing client duties are suitable	4.03	0.98
Set health and safety culture for a project	4.00	0.90
Give information about the site and/or premises in advance	3.94	0.93
Insist on being involved/play a role with regards to health and safety	3.91	1.04
Provide consultants with special health and safety requirements/guidelines	3.88	0.99
Provide contractors with special health and		

safety requirements/guidelines	3.88	1.05
Request/produce a checklist of possible health and safety hazards	3.85	1.12
Input adequate resources in construction health and safety	3.76	1.35
Set goals for construction health and safety	3.76	1.12
Ensure information about what has been built is issued to enable to manage health and safety over its life	3.64	1.11
Afford health and safety same status as other project parameters	3.61	1.30
Provide financial support to contractors health and safety efforts	3.27	1.51

Respondents were presented with eight statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 12 presents the means of their responses. Respondents agreed that availability of technical resources, control, skill and experience by the consultant and control and supervision of work by the client as the cause of accidents. Respondents tended to agree on skill and experience, care and attention by the client, and care and attention by consultants as the causation of accidents.

Respondents were also requested to indicate the importance of health and safety during this phase of a project on a 5-point Likert scale where 1= very important, 2= important, 3= fairly important, 4= slightly important and 5= not important. A mean score of 2.39 was achieved. In general the respondents can be deemed to perceive the importance of health and safety as fairly important to important during this phase of a project.

Table 12 Clients level of agreement on the causation of accidents during the procurement/tender documentation phase

Statement	Mean Score	Standard Deviation
Availability of technical resources	4.06	1.03
Control and supervision of work by the consultant	4.00	0.97
Skill and experience brought to the job by the consultant	3.88	0.89
Control and supervision of work by the client	3.88	1.24
Site conditions (eg. access to work)	3.85	1.12
Skill and experience brought to the job by	3.64	1.22

the client		
Care and attention by consultants	3.39	1.20
Care and attention by clients	3.36	1.25

Construction phase

Respondents were presented with five statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 1 presents the means of their responses. Respondents agreed mostly that contractors should bear the responsibility for health and safety while agreeing that the client is responsible for health and safety and indicating this phase of a project as the most effective relative to health and safety. They further tended to agree that they and the consultants should bear the responsibility relative to health and safety.

Table 13 *Client involvement in the construction phase*

Statement	Mean Score	Standard Deviation
Contractors should bear the responsibility for health and safety	4.64	0.70
Most effective phase to consider project health and safety and eliminate potential hazard	4.36	1.17
The client is responsible for health and safety	4.00	1.20
Consultants should bear the responsibility for health and safety	3.70	1.26
Clients should bear the responsibility for health and safety	3.55	1.54

Respondents were presented with seventeen statements to which they were required to indicate the frequency of addressing such statements on a 5-point Likert scale where 1 = never, 2=rarely, 3=sometimes, 4= often and 5= always. Table 14 presents the means of their responses. Respondents agreed mostly that they should include health and safety on the agenda at client/contractor meetings, schedule, prioritise and set a culture relative to health and safety while insisting in being involved in giving information about the site and/or premises and conducting health and safety audits. They further tended to often addressing the following nine statements with regards to health and safety.

Respondents also indicated the lowest mean score of 3.24 relative to providing financial support to contractors health and safety efforts.

Table 14 Frequency of client actions during the design development phase

Statement	Mean Score	Standard Deviation
Always include health and safety on the agenda at client/contractor meetings	4.42	0.75
Input adequate resources in construction health and safety	4.39	0.79
Set health and safety culture for a project	4.24	1.06
Request/produce a checklist of possible health and safety hazards	4.18	0.98
Stress health and safety as part of the contract during the site handover/briefing	4.18	0.88
Schedule and prioritise health and safety requirements	4.15	1.18
Insist on being involved/play a role with regards to health and safety	4.12	1.05
Conduct health and safety audits/inspections of the contractor during construction	4.06	1.22
Include health and safety as a pre-qualification criteria to design approval	3.94	1.27
Set goals for construction health and safety	3.91	1.07
Take reasonable steps to ensure that arrangement for managing client duties are suitable	3.88	1.11
Provide contractors with special health and safety requirements/guidelines	3.79	1.08
Ensure information about what has been built is issued to enable to manage health and safety over its life	3.76	1.25
Provide consultants with special health and safety requirements/guidelines	3.76	1.12
Afford health and safety same status as other project parameters	3.73	1.23
Give information about the site and/or premises in advance	3.48	1.20
Provide financial support to contractors health and safety efforts	3.24	1.48

Respondents were presented with eleven statements to which they were required to indicate the extent of their agreement on a 5-point Likert scale where 1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. Table 15 presents the means of their responses.

Respondents mostly agreed that control, supervision, skill and experience by the contractor as the cause of accidents. Respondents tended to agree that the availability of technical resources, control and supervision of work by the client and consultant, and care and attention by the contractor as the causation of accidents.

Respondents further tended to be neutral on skill and experience, and care and attention by clients and consultants.

Respondents were also requested to indicate the importance of health and safety during this phase of a project on a 5-point Likert scale where 1= very important, 2= important, 3= fairly important, 4= slightly important and 5= not important. A mean score of 2.09 was achieved. In general the respondents can be deemed to perceive the importance of health and safety as fairly important to important during this phase of a project

Table 15 *Degree of concurrence with various statements on causation of accidents*

Statement	Mean Score	Standard Deviation
Control and supervision of work by the contractor	4.44	0.88
Skill and experience brought to the job by the contractor	4.16	1.05
Site conditions (eg. access to work)	4.06	1.01
Availability of technical resources	3.97	1.23
Control and supervision of work by the consultant	3.94	1.05
Control and supervision of work by the client	3.88	1.21
Care and attention by contractor	3.88	1.50
Skill and experience brought to the job by the client	3.69	1.20
Care and attention by clients	3.66	1.34
Care and attention by consultants	3.66	1.34
Skill and experience brought to the job by the consultant	3.53	1.07

4. CONCLUSION

The exploratory study showed that although clients are generally aware of the importance of health and safety throughout all the project phases, client involvement in health and safety in all phases of projects would result in reduction in incidents and accidents. These would also include more

successful projects as proper planning and addressing of health and safety compliments other project parameters

The findings suggest that clients should be made aware of the ability to influence health and safety of a project earlier during the concept and design phase. Such awareness will enhance the prospects of an improved allocation of resources and importance to health and safety that could eliminate or significantly reduce the hazards associated with construction and accidents from occurring.

Clients should be role models in affording health and safety same status as other project parameters. This would only come about if the client is completely aware of his role and influence to health and safety.

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A pilot study on public clients' contribution to construction workers' health and safety in Botswana

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ABSTRACT AND KEYWORDS

Purpose of this paper

This paper presents findings from a pilot study conducted in two major construction public client organisations in Botswana on their contribution to construction workers' health and safety.

Design / methodology / approach

Structured questionnaire interviews were conducted with project managers. The aim was to establish public client organisations' practice in promoting construction workers health and safety.

Findings

The pilot study found that public clients' contribution to workers health and safety is not significant. Further, it was realised that client organisations presented opportunities for further research on health and safety performance improvement in the construction industry.

Limitations

The survey was only conducted in two major public clients and interviews were only conducted with four senior project managers from each organisation and so the results may not be generalised to all public clients in Botswana. Further, only a few selected elements of the many suggested characteristics of health and safety culture were assessed in the study.

Originality / value of this paper

Public clients' role and health and safety performance improvement has not been extensively explored even though it is widely accepted that clients are equally important to health and safety improvement. This paper seeks therefore to contribute to this body of knowledge.

Keywords: Botswana, client, construction, health and safety, workers

1.1 INTRODUCTION

The construction industry is said to be one of the most dangerous industries and continues to lag behind other industries (Huang and Hinze, 2006; Sawacha, Naoum and Fong, 1999; Suraji, Sulaiman, Mahyuddin & Mohamed, 2006, and Seo, 2005).

Despite having one of the worst records on health and safety, the construction industry also has a vital role to most economies of the world, Botswana included. The construction industry in Botswana is one of the most important economic sectors contributing about 11.6% to the National Gross Domestic Product (GDP) making a construction worker one of the most important resources in the nation. In the 2009/10 financial year, budget allocation to one major public client organisation in this study was 13.7% of the total national development budget. This was the second largest allocation in comparison to other Government institutions. Although the current economic melt has somehow affected the construction sector in Botswana, the industry still managed to record growth in the 2008/2009 financial year of almost 12% between March and June 2008 (Mmegi, 2008).

The construction industry is also one of the largest employers. Current figures show that the construction industry contributes about a third of the entire labour force in Botswana accounting for about 7.1%. Because of the growth recorded in construction between March and June 2008, employment figures also went up in the industry by about 1.3% (CSO, 2008). A construction worker in Botswana is therefore very important and contributes greatly to the national economy.

Construction workers have also been victims of poor health and safety environments and management practices. Mmegi a local news paper, reported in their publication of 28 August 2008, that construction workers at one construction site wrote to the labour minister complaining about the lack of personal protective equipment and those that had been issued with one, were forced to pay a fee for it (Mmegi, 2008). In another unrelated incidence, Mmegi (2005) reported on 11 November 2005 that workers at a named construction site complained about a lack of safety signs to caution the public and workers on site of hazards on the site. Workers lamented that safety was evidently not a priority for the construction company

(Mmegi, 2005). In yet another report, a 59-year-old employee of a named construction Company in Lobatse died on the spot and three others suffered injuries when a scaffold collapsed while they were doing some maintenance work at the Lobatse Institute of Health Sciences on June 16, 2000. It is suspected that the scaffold was not in good condition when the four used it on that fateful afternoon (Daily news, 2000).

A study conducted in Botswana by Musonda and Smallwood (2005) also revealed a low health and safety awareness, non compliance to legislation and a general lack of policies and procedures by contracting organisations.

The intention of the pilot study was to determine the extent to which public clients contribute to improving construction workers' health and safety. This was achieved by assessing public clients' practice and level of effort on health and safety management.

A considerable amount of research has been conducted on health and safety improvement in construction. However most research focuses on processes and practices in contracting organisations (Hinze, 1997; Hinze, 2002 and Levitt and Samelson, 1993) and on designers (Hinze and Gambetese, 1996). Few studies such as the one by Huang and Hinze (2006) have looked at the role of clients. This pilot study is therefore complementary to Huang and Hinze's (2006) study and seeks to add to this body of knowledge.

For the purpose of this particular paper, the term 'client' and 'owner', has been used interchangeably to refer to one and the same entity. Typically they are the initiators of projects and purchasers of the construction industry's product (Lingard, Blismas, Cooke and Cooper, 2008).

1.2 CLIENT'S ROLE IN PROMOTING HEALTH AND SAFETY

A better health and safety outcome has been associated with a positive health and safety culture prevailing within an organisation concerned and indeed the industry (CRC, 2006; Molenaar et al, 2002; and Chinda and Mohamed, 2007). Health and safety culture is therefore very important in so far as the improvement of construction worker's health and safety is concerned. Chinda and Mohamed (2007) rightly argue that it seems that attempts to improve the health and safety record will not be fully effective until the health and safety culture is improved. However, most studies on health and safety culture in the construction industry have mainly been conducted in contracting organisations. Health & safety culture of construction clients or owners is an area that has not been extensively explored even though it is widely accepted that clients are very important to health and safety performance improvement.

Given that most construction projects in Botswana are executed by public sector clients, it follows therefore that they may be influential on more than half of all construction projects in Botswana. Many researchers affirm that clients can influence health and safety on site (Huang and Hinze, 2006; Suraji, 2001 and Smallwood, 1998). Therefore, the health and safety culture within client bodies is important since health and safety culture has also been identified to have an impact on health and safety goals (CRC, 2006).

However, from evidence in several earlier studies it seems that most clients have not shown serious commitment to health and safety. A study conducted by Smallwood (1998) in South Africa; found that most clients give priority equally to cost and quality in comparison to health and safety being largely overlooked. This situation is a challenge to health & safety performance improvement.

A further challenge is the perception that health and safety management is primarily the responsibility of contractors despite the emergence in recent times of legislative and regulatory frameworks that redistribute responsibility for construction health and safety to all parties involved in the construction process. Interventions such as health and safety audits are usually designed only to find risks or hazards at the technical or operational level but less concern at managerial level of the project organisation as a whole. Few strategies are directed at improving upstream elements including those involving clients. Health and safety campaigns are only made for operatives rather than for those who are involved during the concept or design phases of a construction project Suraji et al (2006).

A review of literature confirms that examination of the role and culture of clients are almost absent from most studies. Concentration is overly placed on the construction phase of projects and the related operational processes of contractors (Saurin et al, 2003; Sawacha et al, 1999; Carder, 2002; Teo et al, 2005 and Hudson, 2001). However, Huang et al (2006) focused on clients and Lingard et al (2008) on the development of a model client framework for the Australian Government.

Clients if involved can influence worker health & safety (Huang et al, 2006 and Smallwood, 1998). Using total recordable injury rate (TRIR), to determine the relationship between health and safety performance and owner involvement, Huang et al (2006) demonstrated that clients can influence health and safety outcomes. Smallwood (1998) found that most general contractors believed that the client could potentially influence their health and safety performance.

According to Suraji et al (2006), improving health and safety means to make clients, client representatives, designers and contractors as well as employees to be aware of their roles in the improvement process. Hinze and Gambetese (1996) further argue that involvement of clients is an essential requirement for the zero injuries objective. In fact according to

Gambetese (2000), owners should participate with contractors in all project H&S activities.

Bomel (2001) identified the culture of client organisations as presenting considerable opportunities for health and safety improvement in the UK construction industry. Improving health and safety record has been attributed to an improvement in the health and safety culture by many authors (Chinda and Mohammed, 2008; Baram and Schoebel, 2007; Dingsdad, Biggs and Sheahan, 2006; Muniz, Peon and Ordas, 2007 and CRC, 2006).

There has also been an increasing interest in the subject of safety culture primarily because of its impact on safety outcomes. As a result many definitions of the concept have emerged. A number of authors however agree that there is no unanimity on the definition of the concept of health and safety culture (Muniz et al, 2007; Hopkins, 2006 and Cooper, 2000). According to Cooper (2000), health and safety culture does not operate in a vacuum. Rather it affects and is affected by other non-H&S related operational processes or organisational systems. For the purpose of this paper and study H&S culture describes the H&S beliefs, values and attitudes that are shared by the majority of people within an organisation (Muniz et al, 2007; CRC, 2006; Australian Government, 2008; Molenaar et al, 2002 and Cooper, 2000). This definition is also summed up by 'the way we do things here' (Cooper, 2000: 115).

There has been debate not only around the definition of the safety culture concept, but also its measurement. However, according to Cooper (2000) it is "that observable degree of effort with which all organisational members direct their attention and actions towards improving safety on a daily basis". The units of 'effort' differ and could be the degree to which members give priority to H&S over production. Outcomes of a positive H&S culture could be a reduction in injury rates. However as Cooper (2000) points out, reductions in injury rates although very important, are not sufficient in themselves to indicate the presence or quality of a H&S culture, where as "that observable degree of effort" is something that can always be measured and assessed.

This paper focuses on public clients' contribution to construction workers' health and safety. This is achieved through an assessment of clients' commitment, allocation of resources and leading by example. In other words, it is a preliminary assessment of "that observable degree of effort" towards improving construction workers' health and safety in Botswana.

1.3 RESEARCH METHODOLOGY

A structured questionnaire was used to conduct interviews with representatives at two public construction client organisations. This approach was followed to improve consistency in the responses and ease of analysis. The method was also considered appropriate for a pilot study. In the next phase of the study a Delphi approach will be followed.

1.3.1 Profile of sample

Four project managers from each of the two major public client organisations were interviewed given that they had access to information on policies and their responses on their practices on health & safety would shade light on the way things were done in their organisations. These two public clients, namely X and Y, were selected because they were recurrent clients of constructed facilities with one of them taking a second largest percentage of the developmental budgetary allocation. Almost 14% of the developmental budget was allocated in the 2009/10 budget to it. They were also directly involved in the management of their construction projects across Botswana.

Most responses to the questions were based on a five point Likert rating scales of frequency, agreement or importance.

The generalization of the findings of the study to the entire Botswana construction client sector is limited considering the small sample size. However, considering the market share of the selected clients the findings are indicative of what the likely trends might be and the issues that need to be examined more closely.

1.4 FINDINGS

1.4.1 Public client contribution to health and safety management

Respondents were asked about how often they implemented various health & safety elements, namely:

1. Appraising designs in terms of health & safety;
2. Attending health & safety specific meetings on construction projects; and
3. Conducting health & safety audits.

Responses on whether both client organisations appraised designs in terms of health & safety revealed that this was not frequently done in both organisations. In client organisation X, half of the interviewees reported that designs were 'rarely' appraised in terms of health and safety while the rest reported appraisal was done 'sometimes' (Table 1.0).

Table 1.0 Appraising of designs

Entity	Response (%)				
	Never	Rarely	Sometimes	Often	Always
Client organisation X	0	50	50	0	0
Client organisation Y	25	25	50	0	0

As to whether clients attended health & safety specific meetings on construction projects, participants responded similarly, namely that clients 'rarely' attended these meetings. Half of the interviewees from public client X indicated that meeting attendance occurred 'rarely' while all except one from public client Y reported that they 'rarely' attended such meetings (Table 2.0).

Table 2.0 Attending health and safety meetings

Entity	Response (%)				
	Never	Rarely	Sometimes	Often	Always
Client organisation X	0	50	25	0	25
Client organisation Y	0	75	25	0	0

In client organisation X, responses from half of the interviewees were that clients conducted health and safety audits 'sometimes' with the rest reporting that health and safety audits were either 'rarely' or 'never' done. This finding was echoed in client organisation Y with 75% reporting that they 'rarely' conducted health and safety audits.

1.4.2 Perceptions on health and safety management, and on impact of accidents on clients

Interviewees were also asked to rate the extent to which accidents directly impact on public clients. 50% of respondents from client organisation X indicated that the impact was 'low' and the other 50% indicated that it was 'medium'. A similar result was obtained from client organisation Y. 50% of

the respondents indicated that the impact was 'medium', the other 25% indicated that the impact was 'low' and the rest said it is 'very low'.

Assessment of perceptions on health and safety management was another important aspect that was examined through questions about practices in the organisations and the management of health and safety.

In particular responses were sought relative to the following:

1. Whether clients should be obliged to pay for ensuring health and safety on construction projects;
2. Whether health and safety should be a primary responsibility of either contractors, clients or designers; and
3. Whether revision of legislation would make client organisations responsible for the management of health and safety.

Relative to whether clients should pay for ensuring health and safety, responses ranged equally from 'strongly agreeing' and to 'disagreeing' with the idea. Combined responses across the two organizations were that 25% 'strongly agreed', 12^{1/2}% were 'not sure', 25% 'disagreed' and the remaining 12^{1/2}% 'strongly disagreed' with the idea (Table 4.0). Similarly combined responses from both client organisations showed that 37^{1/2}% 'strongly agreed', a similar percentage also 'agreed' with the idea whilst 12^{1/2}% 'disagreed' and the other 12^{1/2}% 'strongly disagreed' on whether health and safety should be a primary responsibility of either clients, contractors, designers or indeed be equally shared between all of them. There was strong full agreement in client organisation X on the client being more responsible for health and safety. In client organisation Y however, only half 'agreed' while the other half 'disagreed' with the idea. Similar results were obtained on responses regarding whether designers should be more responsible for health and safety. There was however a general agreement that all parties should be involved in the management of health and safety although not so emphatic as on other aspects where there was a strong agreement. Between the two client organisations, responses from 75% of the interviewees 'agreed' that all parties must be responsible for ensuring health and safety on construction sites (Table 5.0).

Table 4.0 Clients paying for health and safety

Entity	Response (%)				
	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Client organisation X	25	25	0	25	25
Client organisation Y	25	25	25	25	0
X & Y combined	25	25	12.5	25	12.5

Table 5.0 Health and safety responsibility

Entity More responsibility to:	Response (%)					Ranking index	Rank
	Strongly agree	Agree	Not sure	Disagr ee	Strongly disagree		
Clients	50	25	0	12.5	12.5	2.88	2
Contractors	37.5	37.5	0	12.5	12.5	2.75	3
Designers	25	25		25	25	2.00	4
All parties	50	25	12.5	12.5	0	3.12	1

1.5 DISCUSSION

In many instances, accidents on construction sites can not be attributed to worker's carelessness but quite often the lack of a controlled working environment and the complexity and diversity of the size of organisations (Sawacha et al., 1999) and management and organisational failures (Reason, 1993 and Groeneweg, 1994). Unfortunately, direct impact of accidents is felt by workers and their families almost immediately.

Statistics show that injury rates in the construction sector are still 50% higher than that of all industries (Huang et al., 2006a). According to Sawacha (1999), in the construction industry the risk of a fatality is five times more likely than in a manufacturing based industry, whilst the risk of a major injury is two and a half time higher. It is no wonder 67% of the workers across the EU in the construction sector believed that they are at risk of having accidents (Commission of European Communities, 1992).

Considering the results from the pilot study presented above, workers are justified by so to say live in constant fear of imminent accidents. Contribution by public clients to construction workers' health and safety does not seem to be significant.

It was also interesting to find out that interviewees' perceived the direct impact of accidents on clients to be low. This could be in part the reason for their level of contribution to construction workers' health and safety. It is argued that one of the factors that could motivate clients to address health and safety apart from human considerations is the impact and cost of accidents on those that initiate projects. This argument is validated by the responses on the level of effort applied by public clients in contributing to the improvement of workers' health and safety. The two public clients rarely attended health and safety meetings, rarely conducted health and safety audits and are not consistent in appraising designs in terms of health and safety.

1.6 CONCLUSION

Literature informs that clients set the health and safety culture tone. Health and safety record has been attributed to health and safety culture. It follows therefore that it seems worker health and safety is likely to improve only if a positive health and safety culture exists in public client organisations and ultimately in the entire industry.

This pilot study revealed that the two public clients' health and safety culture is not strong as seen through their practice on a few selected efforts. The above consequently raises questions on public clients' contribution towards construction workers' health and safety improvement. It may be concluded therefore that the pilot study did not reveal a significant contribution by public clients towards the improvement of construction workers' health and safety. This aspect to health and safety improvement needs to be explored more.

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Clients' views of Architects competencies

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ABSTRACT

Purpose - The purpose of this paper is to determine the ranking of Architect competencies and Client requirements according to (a) importance, (b) evidence, and (c) to the gap between the importance and evidence rankings in the South African context.

Design/methodology/approach - An exploratory study was conducted to development a list of competencies specific to South Africa and was subsequently followed by a quantitative method of data production using a questionnaire.

Findings - The top five competencies in terms of deficiency as represented by a gap analysis are maintenance planning; skills working with emerging contractors; advanced financial management; cost control and arbitration and other dispute resolution procedures. The top three Client requirements with the largest gaps between importance and evidence ranking are black economic empowerment; cost and time.

Originality/value - Tertiary institutions, the Council for the Built Environment (CBE), the South African Council for the Architecture Profession (SACAP) and the South African Institute of Architects (SAIA) should address the perceived deficiency relative to the competencies and Client requirements identified by the gap analysis.

Keywords: Architects, Clients, Competencies, Performance requirements

1. INTRODUCTION

According to Hindle and Rwelamila (1998) the Architectural profession has been accused of resisting change whilst defending an archaic system, and in doing so, neglecting Client needs. Whilst Client satisfaction has been identified as one of the most important challenges facing the construction industry (Othman, Hassan and Pasquire, 2005) it is therefore no surprise the Construction Industry Development Board (CIDB) (2004) provides insight relative to the performance of the design team by stating that the quality of delivery varies and Clients expressed dissatisfaction particularly with regard to timely preparation of designs, handling of variations, invoicing and final account settlement. The CIDB (2007) further states the performance of Client's agents / consultants on 20%-25% of projects surveyed in 2006 are distinctly below the performance of their peers. With no real sign of the economic downturn easing for some time to come it is therefore necessary to address the Client perceived competency deficiencies within the Architecture profession in order to attract repeat business.

This article emanates from part of a Doctoral study which investigated clients' perception of five built environment professions competencies. The article firstly reports on the competencies of Architects and secondly on how Architects realise Client's requirements based upon responses emanating from private and public sector Clients. The input gathered from Clients is invaluable as they in essence, constitute the primary customers of Architects, and therefore their input may inform the practice of Architecture.

2. REVIEW OF THE LITERATURE

2.1 Competence

Carnell's (2003) competence model (Figure 1) can be used to explain competence and how incompetence comes about. Starting with block 1, an individual (In this research a profession) may start off being unconsciously incompetent therefore "not knowing that he / she don't know" and in order to cross barrier 'A' the individual acknowledge incompetence and have a willingness to grow. When in block 2 or being consciously competent, barrier 'B' needs to be crossed which is depicted by a strong commitment to development and growth. While occupying block 3 the ultimate intention would be to cross barrier 'C' which represents transforming the knowledge learnt into wisdom and occupy block 4. The most important aspect of this

model though is that there is no barrier between block 4 and block 1, thus if continuous development does not take place the individual runs the risk of being unconsciously incompetent again. This model can be directly applied to the Architectural profession. Therefore, if continuous research and development of the profession is not initiated, unconscious incompetence will come to the fore and Clients will raise their dissatisfaction as indicated in the introduction.

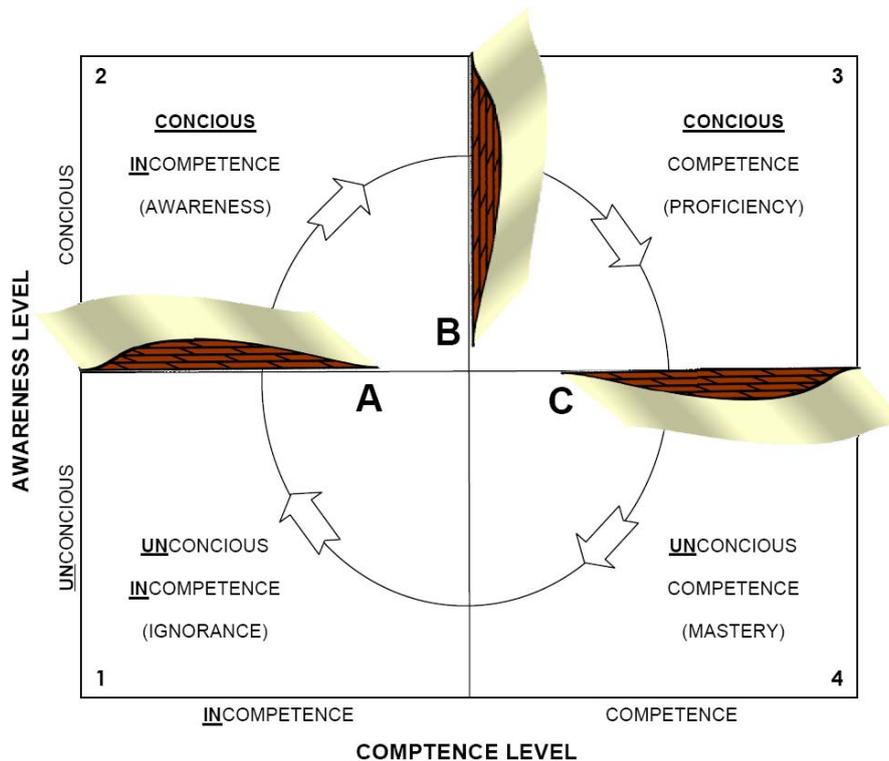


Figure 1 Competence model (Carnall, 2003)

2.2 Using competencies to review performance

According to Whiddett and Hollyforde (2006) there are many reasons for performance to be reviewed through competencies. From a profession point of view, these include:

- Managing poor performance – identifying training and development needs for the current role;
- Identifying training and development needs for future roles;
- Reinforcing stated profession values and culture;

- Succession-planning, and
- Auditing.

Competencies can make significant contributions to each of the purposes listed above, i.e. (Whiddett and Hollyforde, 2006):

- Establishing levels of performance;
- Identifying needs for performance improvement;
- Identifying development potential for succession, and
- Identifying profession direction.

Once competencies have been agreed, there are several ways in which information on behavioural performance can be collected according to Whiddett and Hollyforde (2006). The three basic forms of information that can be collected are:

- Ratings of performance;
- Comments on performance, and
- Examples of performance.

This research used the ratings of performance method in order to obtain information on the competencies.

2.3 Architectural competencies

Bartuska and Young (1994) defines Architecture as the art and science of designing and building open areas, communities and other artificial constructions or environments, usually with some regard to aesthetic effects.

The Architect is often regarded as the leader of the design team, although the inroads of Project Managers and other professionals are tending to change the traditional approach (Seeley, 1997). The Architect is often entirely responsible for the preparation of the contract, including the formulation of designs for the project and is virtually in sole control of the project until the contract is signed, but should make it clear to all tenderers that he is acting on behalf of the Client (Seeley, 1997). Once work has commenced on site, the Architect is responsible for ensuring that the contractor completes the work in accordance with the contract and to the architect's reasonable satisfaction. The Architect is without doubt, one of the principal parties to the contract, and is in direct contact with the majority of people connected with the work at one stage or another (Seeley, 1997).

Twenty-nine competencies were identified after critically evaluating the Royal Institute of British Architects (2003) outline syllabus and the South African Council for the Architectural Profession's (2000) practical training and examination policy statement. The competencies include the following: advanced financial management; arbitration and other dispute resolution procedures; client briefing; communication; computer literacy and information technology; construction technology and environmental services; coordinating; cost control; design; economics of construction; integration of stakeholder interests; law; leadership and general

management skills; maintenance planning; marketing; personal and interpersonal skills; planning and organising skills; post completion evaluation; post occupation evaluation; procurement; professional practice; quality management/control; research methodologies and techniques; risk management; skills working with emerging contractors; structural knowledge; time management, and value management.

The above mentioned competencies were used in order to establish if the Clients perceive Architects to be competent in their daily business.

2.4 Client requirements

According to Ahmed and Kangari (1995), Hudson (1999) and Kamara, Anumba and Evbuomwan (2002) Clients are likely to be satisfied when the final product matches or exceeds their expectations. Therefore, the need to achieve Client satisfaction coupled with the dynamic, changing and fragmented environment of the construction industry (Bowen and Edwards, 1996; Kamara, 1999) results in the need to investigate the various Client requirements.

Client requirements may vary from one Client to the other. The Client requirements that are most prominent are cost, quality and time (Franks, 1998; Masterman, 1992; McCabe, 2001; Rowlinson and McDermott, 1999; Seeley, 1997; Pettinger, 1998; Willis, Asworth & Willis, 1994). However, the simplistic approach disregards the essential fact that it has long been recognised that these requirements are interrelated and conflicting, and that it is impractical to try to achieve all three objectives (Masterman, 1992). At least one, and more often two, will need to be sacrificed to some extent and the individual Clients will need to weigh their own organisation's particular circumstances and the project's technical, commercial and other characteristics.

Smallwood (2000) states that, cost, quality, and time are the traditional Client requirements, while non-traditional measures include black economic empowerment; occupational health and safety; construction health and safety; developmental issues, and the environment.

The above mentioned traditional and non-traditional Client requirements were used in this research to establish (a) the level of importance of Client requirements as ranked by Clients, (b) the extent to which Architects realise Client requirements as per Client perceptions, and (c) the percentage gap between the above mentioned.

3. RESEARCH

3.1 Methodology

The descriptive survey method was employed to process the data obtained through observation. This type of research involves either identifying the

characteristics of an observed phenomenon or exploring possible correlations among two or more phenomena. In every case, descriptive research examines a situation as it is. It does not involve changing or modifying the situation under investigation, nor does it intend to determine cause-and-effect relationships (Leedy & Ormond, 2005). Thus, it observes existing conditions artificially, and is limited to ascertaining and describing the characteristics of the variables of interest in a given situation (Cropley & Harris, 2004).

An exploratory study was conducted to enable the development of an optimum list of competencies. A qualitative approach was adopted during this phase which entailed the interviewing of ten Architects, Construction Managers, Engineers, Project Managers, and Quantity Surveyors in the Eastern Cape and Western Cape. The interviews investigated the various disciplines' understanding of their own competencies, and the competencies of the other disciplines', with the possibility of adding additional competencies to the pilot questionnaire. Subsequently, during the primary study, a quantitative method of data production using a questionnaire was followed.

The populations of respondents in the primary study can be divided into two categories:

- Public sector Clients – a mailing list of all the Municipal Managers in South Africa was obtained from the Department of Water Affairs, and
- Private sector Clients – a mailing list of all the property developers in South Africa was obtained from the South African Property Owners Association (SAPOA).

The total number of property developers or private sector Clients on the SAPOA mailing list totalled 74 members. The total number of Municipality managers or public sector Clients on the mailing list obtained from the Department of Water Affairs totalled 284.

3.2 Questionnaire design

The questionnaire consisted of three sections. Section one consisted of demographic questions, which were later used to test if any of the variables had a significant influence on the rating of the competencies.

In section two, each disciplines' competencies were listed in alphabetical order with two accompanying scales, namely level of importance and evidence of competencies. The questionnaire was designed to include all the competencies which were gathered during the survey of the literature and during the exploratory phase interviews. The method of presenting all the competencies and then asking the respondents to rate the competencies according to current importance and evidence on the Likert scale was adopted from Nkado (1999). The two scales were:

- The level of importance of a competency for a career in a specific discipline at present, from 1 (not important) to 5 (very important), and
- How evident that competency is in the specific discipline in South Africa, from 1 (poor) to 5 (excellent).

Section three also included two scales in which the respondents had to (a) rate the level of importance of the Client requirements, and (b) rate to what extent Architects realise the Client requirements, similar to the scales in section two.

3.3 Sample size and response rate

Krejcie & Morgan (1970) suggest appropriate sample sizes for effective representation of the target population. However, the author deemed it erudite to survey the target population due to the poor response rate in construction related studies.

Of the 358 questionnaires posted, 59 were returned 12 weeks after the initial mailing - this equates to a response rate of 16.8%. However, 8 of the returned responses could not be included in the analysis of the data as not a single response had been recorded thereon. It is notable that no reasons were provided for returning the questionnaires blank. Therefore, the effective response rate was 14.5% as shown in Table 2. However, when comparing the amount of completed questionnaires to the sample size recommended by Krejcie & Morgan (1970), it represents a 22.8% response rate. In essence, this response rate is not far below the 25% response rate achieved by the initial competency research conducted Nkado (1999).

Table 2 Analysis of respondent sample

Sector	Useful questionnaires (No.)	Questionnaires posted (No.)	Required sample size (No.)	Response rate of census (%)	Response rate of required sample size (%)
Public	38	284	165	13.4	23.0
Private	14	74	63	18.9	22.2
Total	52	358	228	14.5	22.8

3.5 Relative importance of competencies

After re-scaling the ordinal data to interval data, the means of the competencies were computed. The means were then converted to percentage ratings. Table 3 presents the importance and evidence ratings, and the percentage gap between the aforementioned.

The five most important current competencies required by Architects as ranked by Clients are design; computer literacy and information technology; communication; quality management / control, and client briefing. All the competencies were ranked as above average in terms of current importance.

The five competencies that Architects are most proficient in according to Clients are design; professional practice; computer literacy and information technology; construction technology and environmental services, and coordinating.

The top five competencies in terms of deficiency as represented by the gap analysis are maintenance planning; skills working with emerging contractors; advanced financial management; cost control, and arbitration and other dispute resolution procedures. None of these competencies are ranked in the top five current importance competencies which suggest that there is no immediate intervention is needed, however attention needs to be paid the above mentioned competencies in the near future to increase Client satisfaction.

Table 3 Importance and evidence of Architectural competencies

Architectural Competencies			
Competency heading	Importance %	Evidence %	Gap %
Design	98.23	87.26	10.97
Computer literacy and information technology	97.41	84.41	13.00
Communication	96.80	81.25	15.55
Quality management/control	96.76	80.98	15.78
Client briefing	96.48	80.87	15.61
Professional practice	96.43	85.36	11.07
Post completion evaluation	96.14	80.42	15.72
Coordinating	95.83	83.63	12.20
Construction technology and environmental services	95.79	83.90	11.89
Construction contract practice	95.33	81.59	13.74
Planning and organising skills	95.30	80.54	14.76
Time management	95.17	77.32	17.85
Post occupation evaluation	94.72	79.24	15.48
Integration of stakeholder interests	94.55	79.45	15.10
Value management	94.55	76.64	17.91
Economics of construction	94.52	76.18	18.34
Leadership and general management skills	94.49	79.66	14.83
Personal and interpersonal skills	94.42	81.47	12.95
Cost control	94.39	73.47	20.92
Structural knowledge	94.35	78.88	15.47
Maintenance planning	92.95	70.73	22.22
Skills to work with emerging contractors	92.26	70.43	21.83
Arbitration and other dispute resolution procedures	92.17	72.46	19.71
Risk management	91.56	74.36	17.20
Research methodologies and techniques	91.11	76.76	14.35
Procurement	89.98	75.77	14.21
Law	88.13	75.49	12.64

Advanced financial management	87.23	66.07	21.16
Marketing	87.13	77.15	9.98

3.7 Client requirements

Table 4 indicates (a) the level of importance of Client requirements as ranked by Clients, (b) the extent to which Architects realise Client requirements as per Client perceptions, and (c) the percentage gap between the above mentioned.

The three most important Client requirements as ranked by Clients are cost, quality and value. All the Client requirements were rated as important by Client therefore it can be concluded that there are more Client requirements than the traditional cost quality and time. Time is ranked at fourth most important just outside the top three. The top Client requirements are therefore inline comments from Seeley (1997) Franks (1998); Rowlinson and McDermott (1999); Pettinger (1998), and McCabe (2001) which indicates that cost, quality and time are the most important Client requirements.

The three requirements that architects realise the most according to Clients are quality, environment and value. The only Client requirement that is not rated above average is black economic empowerment. Therefore, the Client perception is that Architects are not realising this requirement.

The Client requirement criteria with the largest gaps between importance and evidence ranking are Black economic empowerment cost and time. Only one of these requirements (Cost) is ranked in the top three most important requirements as ranked by Clients. Therefore it can be argued that an immediate intervention is needed in order to address this deficiency with regard to Architects realising cost as a Client requirement.

Table 4 Clients views on Architects realisation of Client satisfaction

Competency heading	Clients	Architecture		
	Percentage Importance %	Percentage Evidence %	Percentage Gap %	Gap Rank
Cost	98.51	75.71	22.79	2
Quality	98.38	81.98	16.40	7
Value	98.21	81.54	16.67	6
Time	97.91	77.78	20.13	3
Occupant Health and Safety	95.27	77.69	17.58	5

Construction Health and Safety	94.43	75.10	19.33	4
Black Economic Empowerment	93.44	68.61	24.83	1
Environment	93.30	81.69	11.61	9
Developmental issues	92.60%	80.62%	11.98%	8

4. CONCLUSIONS

Based upon the predominating competencies in terms of importance, it may be concluded that Architects are perceived to fulfil their traditional role of designer of the human environment. Although the gap analysis indicates that the top five competencies with the biggest gaps are maintenance planning; skills working with emerging contractors; advanced financial management; cost control, and arbitration and other dispute resolution procedures it should be kept in mind that these competencies do not feature under the top 10 important competencies. Thus, it could be argued that the perceived importance of each competency should be considered before addressing the perceived deficit in any specific competency.

The Client requirements with the largest gaps between importance and evidence ranking are black economic empowerment cost and time. Attention needs to be paid to these three Client requirements not just because they are ranked in the top three in the gap analysis but also due to the following reasons:

- Black economic empowerment as a Client requirement is not being realised by Architects according to Clients, and
- Cost and time is ranked under the top four Client requirements by Clients.

5. RECOMMENDATIONS

It is recommended that tertiary institutions, the CBE, SAIA and the SACAP should address (a) the perceived deficient competencies identified by the gap analysis relative to their perceived importance and (b) the competencies which assist in fulfilling the top three perceived deficient client requirements identified by gap analysis. This recommendation could require interventions during curricula design, accreditation, assessment of professional competency, and continuing professional development.

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A Study of Work Attitudes of Construction Workers in Hong Kong

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ABSTRACT AND KEYWORDS

Purpose of this paper

To investigate the work attitudes of construction workers in Hong Kong, who entered the industry at different historical periods, in regard to perceptions of salience of trade norms, intra-occupational sociability, involvement in work, commitment to and identification with occupation.

Design

The study adopted a mixed-method approach utilizing both qualitative and quantitative methods. Qualitative data was collected through two rounds of semi-structured interviews with 46 construction workers who entered the industry at different periods of time. A work attitude questionnaire survey was subsequently administered to construction workers at two union centers (n = 348).

Findings

Respondents who entered the industry at different time periods expressed notably different work attitudes. Namely, the *presence of trade community norms, socialization with other workers, engagement in work-itself, occupational commitment and occupational identity* have all declined over time and successive cohorts. Nevertheless, informal means of finding employment remains prevalent (66% of respondents).

Research limitations/implications

Due to difficulties in acquiring access to the research subjects, the sample of the quantitative survey conducted is skewed. Workers who have union membership are overrepresented in the sample.

Practical implications

Since operative construction work relies on organic systems of knowledge transmission for skill formation, it is crucial for industry stakeholders to understand the historical and cultural facets of worker communities when formulating suitable human resource, training and resource allocation strategies and policies.

What is original/value of paper

This paper extends knowledge concerning workers' views of work, their commitment and work identity in relation to historical changes in the socio-structural features of their work contexts. It is also an original, regional study on this topic.

KEYWORDS

Construction worker, work attitudes, occupational community, historical context, Hong Kong

1. INTRODUCTION

In the last ten years, government reports and research on construction management, skill formation, procurement practices, and safety practices have all identified construction culture change as the common challenge and panacea to the further development of this industry (Dainty et al, 2007a:503) . Not immune to pandemic structural malaises of the industry such as the shortage of skilled labour and excessive multi-level subcontracting, Hong Kong has also heeded calls for construction industry reform. Amongst others, the Hong Kong government is currently working with main construction stakeholders including contractors, subcontractors and training institutes in implementing a long-term reform agenda of improving a wide gamut of practices (CIRC, 2001). In the official reform documents as well as in scholastic publications, suggestions for changes in 'soft, cultural' aspects of practices are explicitly emphasized (CIRC, 2001; Fox and Skitmore, 2003:712).

Whilst there has been growth in managerial and research attention paid to soft approaches to cultural change, studies that have taken on the task of examining the work attitudes and perspectives of individual construction occupational groups are still few and far between. It is widely known that the success of project-based construction work is highly contingent upon intensive, situated collaboration between different groups of construction personnel, each bringing divergent interpretative occupational lenses to the site.

Scholars have hence argued that more nuanced knowledge in each work group's site-level, and occupational culture would enhance change implementers' awareness of tacit inter-group social dynamics underlying project events (Jorgensen et al., 2004:11; Bresnen et al., 2005:558; Rooke and Clarke, 2005:569; Dainty et al., 2007b:12). This knowledge can certainly help policy makers in identifying hidden barriers to change and hence reduce elements which may cause resistance to change programmes and policies.

The research focus of this paper is on one of the most under-researched construction workgroup – frontline operative workers. In view of the central roles operatives play in day-to-day construction work, there needs to be more in-depth exploration that provides insights into construction worker's cognitive, attitudes and the occupational terrain in which their locally contextual 'work culture' is engendered. Furthermore, since cultures do not arise overnight, historical insight into the evolution of workers' occupational landscape, with parallel consideration of regional contextual developmental influences, is needed to uncover extant, hidden social logic and forces embedded inside prevailing occupational cultures (Weil, 2005:450).

Based on the main research problem described above, a mixed (qualitative and quantitative) method study of Hong Kong construction workers' attitudes and the characteristics and historical development of their occupational communities was conducted with the following research aims:

Research question 1: What are the current work attitudes of Hong Kong construction workers in regard to job searching, salience of trade norms, intra-occupational sociability, engagement in work-itself, commitment and identification with occupation?

Research question 2: Are there differences in worker attitudes amongst workers who had entered the Hong Kong construction industry in different epochs? If so, how has worker attitudes evolved over time in relation to socio-structural changes in the workers' community?

2. LITERATURE REVIEW

2.1 Occupational culture and communities of practice

Although management of construction culture has received substantial scholastic attention recently, only a handful of studies have approached the issue from an occupational or career perspective (Kappia et al., 2007:239).

According to Dainty et al. (2007b:6), an “institutionally embedded reliance on subcontracting” supported by a highly casualized, self-employed operative workforce which moves itinerantly from one subcontractor company or project to another, makes it difficult to apply prevalent managerialist human resource notions, premised upon stable organizational contexts, to non-managerial staff in construction. In earlier construction culture research, Riemer (1979) and Applebaum (1981) pointed to the crucial role of informal ‘occupational culture’, comprised of tacit norms of socialization, in shaping workers’ perceptions, skill formation experiences, and occupational identity (Barthorpe et al., 2000:347). A renewed focus on occupational cultures and their trajectories through time may be illuminative in studies of construction management.

In this study, the concept of ‘occupational community’ is employed to investigate workers’ attitudes and occupational identities in relation to the features and structures of the occupational groups they belong to.

Occupational community is an industrial sociology notion describing a particular type of occupational group “who consider themselves to be engaged in the same sort of work; who identify (more or less positively) with their work; who share a set of values, norms, and perspectives that apply to, but extend beyond, work related matters; and whose social relationships meld the realms of work and leisure.” (Van Maanen and Barley, 1984:287). Members of an occupational community also derive values, identity or self-images directly from their occupational roles.

Other recent studies in construction management have also seen the emergent scholastic interest in construction as a field of work exemplifying situated learning and workplace learning. These studies draw on the reformulation of the conception of learning as situated and social by nature (Lave and Wenger, 1990; Wenger, 1998). There is also parallel adoption of the communities of practice notion as a means to understanding and fostering organizational learning (Brown and Duguid, 1991) and knowledge management (Bresnen et al., 2004:1539; Styhre et al., 2006:1350). Studies of communities of practice strive to elucidate relationships between workers’ attitudes and behaviours, and the structural dimensions of their social worlds (Wenger, 1998). Taking on a community of practice perspective, Gherardi and Nicolini (2002; 2006) conducted an ethnographic study of three occupational groups, namely engineers, site-managers, and main contractors, within the construction industry with focus

on how these groups of personnel viewed and enacted safety practices differently.

3. RESEARCH METHOD

In order to capture in-depth coverage of contextual information whilst ensuring comparability across contexts, this study adopted a mixed-method approach utilizing both qualitative and quantitative methods. In line with the socio-constructivist theoretical basis of the study, the semi-structured interview approach was chosen to solicit detailed accounts of work perceptions. A triangulation approach was subsequently taken: statistical and archival data was collected from government publications and other stakeholder sources, and iteratively compared and analyzed with personal interview data to assess reliability of respondent accounts. Next, data from the exploratory, first-wave interviews were analyzed to inform the design of a questionnaire. The questionnaire aimed to measure construction workers' work attitudes, and occupational perceptions which reflect aspects of an occupational community relying on informal norms of employment relations.

A first-round of exploratory interviews (n=29) and field studies were conducted from January 2007 to April 2007. A questionnaire survey (n=348) was subsequently administered in April 2008. To further enrich the interpretation of retrieved data, a second-round of interviews (n=17) was conducted from April to June 2008.

3.1 QUALITATIVE STUDY DESIGN AND ANALYSIS

In total, 46 semi-structured personal interviews were completed during the research period. Thirty-five of these interviews were conducted with construction operatives. The summative profile of the construction worker interview sample (n=35) is presented in Appendix A. To supplement workers' accounts, 11 other personal interviews conducted with relevant, non-operative worker, industry personnel belonging to different groups of stakeholders. Twenty-nine first-round interviews were conducted on a construction site with the assistance and permission of a site management staff who worked for a foreign-owned main contractor company. Seventeen second-round interviews were conducted with union workers/representatives and construction trainees at two major union centres and CICTA¹ respectively.

¹ CICTA stands for Construction Industry Council Training Academy. CICTA was formerly known as Construction Industry Training Authority (CITA) – its statutory name at the time of the interviews.

Following the grounded theory tradition, both rounds of interview data was transcribed verbatim and then coded and analyzed iteratively by analytical induction methods with the assistance of the NVivo 7 software.

3.2 QUANTITATIVE STUDY DESIGN

A questionnaire survey was administered to construction operative workers who were also union members through consent and assistance from two major union centers (n=348). It should be noted that there are limitations in the sample, which is skewed towards those who are well-experienced and holding higher skill qualifications.

The questionnaire seeks to measure five dimensions of workers' attitudes and perceptions which correspond to aspects of an ideal-type occupational community: I. Saliency of trade norms; II. Job search factors; III. Occupational sociability; IV. Engagement in work-itself; V. Occupational Commitment and Occupational Identity. A four-point scale is used for measuring attitudinal differentials among respondents with a score of 1 standing for strongly disagree, 2 for disagree, 3 for agree, and 4 for strongly agree. To test whether perceptions of workers change in accordance with historical changes in the occupational terrain or other profile factors, workers are also asked to supply information about their year of entry into the industry, country of origin and employment status. Results were tabulated and analyzed using the SPSS 16.0 statistical package. The survey results are summarized in Table 1.

4. FINDINGS AND ANALYSIS

Based on data collected in the first-wave personal interviews, it was hypothesized that the time at which workers entered into the industry is a key factor for understanding workers' work attitudes. According to their year of entry into the industry, the survey and interview respondents were categorized into three cohorts corresponding to three key stages of industrial development for the Hong Kong construction industry: 1945 to 1967, 1968 to 1993, and 1994 to 2008. The historical background and rationale for the cohort period division is explained below.

4.1 Historical background of Hong Kong construction in relation to the societal context

During the post-WWII period (1945 to 1967), the Hong Kong construction industry expanded slowly as the city began its gradual transformation from an entrepot into an industrial society. Construction entrepreneurs typically used labour-intensive production modes to generate quick capital turnover

and short-term profits. The social milieu and the loose labour market during this period holds enormous implications for the cohesiveness and salience of worker communities: the primitive state of the city's infrastructure coupled with lack of public social provisions had necessitated the need for workers, most of whom were new refugees from China, to co-depend on each other. With limited financial means, most workers lived communally on workshops, sites, at unions, or in close proximity to their workplace and kinship networks (Fung, 2005).

Between 1967 and 1993, Hong Kong's economy began to take off and the construction industry boomed concomitantly as construction volume soared. In the late 1960s, subcontractors began to utilize mechanical tools, though the speed of technological adoption was still slow and varied between trades. In the mid 1970s-1980s, construction project sizes expanded swiftly as a new class of main contractors emerged with substantial capital to modernize production modes and technology. Hong Kong construction became increasingly "business-led" and "directly affected by the performance of the property market, which is extremely volatile" (Hills et al., 2006:881). Broader social changes such as public housing development, improved urban infrastructure and social provisions also allowed workers to own their own homes and develop their families in the 1970s. Critical shortage in skilled labour in the early 1990s leading up to 1997 led to industry-wide wage hikes and a rapid, unregulated increase in levels of subcontracting. During this period, "professionalism and workmanship were neglected as the whole industry rushed to finish projects and put them on to the market before the handover of sovereignty to China." (Hills et al., 2006:881)

The adoption of capital-intensive technology such as prefabricated units in the early 1990s (Ganesan, 1996) and Hong Kong's restructuring into a post-industrial society marked the industry's transition into its 3rd developmental stage (1994 to 2008). After construction volume peaked in 1997, the industry dovetailed into cyclical decline in 1998. The fallout of the decline entailed a painful 10-year market contraction of excess subcontracting levels marred by highly publicized project fraud scandals, growth in the number of subcontractor defaults, and frequent incidents of worker wage arrears. For workers, the post 1997 period is characterized by high unemployment rates, drop in average wages, and work overseas for some. To controvert these negative trends, the government has been working with contractors and unions in reviewing and implementing a series of construction reform policies to regulate industry practices since 2001.

Regulatory initiatives introduced in the past three years include, amongst others, a workers' registration system, new regulations of worker payments and subcontracting levels.

A summative look at the survey and interview data reveal that worker attitudes towards *salience of trade norms, occupational sociability, engagement in work-itself, occupational commitment and occupational*

identity have all declined over time and successive cohorts. Quantitative and qualitative accounts confirm that operative worker communities in the first stage of development (1945-1967) were symptomatic of a prototypical occupational community. However, both the 1968-1993 and 1994-2008 cohorts expressed somewhat altered work attitudes that no longer reflected self-perceived participation in a characteristic occupational community. In the following section, attitudes of construction workers are analyzed by cohort using the above historical framework.

Table 1 : Workers' Attitudes by Cohort

a	#-Item	All (n=348) ^b	Entry cohort		
			1945- 1967 (n=56)	1968- 1993 (n=173)	1994- 2008 (n=37)
I	1-Your trade traditionally had occupational norms	3.22	3.28	3.25	3.13
	2-A subcontractor's reputation is important	3.50	3.57	3.53	3.55
	3-The credibility of subcontractors in your trade has deteriorated	3.04	3.04	3.12	2.85
II	4-Referrals from relatives are important for job-searching	2.54	2.17	2.60	2.54
	5-Referrals from friends are important for job-searching	3.49	3.52	3.47	3.45
	6-Work experience is important for job-searching	3.60	3.64	3.57	3.79
	7-Personal reputation in your trade is important for job-searching	3.49	3.54	3.52	3.59
	8-Skill certificates are important for job-searching	3.05	3.04	3.02	3.28
III	9-Your best friends work in the same trade as you	2.82	2.85	2.81	2.62
	10-Your best friends work in the construction industry	2.86	3.04*	2.82*	2.68*
	11-You are happy when you are working with your workmates	3.24	3.46*	3.18*	3.30*
IV	12-During non-work hours, you often engage in activities with fellow tradesmen	2.86	2.98	2.83	2.80
	13-You consider your work interesting and challenging	3.04	3.21*	3.02*	2.90*
V	14-Construction work is your long-term career	3.17	3.44*	3.16*	3.05*
	15-You did not leave your trade because you had no other options	2.69	2.78	2.66	2.48
	16-You feel proud when someone calls you a "construction worker"	2.44	2.63	2.42	2.28
	17-You are annoyed when someone calls you a "construction worker"	2.46	2.23	2.46	2.50

^a Dimensions of work attitudes included in the survey.

^b The total valid sample size is 348 with 82 respondents omitting to give their year of entry.

^c* = ANOVA $p < 0.05$

4.2 WORKERS' ATTITUDES: SALIENCE OF TRADE NORMS

According to Wenger (1998:81), a community's "norms" refer to regulatory relations of mutual accountability determined upon and upheld by the community's members. From the survey data presented in Table 1, it is

apparent that though awareness of traditional informal trade norms is still salient amongst workers nowadays, there is a slight drop in scores to item 1 “Your trade traditionally had norms” across new cohorts, possibly indicating decline in salience of trade norms. Moreover, the oldest cohort of workers, acculturated in traditional norms more readily concurred with the degeneration of subcontractor credibility, while the newer cohort did not perceive much decline in subcontractor credibility (item 2). All three cohorts consider subcontractor reputation to be equally important in job searching and employment relations (item 3). The interview data, which is presented below, largely affirm these findings.

4.2.1 Declining legitimacy of construction trade norms from 1945 to 2008

Traditionally, in lieu of formalized systems of skill formation and employment legislature, trade norms which regulate training, employment terms, pay conventions and mutual trust played an important functional role in enabling smooth coordination of labour processes and helped mollify the vagaries of the construction business cycle. Some traditional norms recounted by interviewees of the 1945-1967 cohort include:

Table 2 : Traditional Hong Kong construction trade norms

Norms of skill formation:	
I.	An informal tacit apprenticeship institution whereby new entrants serve under a mentor or group of mentors without pay for at least 3 years. (Interviewee8, personal interview, June 1, 2007)
Norms of job search, informal valuations of work and reputation:	
II.	Job searching and recruitment takes place at Chinese tea restaurants which serve as a job information clearinghouse. ² (Interviewee16, personal interview, April 12, 2008)
III.	Reciprocity in providing job reference and information is expected, except in the case when the worker seeking a referral has a blemished record and reputation. (Interviewee8, personal interview; Interviewee9, personal interview, June 1, 2007)
Industry-wide norms of subcontracting behaviour and employment relations	
IV.	A high degree of mutual trust and reciprocal behaviour was common between main contractors and subcontractors and between subcontractors and his gang of workers. (Interviewee5, personal interview, April 19, 2007)
V.	Pay and work hour norms were negotiated by unions in trades where union density is higher. A collectively agreed day-wage rate negotiated with subcontractor associations would be set and adjusted annually. ³ (Interviewee5, personal interview; Interviewee9, personal interview)
VI.	Slang for typical subcontracting arrangements, work tools and artefacts apply to many trades across the industry, though interpretation may differ minutely between trades. ⁴ (Interviewee2, personal interview, February 17, 2007)
Norms of occupational socialization:	

³ For example, the bamboo scaffolders and bar-benders negotiated annual day-wages through unions.

⁴ Worker who works as a recruitment agent for subcontractors are called “snakeheads”. Gang subcontracting (“*da da shu*”) is preferred over use of “snakeheads” in some particular trades.

- VII. Workers in some trades tend to live together communally on-site, at workshops or at union centres. Socialization norms such as taking turns at preparing meals, drinking and gambling after work pervade non-work domains also (Interviewee19, personal interview, April 19, 2008; Interviewee16, personal interview).
-

Norms of the industry began to lose their legitimacy in the early 1970s as evidenced of the sudden shortening of apprenticeship duration from three years to six months. The rapid decline in norms was triggered by:

- i. Mechanization and the deskilling of craft-trades;
- ii. A new group of main contractors whose management and technologist staff came from vastly different backgrounds did not inherit or pay heed to cultural norms of subcontractor reciprocity, and
- iii. Aided by an industry boom, new entrants were recruited with minimal traditional ties and skill requirement.

When the 1994-2008 cohort entered the industry, many traditional norms were no longer functional in allocating risks and responsibilities while new formal regulations are still being implemented to instil new order and accountability. A notable finding from the qualitative data is a marked semantic difference in what the new cohort 1994–2008 workers perceived to be a 'norm'. Some recent norms included more 'institutionalized' rules of safety, and punctuality, as popularized by governmental initiatives.

While subcontractor reputation persists to be a crucial job selection criteria for workers, interviewees who entered the industry before 1997 tend to agree that subcontractor credibility has deteriorated since 1997. Workers generally attributed degeneration of trust to a culture of lowest bid tendering (Hills et al., 2006:882), which led to increase in opportunistic behaviours and wage arrears.

4.3 WORKERS' ATTITUDES: JOB SEARCH FACTORS

4.3.1 Continual use of informal means to job-searching and recruitment

Construction workers' informality in job search has been well- documented and tested (Clarke and Hermann, 2007:524; Lockyer and Scholarios, 2007:543). The results of the present study give further evidence to this feature. In the survey, the job search data reveal that great significance is attached to friendship's referral (3.49) and personal reputation (3.49). While it is noted that the factor of family referral is lower than the previously mentioned (two) factors (2.54), the score may be confounded by other factors such as career stage effect.

The overall ranking of the five job search factors from the most important to the least is: work experience (3.60), personal reputation (3.49), referral from a friend (3.49), proper skill certification (3.05), and

referral from a family relative (2.54). This factor ranking is consistent across cohorts.

Persistent and significant reliance on informal job search modes is further supported by data collected from personal interviews with workers. Reasons provided for the continual prevalence of informal job searching/recruitment over time include:

- I. From the labour side, the 'refugee', or new immigrant background of the construction workers, and
- II. From the demand side, due to the prevalence of subcontracting behaviour, recruitment is adhoc and highly contingent. Recruitment via existing social network of currently employed workers is considered to be both efficacious and cost-saving.

4.3.2 Declining importance of family referral in acquiring first job

Traditionally, kinship-relations and networks are often required for initial entry into a trade. To test whether or not *family referral* is indeed still relevant for *entry into industry*, respondents were also asked to supply information about how they found their first job. The results are summarized in Table 3.

Table 3: How workers obtained first job in the construction industry (n=261)^a

	All	1945- 1967	1968- 1993	1994- 2008
Family relative referral	46%	58%	45%	32%
Friend referral	29%	21%	30%	34%
Referral through training institution	15%	15%	14%	18%
On one's own without any reference	10%	6%	11%	16%

^aThe total valid sample size is 348 with 87 respondents omitting to give information about how they obtained their first job.

Findings from table 2 indicate that family relative referral is still a dominant means to obtaining entry into the industry (32%). However, kinship networks are decreasing in importance as new entrants are increasingly able to acquire jobs on their own or through a friend's referral or through formal training institutions such as CICTA.

4.3.3 Changes in job search modes

For the 1945-1967 cohort, job vacancies information is acquired primarily through direct socialization with fellow workers at venues such as Chinese teahouses or unions. By the 1970s, workers who had moved into their own homes preferred to stay in contact by phone at night. Currently, cell phones are used for day-to-day logistics and exchange of job information.

4.4 WORKERS' ATTITUDES: SOCIABILITY

With regards to workers' intra-trade or occupational sociability, the survey results indicate a decline in the percentage of workers who agree that their best friends are in also in the same trade / industry over cohorts (item 9 & 10). A mild decline in socialization with tradesmen after work amongst the later cohorts is also observed (item 12).

While the results may be confounded by career-stage effects, interviews reveal that the 1945-1967 cohort did socialize with tradesmen much more frequently than the recent cohorts. The decline in occupational socialization behaviours have much to do with the disappearance of trade occupational communities and traditional apprenticeship system which helped workers form enduring, close-knit occupational relations. Quite a few interviewees from the earliest cohort attested to maintaining lifelong correspondence with fellow apprentices and apprentice-mentorship relations. It may be suggested that their lack of access to alternative social networks also gives rise to high levels of intra-occupational socialization.

By comparison, the 1968-1993 and 1994-2008 cohorts have more diverse social, educational and occupational backgrounds with more workers having previous career and education experiences. Frequency of socialization decreases drastically during times of high unemployment when workers preferred to stay home and in hope of receiving telephone calls offering work. However, during good times, workers occasionally spent their earnings on leisure activities after work with old mates and new colleagues working at the project.

4.5 WORKERS' ATTITUDES: ENGAGEMENT IN WORK-ITSELF

Survey and interview data unanimously point to a decline in feelings of engagement and involvement in work over cohorts (item 13). The most recent cohort generally does not find work to be as interesting and challenging as the oldest cohort which underwent rigorous apprenticeship training. Interviews with old workers often elicited long narratives of pride about arduous apprenticeships, acquiring holistic craft skills, and satisfaction derived from products and structures built with one's own hands. For 1968-1993 interviewees, due to the increased degree of fragmentation during this period, seldom expressed pride in skills. Workers of this cohort, however, were proud of being a self-made man who was able to earn much money during the construction boom and raise families despite minimal education. Finally, the most recent cohort displayed minimal feelings of ownership and pride about their work. Responses to questions regarding work-nature were often sarcastic with emphasis on pragmatism and apathy to work in general.

4.6 WORKERS' ATTITUDES: OCCUPATIONAL COMMITMENT AND OCCUPATIONAL IDENTIFICATION

Although, as a whole, the survey sample of workers is committed to their occupation (item 14), notable diminishing occupational commitment over cohorts is observed in responses to survey item 15. But prospective entrants interviewed portrayed a rather slim view of their own career. Reasons workers and prospective entrants supplied for a lowered sense of commitment to construction work include:

- I. Industry downturn had led to low wages and unemployment. Stress induced by job instability and lowered income had led a few experienced interviewees to consider leaving the industry for good;
- II. Low occupational status and harsh work conditions including omnipresent danger, a rough, confrontational culture, and long work hours deter local youngsters from entering the trade. Youth with low educational attainment prefer to enter other service industries which may offer career advancement options despite lower pay, and
- III. Lack of foreseeable, future growth in local industry and clear career advancement paths also contribute to low worker morale.

In regards to occupational identity, survey scores of items 16 and 17 show that overall, the worker sample is not particularly proud of nor particularly discontent with being a 'construction worker'. Only the 1945-1967 cohort of workers expressed minor positive identification with the occupation. The 1963-1993 and 1994-2008 cohorts display a detached and minor negative identification with construction work, respectively.

During interviews, workers of all cohorts overwhelmingly concurred that they would not encourage their children to enter the industry. The oldest cohort dominantly identified with their trade and was nostalgically proud of their past achievements. Less engaged in their work, the latter two cohorts' sentiments towards the occupation are more mixed and complex.

5. DISCUSSION AND CONCLUSION

The present study has explored the evolving work attitudes of the construction workers in different epochs in Hong Kong. In the past, construction trade occupational communities moderated by informal norms of work practices have played critical functional roles in maintaining social connectedness amongst workers, whilst contributing to regulated transmission of craft knowledge. However, such self-sustaining occupational communities have withered away since the 1970s, though certain norms such as informality of recruitment behaviour persists at present. In regards to work attitudes, contrary to the salient pride of work

displayed amongst US construction workers studied by Applebaum in the late 1970s (Applebaum, 1981), the Hong Kong workers studied display a rather complex work psychology regarding their pride towards their work. In particular, decline in intra-trade sociability coincided with declining identification and commitment to the occupation amongst younger workers.

Without doubt, a multitude of developmental factors, some universal and some varying by region, have contributed to this phenomenon. Some plausible regional factors at play include differences in political and regulatory environment, strength of worker unions and variations in worker cultural ideologies (Bosch and Philips, 2003:22). With regards to the role of local, cultural beliefs in shaping work attitudes and relations, it is worth noting that Hong Kong construction workers, most of whom were once poor migrants from China, frequently adopted a popular maxim - *“those who work more should get paid more”* (*“duo lao duo de”*) – to justify the merits of the subcontracting system, despite its current dysfunctionality. Although this opportunistic and pragmatic “refugee mentality” (Chiu et al, 2001:68) facilitated rapid mobilization of workforce and conflict-avoidance during times of expansion, it is also a deep-seated hindrance to collectivism and substantive collaboration amongst workers and subcontractors.

In addressing quality and regulatory issues brought upon by cyclical industry decline and obsolescence of trade norms, the Hong Kong government has been ushering in new legal sanctions, best-practice initiatives and other formalized systems such as qualification frameworks. While the significant efforts of the government and other stakeholders in these regards are acknowledged, I would like to point out that the core work of construction is still essentially situated and community-based. To-date, frontline construction work still requires continual, cooperative harnessing of experiential knowledge. This study found that, not only was such knowledge historically propagated and transmitted through collaborative regulation and socialization, older workers trained in communal modes of practice tend to exhibit higher work commitment and sense of work pride. It is hence proposed that, instead of treating the modern construction worker as decontextualized, modular units of analysis, more attention should be placed on studying workers’ collective behaviours and human resource development within their regional and historical contexts. A modern training or management initiative which simply focus on transmission of technical knowledge and ignore the extant social dimensions in work, will ultimately be self-defeating.

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APPENDIX A: PROFILE OF SURVEY RESPONDENTS AND INTERVIEWEES

	Survey respondents (n=348)	Interview respondents (n=35) ^a
Year of entry into industry	between 1945-1967 - 20.6% between 1968-1993 - 65.0% between 1994-2008 - 14.4%	between 1945-1967 - 17.1% between 1968-1993 - 54.3% between 1993-2008 - 28.6%
Employment status	self-employed / temporary worker - 26.3% long-term temporary worker - 45.3% full-time directly-employed worker - 13.1% unemployed - 4.3% retired - 11.0%	temporary worker - 28.6% long-term temporary worker - 45.7% full-time directly-employed worker - 11.4% retired - 14.3%
Type of training	traditional apprenticeship - 76.2% on-the-job learning - 12.9% institutional training (CICTA) - 11.1%	traditional apprenticeship - 37.1% on-the-job learning - 54.3% institutional training (CICTA) - 8.6%
Trade	Plastering - 25.6%; Painting - 18.1%; Carpentry - 17.7%; Plumbing - 6.5%; Bricklaying - 5.6%; Renovation - 5.1%; Plant operator - 4.2%; Bamboo scaffolding - 3.7%; General worker - 3.3%; Bar-bending - 3.3%; Others - 7.0%	Hoarding - 34.3%; Electrician - 14.3%; Painting - 8.6%; Carpentry - 8.6%; Plastering - 8.6%; General worker - 8.6%; Demolition - 5.7%; Formwork - 5.7%; Others - 5.7%
Skill-level	skilled tradesmen - 70% semi-skilled tradesmen - 5.9% general worker - 24.1%	skilled tradesmen - 57.1% general worker - 42.9%
Age	21 - 30 yrs - 3.9%; 31 - 40 yrs - 8.5%; 41 - 50 yrs - 33.2%; >=51 yrs - 54.4%	21 - 30 yrs - 5.7%; 31 - 40 yrs - 20%; 41 - 50 yrs - 42.9%; >=51 - 31.4%
Country of origin	Hong Kong - 58.1%; China - 40.1%; Others: 1.8%	Hong Kong - 40%; China - 48.6%; Nepal - 8.6%; Pakistan - 2.9%

^a Only the profile information of workers interviewed are provided.

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Procurement, Maintenance, Installation and Commissioning of HVAC Systems in Buildings

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Purpose of this paper

This paper evaluates the performance of Heating, Ventilation and Air Conditioning (HVAC) system in selected public buildings and relates this to aspects of management in procuring services for installation and commissioning for HVAC systems in public buildings.

Approach

A survey of library buildings was conducted in the Southern Area of Ekurhuleni Metropolitan Municipality. Structured observation and interview with occupants and Facility Managers were used in data collection. A total of 16 library buildings were studied in the exercise. Results were statistically analysed and emerging issues thematically.

Findings

Buildings visited operated HVAC systems with little or no due commissioning procedures undertaken. Cases of poor installation practices were also observed. The end result may be poor comfort levels and sick building syndrome.

Value of paper

It is demonstrated that the use of affirmative action while disregarding competency poses a challenge to successful procurement of maintenance, installation and commissioning services for HVAC systems.

Key words: procurement, installation, commissioning, HVAC systems, sick building syndromes

1. INTRODUCTION

Govender and Watermeyer (2000) describe procurement as the process that creates, manages and terminates contracts while noting the existing potential in construction industry to use it (procurement) to promote specific/strategic aspects there. The use of targeted procurement is particularly used in South Africa to circumvent the constraints due to lack of access to market, credit, skills and institutional support (Govender and Watermeyer, 2000; Watermeyer, 2000). Bolton (2006) reports that prior to 1994 the government procurement systems favoured large business establishments, with the post 1994 preferential procurement was used as a policy tool to encourage redistribution of wealth. South Africa was driven towards this route by the enactments of a series of legislations that include the Procurement Policy Framework Act (Republic of South Africa, 2000a), the Public Finance Management Act (Republic of South Africa, 1999), the Municipal Management Act (Republic of South Africa, 2000b and Republic of South Africa, 2004a) and the Broad Based Black Economic Empowerment Act (Republic of South Africa, 2004b). Bolton(2006) further comments that these legislations captured the objectives of the reconstruction and development projects that expressed the desire to improve access to tendering information, development of tender centres, broadening of participation base for small contractors, waiver of securities and sureties for contract values less than R100,000, unbundling of projects to smaller sub projects and preferential procurement to favour SMMEs owned by historically disadvantaged peoples among others.

It should however be noted that despite the use of preferential procurement for public projects, the project must firstly attain the primary intended objectives in order to avoid a feeling of entitlement by the historically disadvantaged peoples and to ensure cost control. Thus the government in a bid to portray its commitment to practice of fairness, equity, transparency, competitiveness and cost effectiveness under decided to introduce preferential points system and award of tender based on the 80/20 preference system and the 90/10 preference system. This balanced the uncompetitive bias of the preferential procurement as a policy. Edler and Georghiou (2007) however assert that demand has the potential to greatly influence procurement of innovative solutions and products in public service delivery and yet remains largely ignored.

2. HVAC SYSTEMS AND PROCUREMENT

HVAC systems are used in buildings for the sole purpose of maintaining thermal comfort and indoor environment (temperature, humidity and air cleanliness) at desired levels where this cannot be achieved naturally. The HVAC systems are not only building specific but also depend on use

thermal requirements, location and purpose to which it's designed (American Institute of Architects, 1993).

In most cases where these purposes are not accomplished a situation described as the Sick Building Syndrome emerges (SBS). SBS is characterised by mucous membrane, cutaneous or fatigue or dizziness or asphyxia on building occupants (World Health Organization, 1983; Fanger et al., 1988; (Mølhave et al., 1986; Berglund et al., 1992; Mendell, 1993) and is mainly attributed to poor indoor air quality as a result of inadequate air changes, increased pollution load on indoor air due to pollutants emitted by building materials and furnishing (Wargocki et al, 1999).

In the modern world apart from considering the attainment of goals procurement of HVAC services must also consider energy efficiency. The London based Chartered Institution of Building Services Engineer (CIBSE) describes 'energy efficiency' concept in buildings as encompassing the provision of desired internal environment and services using minimum energy and in an environmental friendly manner (CIBSE, 2004). Energy efficiency as a consideration in building services is chiefly motivated by scarcity of energy/deficit of electricity, cost of operation and the threat of global climatic change (Matsugawa et al, 1993; Department of Minerals and Energy, 2005; Liang et al, 2007; Talukhaba and Aduda, 2008). In view of the fact that South Africa continues to face insufficient inadequate electricity generation reserve, the country needs to promote policies towards this end. One such policy is energy efficiency across all economic sectors. Building as a major consumer of electricity must also adhere to these policies. One way of promoting energy efficiency in buildings is by aligning procurement of services to the Energy Efficiency Strategy (Department of Minerals and Energy, 2005). The energy efficiency strategy specifically recognises link between energy efficiency and sustainability in the Republic of South Africa and goes on to set a target to reduce electricity demand by 12% by the year 2014.

While procuring HVAC related services it is therefore of inherent importance that the twin issues of the need to achieve functionality (and prevent SBS) and energy efficiency be used as the main criteria for technical compliance.

3. METHODOLOGY

The paper specifically attempts to link the performance of maintenance, installation and commissioning services in HVAC systems to the procurement policies. The case of library buildings in the Southern Region of Ekurhuleni Metropolitan Municipality, Gauteng Province has been used to effectively illustrate. As part of the research, the government policy on procurement of services was examined by document analysis. In addition the Departmental Head for Library and Information Services at the

Ekurhuleni Metropolitan Municipality was interviewed on protocols concerning procurement for building services.

Building survey was carried out in a total of 16 library buildings (these were library buildings at Germiston, Alberton, Reigerspark, Leondale, Dinwiddie, Katlehong, Spruitview, Isaac Mokoena, Edenpark, Brackenhurst, Thokoza, Palm Ridge, Zonkizizwe, Boksburg, Elburg and Vosloorus). The survey utilised a combination structured observation, structured interview and document analysis to answer the question as to whether procurement of maintenance, installation and commissioning services for HVAC systems influences their effectiveness in terms of energy efficiency and functionality.

In order to assess functionality of HVAC systems occupants were interrogated to find out their qualification of odour (whether strong, acceptable or lacking) and thermal comfort level (whether good, moderate or poor). This borrowed a leaf from Wargoscki et al (1999) who conducted a similar study in Denmark; this study was used as a basis for assessment of thermal comfort and odour mainly due to ease of replication and its simplicity. This gave an indication of occupant's satisfaction with HVAC system performance.

Energy efficiency issues were assessed through direct interrogation of issues concerning maintenance, installation and commissioning; lack of these was interpreted to imply failure in implementing energy efficiency agenda. With regards to maintenance the specific aspects examined were measurement and monitoring and planning or schedule. Installation was interrogated on the basis of how long it took for the equipment to function without any problem after handover; the categories of answers were very short (3 months after commissioning), short (3-6 months after commissioning), medium (6 -12 months after commissioning) and long(over 12 months after commissioning). Commissioning was evaluated on the basis of availability of maintenance/repair log books, as built manuals and as built drawings; lack of these was interpreted to imply poor services or need for re-commissioning.

4. MAINTENANCE

The building survey revealed that maintenance for all HVAC systems were reactive and not planned. This meant that the equipment were only repaired or serviced after faults. As such it reflected the elements referred to by Tsang (1998) as the traditional role of maintenance as fixing broken things. Even though this may prove effective in budget control in the short term, it definitely leads to huge expenditures in the long run as machines start betraying signs of neglect. Additionally the survey revealed that there were no mechanisms put in place for measuring and monitoring of energy consumption (EEM). Van Gorp (2004) supports the use EEM systems due

to the importance attached to accurate energy metering and sub metering which is highly crucial in ensuring reliability; the ease of conducting energy audits in the systems where they are used and lastly the use of measured data for load profiling which is necessary for scheduling and planning of building equipment. Figure 1 illustrates the full results of the survey with regards to maintenance. The combined practices of reactive maintenance at the expense of planned maintenance mode and lack of EEM systems in buildings visited betrayed absence maintenance. Additionally it follows that the procurement process for maintenance was a failure.

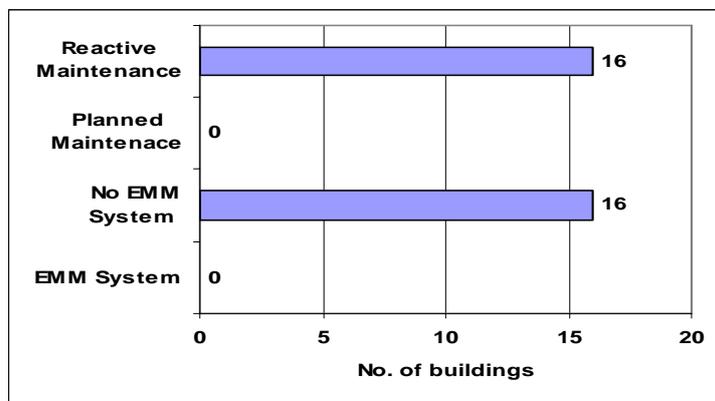


Figure 1: Maintenance modes and availability of energy monitoring & measurement systems for HVAC systems; Source, Field Survey

5. INSTALLATION

In order to assess the success of installation, the period taken to report system malfunction after handover of HVAC systems was analysed for the buildings studied. These periods were categorised as very short (less than 3 months), short (3 months to 6 months), medium (6 months to 12 months) and long (over 12 months). The results revealed that 25% of the buildings surveyed took between short to very short before reporting failure in HVAC systems, this implied that improper installation practice was a rarity. It therefore follows that with regards to installation of HVAC systems the procurement services succeeded in terms of functionality. Figure 2 below illustrates the results on success of installation.

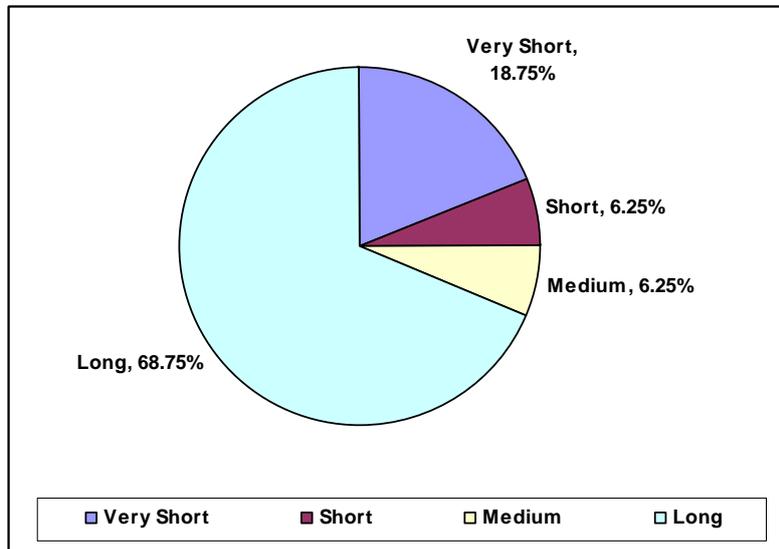


Figure 2: Installation success as shown by the time taken after handover to report system failure; Source, Field Survey

6. PERCEPTION

In terms of perception on thermal comfort levels, the study revealed that that slightly over 56% of the respondents qualified the thermal comfort level as moderate while over 31% described it as poor. These revelations put to doubts arguments on attainment of adequate functionality. The findings were however different in terms of perceived odour in buildings or lack of it. Only 12.5 % of the respondents found the odour inside the buildings strong and unacceptable (Refer Figure 4).

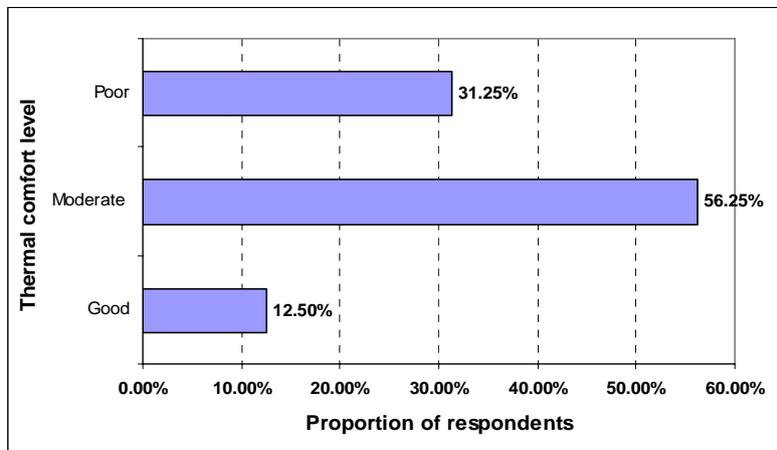


Figure 3: Perceptions on thermal comfort; Source: Field Survey

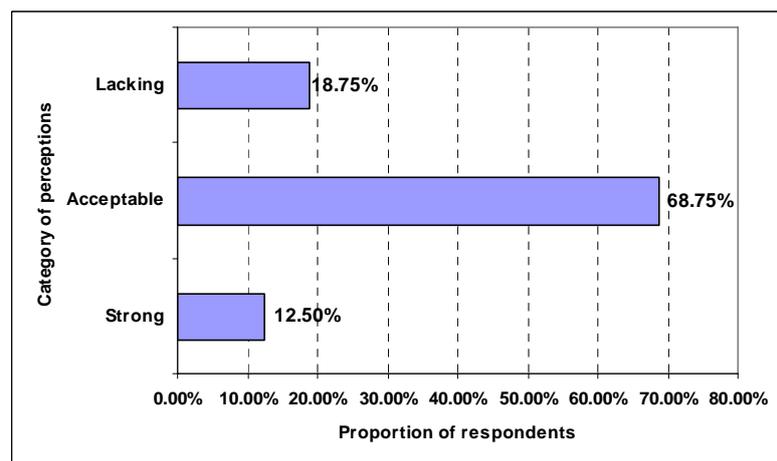


Figure 4: Perceptions on odour; Source: Field Survey

7. COMMISSIONING

In order to assess their functionality HVAC systems were qualified as successful in cases where full documentation details were available.

The documentation assessed specifically included maintenance and repair logs, as built drawings and maintenance manuals. The survey revealed that apart from availability of maintenance and repair logs in 37.5 % of the facilities visited other documents (that is as built drawings and

maintenance manuals) were lacking in all buildings. This is illustrated in Figure 5 below.

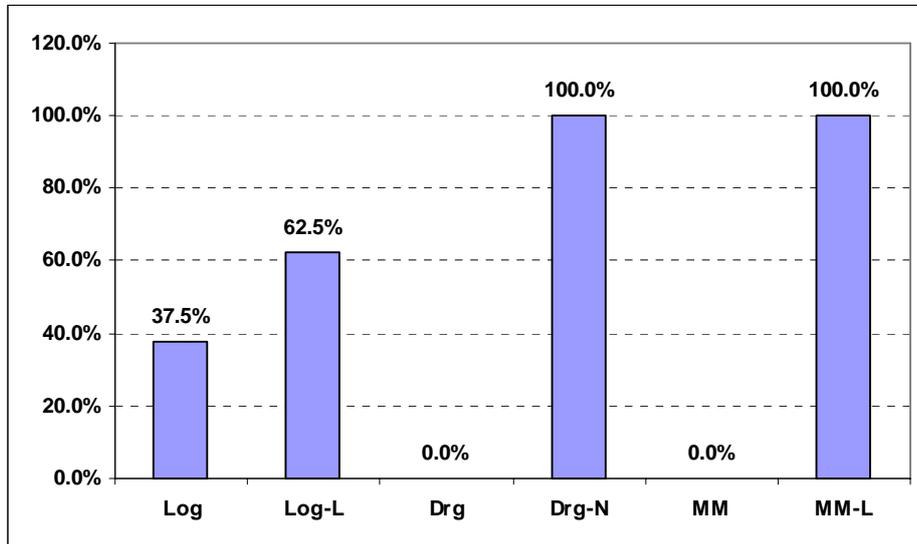


Figure 5: Indicators of equipment commissioning on percentage basis;Source, Field Survey
Key to Figure 5

Item key	Description
Log	Maintenance/Repair log details available
Log-L	Maintenance/Repair log details lacking
Drg	As built drawing available
Drg-N	As built drawing available not available
MM	Maintenance manual available
MM-L	Maintenance manual not available

Source: Author’s construction

Figure 5 reveal that the procurement of commissioning services for HVAC systems was a failure in these facilities. As a result there re-would be the only

professional recourse if professional advice is to be followed (Poulos, 2008); this implies additional expenditure.

8. CONCLUSIONS AND RECOMMENDATIONS

This study has illustrated that there are doubts in the performance of HVAC systems with regards to functionality and their energy efficiency.

Functionality failure is specifically underlined by poor perceptions on thermal comfort levels, lack of planned maintenance services and lack of energy monitoring and measurement in HVAC systems. As a result the Sick Building Syndrome could be likely to develop in these buildings as further rote sets in. The dangers of these can only be offset by proper installation, planned maintenance and re-commissioning as earlier on explained by Tsang (1998), Van Gorp (2004) and CIBSE (2004).

The failure of HVAC systems could be related to the existing policy of preferential procurement that is widely used for low value jobs. This policy is enshrined in the Preferential Procurement Policy Framework Act (Republic of South Africa, 2000a) and the Broad Based Black Economic Empowerment Act (Republic of South Africa, 2004b). These acts in addition to the government policy of expanded public works programme have ensured that the SMMEs are awarded projects at low levels. This may at times be at the expense of expertise as performance based contracting is not fully emphasised. The categories of these jobs in the construction industry are largely inclusive of procurement for the maintenance, installation and commissioning in HVAC systems in buildings especially in buildings whose equipment have been rendered obsolete over time or where the idea of HVAC systems came as an afterthought.

It is recommended that for specialised works like installation, maintenance and commissioning of HVAC systems competency be used as the only yardstick for award of tender. In cases where it is desired to implement procurement laws to full extent (that is Preferential Procurement Policy Framework Act, Republic of South Africa, 2000a; Broad Based Black Economic Empowerment Act, Republic of South Africa, 2004b; Public Finance Management Act, Republic of South Africa, 1999; and Municipal Management Act, Republic of South Africa, 2000b) care should be taken to ensure that the emerging contractors are adequately trained as part of the project. This would ensure that the contractors are empowered with the skills while realising functional efficiency at the same time.

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Energy Efficiency Policies and Programs in the Industrial Sector in South Africa

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Purpose of this paper

This paper outlines possible policy instruments in promoting sustainable use of energy in the industrial sector.

Approach

Meta-analysis approach is taken. Selected reports and research findings on Energy Efficiency issues in the Industrial Sector of India, China and South Africa are presented in an integrated manner. This is done in order to ensure an integrated approach to policy formulation for energy efficiency in the Industrial Sector.

Findings

Though the South Africa's energy sector is heavily reliant on coal as the primary energy source it faces similar challenges to countries like China and India. It is as a result highly prudent that South Africa borrows a leaf from these countries as it adopts policies in mitigating energy challenges.

Value of the paper

This paper demonstrates policies which if adopted may contribute significantly to the overall reduction of energy demand in South Africa and eventually free up financial resources to other sectors of the economy.

Key words

Industrial Sector, Energy Efficiency, Energy poverty, Policies & Programmes, South Africa.

1. INTRODUCTION

The beginning of the 21st century heralds great challenges in energy development for South Africa. The twin issues of energy poverty and green house gas emissions dominate the horizon as the country with this new beginning.

The issues concerning energy poverty is best captured by the spirit of the energy efficiency strategy which notes that electricity demand reduction is made difficult by the perceived low price of power, lack of knowledge and understanding on the concepts, institutional barriers and resistance to change and lack of overall investors' confidence due to lengthy payback period (DME, 2005a). The South African Energy Efficiency Strategy focuses on an overall electricity demand reduction of 12% by the year 2015 as a means of alleviating energy poverty (DME, 2005a). The promise of increased access to electricity via demand reduction greatly makes a convincing argument for energy efficiency studies.

With regards to green house gas emissions, South Africa's energy sector is reputed for its high carbon dioxide intensity as evident in report on global warming outlined in the 2007/2008 (UNDP, 2007). UNDP (2007) observed that by international standards South Africa's economy is extremely high energy intensive in terms of energy consumption in relation to its Gross National Product. UNDP (2007) further noted that despite its relatively low GDP (52nd in the world) and low human development index (121st in the world) South Africa has a considerably high green house gas emissions (37th in overall carbon dioxide gas emissions according to the 1999 data supplied by the department of tourism and environment). This is mainly due to the fact that Coal remains the dominant total energy supply source at 70% of the country's primary energy followed by electricity and natural gas at 28% and 2% respectively; in addition coal fuels 93% of electricity production (DME, 2005a). Available data indicate that the South Africa's energy sector remains the highest contributor to carbon dioxide gas emissions to the atmosphere at approximately 70% (UNDP, 2007). It is therefore implies that any demand reduction as a result of energy efficiency would greatly contribute to a reduction in green house gas emissions especially Carbon Dioxide.

The paper examines the impacts and possible effects the various energy programs and policies can have in promoting sustainable development particularly in the industrial sector, but also that for industrial processes, energy costs are relatively a large fraction of production costs (Fawkes, 2005). The industrial sector is said to consume not only a lot more energy than other sectors. It is due to this that energy efficiency be a daily language complemented by and best practices in this sector. South Africa is indeed faced with challenges in its energy development route to creating a sustainable development to benefit all South Africans and the

environment. These challenges do not only need to be attended to urgently, but require robust and concrete programs and policies that are implementable in today's situation and can take South Africa to the future they yearn for in terms of energy efficiency.

2. ENERGY SUPPLY IN SOUTH AFRICA

South Africa is a country endowed with abundant energy resources, in the form of coal. Coal has inevitably emerged as the major source of primary energy to meet the demands of industry and the country as a whole. The country is fortunate in South Africa to be in a position to utilise such a broad spectrum of energy carriers. Various economic sectors that contribute to the gross domestic product (GDP) of the country are practically driven by these energy carriers. Successful tapping of all possible energy carriers in the country is vital for sustainable economic growth and development.

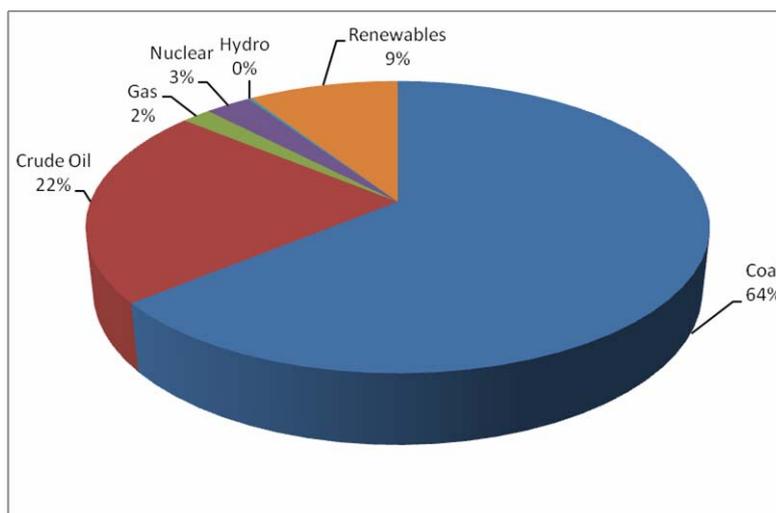


Figure1: 2002 Energy Supply in South Africa (Source: DME,2005b)

The economic development of South Africa has historically been focused upon the extraction and processing of its resources (minerals). This has led to the development of a national economy heavily dependent upon energy as its driving force, and has resulted in the core of the industries being those concerned with energy-intensive activities, such as iron and steel production and other raw materials processing.

South Africa's abundant coal reserves have partially contributed towards an economic environment wherein the unit price of electricity is amongst the cheapest in the world. Although the cost of electricity in South Africa is among the world's lowest, strong economic growth, rapid industrialisation and a mass electrification program led to demand for power outstripping supply in early 2008. It is this power crisis that accelerated recognition of the need to diversify the energy mix, such as nuclear power and natural gas, as well as various form of renewable energy. Figure 1 shows the energy sources in South Africa which portrays heavy reliance on coal. As a result, state energy company Eskom has embarked on a massive programme to upgrade and expand the country's electricity infrastructure, which emphasises the need to diversify the energy mix.

South Africa has a relatively energy-intensive demand sector. Demand for energy was historically dominated by the energy-intensive mining sector. Industrial demand has been the major source of recent increases in energy demand across all energy carriers. Although energy demand has now shifted towards manufacturing and services, the availability of comparatively cheap energy- especially electricity- has led to its inefficient use. However, South Africa's relatively high energy intensity makes the more efficient use of energy particularly important. Figure 2 below shows the consumption of energy in South Africa in the year 2000.

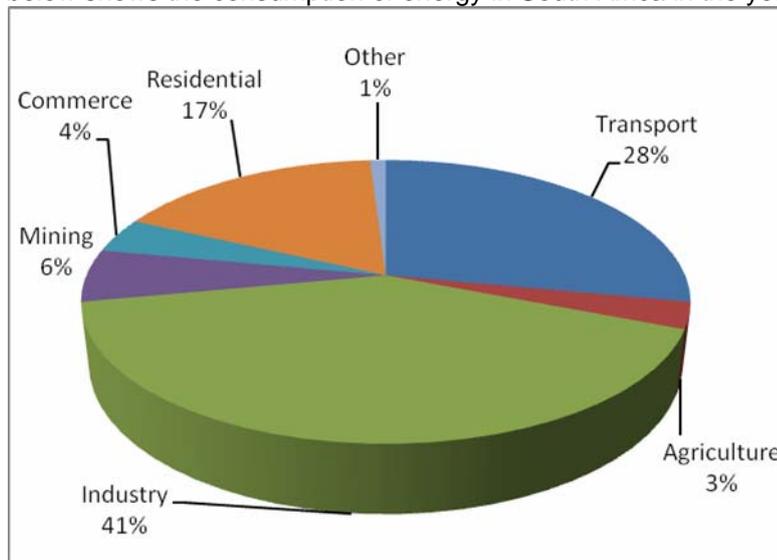


Figure 2: 2000 Final Energy Use by Sector, (Source: DME, 2005a)

3. METHODOLOGY

The meta-analysis approach was preferred out of the need to present integrated policy possibilities towards energy efficiency in the industrial sector. The use of meta-analysis is particularly appropriate where research direction need to be integrated (Bailey, 1994; Egger et al, 1997). The objective of this analysis was to synthesize policy positions presented from past papers and research findings in energy efficiency in the Industrial sector; this would then be formulated to pilot policies for energy efficiency in South Africa's industrial sector. Papers, reports and research findings from China and India were particularly; this was because these countries are net importers of energy and their economies are currently at take off stage, they have all been referred to as emerging economies by popular press (Shalizi, 2007).

The main reports and research findings used in this paper are as presented in Table 1 below.

Table 1: Main Documents forming the backbone of analysis

Ref.	Document Description
1	Shalizi Z.,2007, Energy and Emissions: Local and Global Effects of the Rise of China and India, World Bank Working Paper 4209, April 2007
2	Republic of South Africa, 2009, Electricity Regulation Act, 2006 Notice 139 of 2009, Government Printers, Pretoria.
3	Government of India, 2001, Energy Conservation Act, 2001, September 2001
4	Bennett, K.F. 2001. Energy efficiency in Africa for sustainable development: A South African perspective. UNESCO Workshop on Sustainable Development, Nairobi.
5	Zhiping L. and Sinton J. E. ,1994, Industrial Sector Energy Conservation Programs in the People's Republic of China during the Seventh Five-Year Plan(1986-1990), Available at http://www.osti.gov/energycitations . Accessed on 20 May 2009.
6	Naik A. V., Ghosh S. and Raghuraman V. ,2003, Energy Security Issues-India, Confederation of Indian Industry, Gurgaon. Available at www.acus.org .

Source; Authors' construction

It was hypothesised that South Africa could benefit highly from India and China in the area of energy efficiency in the industrial sector. Thus commonalities of programmes in the three countries (India, China and South Africa) were noted and parallels drawn on applications. It is hoped that the results of the comparison will be a guide on how the South African industries' policies on energy efficiency may be improved. These will form part of the recommendations to the industry.

4. ENERGY EFFICIENCY IN SOUTH AFRICA'S INDUSTRIAL SECTOR

Final energy use or consumption in South Africa by each economic sector is shown in figure 2 above. The data informs us that industry consumed 41% of total energy consumption in 2000. In fact, industry as a whole consumes the largest amount of total electricity generated. This means that electricity is one energy carrier that makes a significant contribution to the economic growth and development. This is made possible by the fact that industry alone accounts for a sizeable proportion of local capital investment. DME(2005b) points that the industrial and mining sectors are the heaviest users of energy, accounting for more than two-thirds of the national electricity usage, with the steel industry being the heaviest energy user.

It is stated in the White Paper on the Energy Policy of the Republic of South Africa (DME,1998) that there is yet insufficient accurate information on energy demand for policy planning and implementation purposes. Regarding policy formulation, the White Paper summarises that the general approach to policy formulation is to recognise problems; to identify causes and solutions; to analyse their implications and make choices; and to implement, monitor and evaluate the effects of policy. The White Paper goes further to state that policy must facilitate optimal energy consumption and production to meet social needs.

In South Africa, previous policy neglected the demand sector. However Reis et al (1985) points that many governments including industrialized and developing countries have adopted policy measures to foster industrial energy conservation. These government interventions have created a favourable climate for improved industrial energy efficiency in many countries. Various strategies and measures have been utilized by governments which are consistent with their own social and economic policies. In this regard, however, it is recognized that many developing countries need to strengthen their methodologies for developing and implementing energy/ industry policies.

The developing countries are now going through a period of adjustment and decision-making regarding their industrial energy futures. Many

countries are already engaged in energy planning, aimed at optimizing national energy supplies and consumption according to their natural resources, priorities assigned to different consuming sector, financial considerations, and other factors.

Winkler et al (2006), Winkler (2007) and Talukhaba and Aduda (2008) have observed that policies focusing on greater efficiency lead not only to energy savings, but also to cost savings. All policy interventions have upfront costs, but energy efficiency saves money over the life of the intervention. Such savings do not only have an economic benefit, they make a contribution to social development by benefiting poor households.

Bennett (2001) outlines five reasons for resistance to the implementation of energy efficiency opportunities in South Africa as related to *attitude (I know my business best)*, *resistance to change*. (Everything is going along just fine, low cost of *energy* (many users see energy as a minor input cost, relative to raw material and labour, and tend to concentrate on these), *lack of capital and uncertainty regarding the future*.

Having outlined reasons that hamper adoption of adoption of energy efficiency measures it becomes imperative to discuss the particular measures undertaken by South Africa to increase energy efficiency in the Industrial Sector. These measures revolve around demand side management programmes run by Eskom and the regulatory initiatives driven by the Department of Minerals and Energy. These measures are discussed in the following sections.

5. DSM

South Africa's energy efficiency in the industrial sector has largely focused on demand side management (DSM) under the auspices of Eskom. The projects currently focuses on national awareness campaign on energy efficiency, development of national policy and regulation for energy efficiency, ensure collaboration amongst agencies, develop and implement tariffs among end users that encourages energy efficiency and prioritise industrial sectors in accordance with the accelerated and shared growth initiative objectives(Eskom, 2008).

The current DSM programs that directly touch on energy efficiency in the industrial sector are the use load limiting and smart metering devices and the subsidized energy efficient motors program. The Department of Minerals and Energy regulated that it will henceforth be compulsory for end users with monthly consumption above 1000 kWh to have smart metering devices to enjoy time of use tariff by 1 January 2012(Eskom, 2008). Eskom (2008) notes that the Eskom energy efficient motors programme

ensures that purchases of motors from 1.1 kW to 90 kW qualify for subsidies. This will go along way in improving energy efficiency taken that as at now the country has more than 17500 electrical motors installed and their electricity consumption is approximately 60% of the total.

6. REGULATIONS

To ensure improved energy efficiency measures the Department of Minerals and Energy embarked on a series of regulations. These include the impending amendments on electricity regulation act(4/2006-Schedule 2) that stipulates that the regulator shall take into account the energy efficiency measures undertaken by the client while deciding on tariff structure(Republic of South Africa, 2008). Further amendments on the same act entitled 'electricity regulations for compulsory norms and standards for reticulation services' sets out to make it compulsory for end users with with monthly consumption above 1000 kWh to have smart metering devices to enjoy time of use tariff by 1 January 2012(Republic of South Africa, 2009)

7. ENERGY EFFICIENCY IN THE INDUSTRIAL SECTOR IN INDIA

Naik et al (2003) reports that 52% of India's primary energy production is accounted for by oil and coal, it is further noted that 62% of electricity in the country was generated using coal. Additionally it is reported that 70% of coal produced in India is consumed locally for electricity generation. This emphasises the high carbon dioxide intensity nature in the energy sector in India and further underscores the need for clean development mechanism as outlined by the Kyoto Protocol. It is forecasted that the year 2020 will see India's energy consumption doubled, this implies great difficulties taken that the country is currently a net importer of energy (Naik et al, 2003). It naturally follows that Industrial Energy Efficiency in India is greatly motivated by the twin needs for enhanced energy security and control on Green House Gas (GHG) emissions; indeed Shalizi (2007:37) emphatically asserts that India closely follows China in GHG emission levels among developing countries.

Naik et al (2003) report that India's industrial energy efficiency is greatly affected by the use of obsolete equipments in manufacturing, high cost of capital required for improvement of energy efficiency and uncertainty on the long term growth of the industrial sector.

Key energy efficiency measures are pegged to the 'energy conservation act' which was enacted in 2001; this act empowers the 'bureau of energy efficiency' to enforce energy conservation and efficiency through measures

like statutory annual energy audits, promotion of sound financing plans for projects, advocacy and marketing of energy efficiency and design of energy efficiency curriculum for educational facilities (Naik et al, 2003; Government of India, 2001).

8. ENERGY EFFICIENCY IN THE INDUSTRIAL SECTOR IN CHINA

Shalizi (2007) points out that the rapid transformation of China from an agricultural economy to a manufacturing one has created an energy glut (China's consumes 12% of world's energy and is the second highest) which is even complicated by the fact that Coal contributes 67% of her primary energy. China's power industry is also highly carbon intensive and the country is expected to overtake US in GHG emission levels in the next two decades (Shalizi, 2007). Just like India, energy efficiency in China is motivated largely by the twin factors of the need for supply to keep up with the pace of economic development and also the need to curb GHG emissions.

Price et al (2001) points that Chinese industrial sector energy-efficiency policy has gone through a number of distinct phases commencing with an initial period of energy supply growth in the 1950s, 1960s, and 1970s that was followed by implementation of energy efficiency programs in the 1980s which were dismantled in the 1990s as the country moved towards a market-deregulation and liberal economy. Later in an effort to once again strengthen energy efficiency, the Chinese government passed the Energy Conservation Law in 1997 which provides a broad guidance for the establishment of energy efficiency policies. Article 20 of this act objectively states that substantial improvement in industrial energy efficiency in the key energy-consuming industrial facilities in China (Price et al, 2001). Indeed, China has perhaps the most successful and institutionalised energy conservation measures (Zhiping and Sinton, 1994).

Zhiping and Sinton (1994) go on to specifically single out the following as some of the key obstacles to energy efficiency in the industrial sector in China: firstly, inadequate financial investment noting that China's investment in energy conservation is only 1.3% of the total investments in the country. Secondly regulation in view of the fact that restriction on energy intensive equipments is weak and the enforcement of the available regulations is poor due to the fact that this is at the prerogative of the local authorities who are ill informed and inadequately equipped for the function. Lastly lack of adequate manpower which leads to failure to meet energy management requirements.

9. CONCLUSION

From the foregoing it is inherently clear that the main driving force in pursuance of greater energy efficiency in India, China and South Africa is the need to reduce green house gas emissions and even more strategically, the need for additional energy resources as countries continue to develop (Naik et al, 2003; United Nations Development Programme, 2007; Shalizi, 2007). The over-reliance on coal by the three countries discussed makes their energy sector to be highly carbon intensive. With the tightening of international accords all the countries need to place more emphasis on energy efficiency to exploit full saving potentials. The need for energy efficiency is even more highly emphasised in the Industrial sectors of China, India and South Africa because of their high pace of growth.

In pursuance energy efficiency in the Industrial Sector the key methods coming out openly are tightening of regulatory framework and inter-agency cooperation/collaboration. With regards to regulations China and India seem much ahead having instituted the measures much earlier. The key regulatory legislation in China was mooted earlier in the 1980s but got ground in 1997 with the passing of the Energy Conservation Law (Price et al, 2001); this arguably has made China to have the most highly institutionalised energy conservation system (Shalizi, 2007). In India the 'energy conservation act' of 2001 remains the pillar for regulating energy efficiency. South Africa is still grappling with amendments to the electricity regulation act, 2006 to make it more responsive to the need for energy efficiency.

Inter-agency cooperation/collaboration in promotion of energy efficiency in the Industrial sector is best espoused by the DSM program run under the auspices of Eskom in South Africa. This is through the 12 points agenda which principally names collaboration with Department of Minerals and Energy, National Electricity Regulatory Services Authority (NERSA) as amongst the key initiatives to be promoted. This is particularly important taken that countries like India and China face a huge problem in lack of coordinated approach between agencies in charge of regulation enforcement (Naik et al, 2003 and Shalizi, 2007). Additionally DSM program as implemented by Eskom is effectively encouraging compliance via motivation and enforcement. Motivation is seen clearly in the 'Eskom energy efficient motor program' and the 'smart metering project' which rewards implementation of preferred initiatives via subsidies and friendly tariff structures (Eskom, 2008)

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Barriers to Training for Employees at SMEs in the Construction Sector

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ABSTRACT

Purpose:

The aim of this paper is to present discussions and elaborations on some of the key skills development barriers for small and medium-sized enterprises (SMEs) in the construction sector.

Design/methodology/approach:

The research methodology employed in this project involved conducting a series of semi-structured interviews with Directors and/or Senior Managers of 89 SMEs, with an emphasis being on their utilisation of design for general construction including building design and manufacturing of construction products.

Findings:

The investigation concludes that there are a number of barriers that may hinder the efforts of many training initiatives offered by organisations and government departments to help SMEs to gain a competitive advantage. The research revealed that there are many barriers to training. These include awareness, finance, geographical location and provision of training and other skills development opportunities.

Originality/value:

This investigation identifies some of key barriers to learning and training that have perpetuated skill gaps and skill shortages in SMEs in the construction sector. This may help academicians and professionals in their attempts to bridge these gaps and shortages.

Keywords: Training, Barriers, SMEs, Construction

1. INTRODUCTION

The construction industry forms about 18.2% of the total firms in the UK and contributes around 8% of gross domestic product (GDP) (Anumba et al., 2005). The industry is dominated by SMEs which make up over 99 per cent of organisations (Hari et al, 2005). It is made up of different professionals and skilled and unskilled tradesmen who provide their services based on their knowledge. Investment in these human resources through training especially those job-related training is increasingly becoming vital to the continuation of their services. All organizations therefore, regardless of their size, activity, or ownership invest in development of their staff. Training can be on how to use a new software package, machine, fill in a form, or carry out specific work. Most organizations formalize this process by drawing up a plan and allocation of budget and resources for training to ensure the best possible return of such investment.

The research described in this paper reports the main findings of a study which set out to identify the barriers to learning and training that have perpetuated skill gaps and skill shortages in the SMEs in the construction sector. This research project is part-funded by European Social Fund (ESF). The study examines how training is planned, monitored, assessed and conducted. The paper focuses on the general aspects of skills and knowledge management. The study is based on a survey conducted in the North of England. The results from the study identify and provide lessons and opinions that can help SMEs and training providers on the key issues that may be taken in consideration when planning and organizing training for employees of SMEs in construction.

The paper starts by a thorough discussion of previous research work related to this study. The research methodology adopted in conducting this research is also presented. This is followed by a description of the key finding of the survey. A discussion of these finding is presented as well. The paper concludes that there are a number of barriers that should be taken in consideration when planning training for SMEs and these barriers may have an effect on the skill of the SMEs in the construction sector and consequently on their competitiveness

2. PREVIOUS WORKS

Training and development in the construction industry have not been given much attention by researchers in the built environment. There is a growing body of evidence on SMEs and skills issues at a national level, much of which is quantitative and gathered from national skills surveys such as the 'Employer Skills Survey 2001'. The information from this paper provides recommendations on ways of tackling skill and training issues facing construction SMEs in North of England.

Miros & Dale (1996) discussed total quality management training needs of small companies. The study examined training needs for 15

small companies. Gann & Senker (1998) attempted to provide a framework for analyzing skills needs for the UK construction industry. The study investigated different training courses provided for developing the skills of the workforce. It concluded that the skill structure is not sufficiently adaptable to support innovation needed to maintain long term performance improvements and a generic training programme is needed to reduce Bureaucracy. The study recommended that construction firms should take the responsibility for training to secure the long-term benefits from employing a skilled workforce. Selecting suitable time for training is important.

New business processes, different forms of organizing production and technical innovations have led to changes in training needs (Gann & Senker, 1998). Knowledge is increasingly regarded by many SMEs as a competitive advantage. Few SMEs engaged in any form of training to achieve this. Training Needs Analysis (TNA) is an essential first step in management development if an organisation wishes to achieve the greatest improvement in performance and best value from its investment in training and development. Companies of the construction sector need to recognize their training needs clearly in the context of their market and technology. (Agapiou 1997). A comprehensive training needs analysis is the basis for designing a cost effective management or talent development programme. The Training cost can be a deterrent to train especially for small companies (Agapiou, 1997). For the construction industry to improve its performance, high quality skills and development of effective human resources strategies by firms are required. Most SMEs do not only have the ability to train their employees for several reasons which will be discussed in more detail later in this paper but they also seek help and that help must be suitable for their conditions and situation. Staff development and training have been given little attention by SMEs in the construction sector despite this sector being considered as the largest one.

3. METHODOLOGY

The sensitivity of the subject made it difficult to find people who can participate in this project. The required information is very sensitive and the time of people working in SMEs is valuable in terms of cost as it is difficult for a small company to assign one of its employees to participate in such a project.

Investigating industry perceptions on skills issues is difficult as it depends upon the market sector in which a company operates and business development strategy (Dainty et al 2005). Consequently, a diverse set of qualitative data were combined in order to create a cross-section of opinion on the important issues in need of redress and the practical ways in which construction firms could begin to address them. This involved a total of 89 construction SMEs in order to debate the key barriers facing their business. The research methodology employed in this research project involved conducting a series of semi-structured interviews

with directors or senior managers of a sample of the SMEs based in the North East and North West of England. These SMEs all work in the construction sector including design and construction product manufacturing.

The sample SMEs were classified as follow, according to the main activity identified by the interviewees:

- Architectural Design
- House Building
- Structural Design
- Civil Engineering
- Construction Product Manufacturing
- Other related sectors

To achieve the objectives of this study the following topics were discussed with the interviewees:

- Policies in place;
- The skills shortages;
- Training plan;
- Training budget; and
- Training and learning assessment methods.

The nature of data collected was mostly qualitative and therefore the analysis was largely a narrative evaluation. Interviewees were asked if and how certain functions were performed and an analysis of responses enabled building up a picture of formal and informal processes in place within the sample SMEs.

3.1 Training as a Request

It is widely considered that training is an important element of individual employees and organizational success. As Jobs become more technical and organization specific, there are fewer candidates whose qualifications and skills meet such requirements. New jobs, equipment, systems, material and building methods are from time to time created and introduced to existing jobs. On the other hand, many jobs are vanishing and the people carrying these vanishing jobs do not have the required skills for the new created positions that now become available. All these mentioned conditions require the type of expertise training can provide, so training is needed to supply the types of employees required.

Effective training is not limited to any industry or to the size of an organization. It may be appear to be a noticeable need for large organizations concerned with the latest technology, but can also be a requirement for smaller, more traditional organizations. In a large organization, with 250 employees for example, a single untrained employee has little impact, he/she is only 0.4% of the total workforce, whereas a single untrained employee in a small organization, with 5

employees for example, a single untrained employee, he/she is 20% of the total workforce. It is obvious the one untrained employee in a small organization has more impact than an untrained employee in a large organization. This reflects the need and importance of training for employees in small and medium enterprises (SMEs). For SMEs to survive in this highly competitive world, a training strategy should be developed and adopted. Training is no longer a prestigious practice. Many organizations adopt training needs assessment methods to identify training needs, ensure success of training and high return of investments in staff development.

3.2 The SMEs' Role in skills development and Employment

Small and Medium Enterprises are regarded as a major source of the economy, employment generation and innovation. There are more than 4.3 million SMEs employing 12.9 million people. In the year 2005, there were 923,770 SMEs in the construction sector employing two million people. The construction SMEs have been criticized with regard to its the up take of new technologies. Technologies and processes and issues related to organizational management (Stewart et al 2003).

4. FINDINGS

Data were collected about the age of the organization, number of staff, and sector of operation. The sample SMEs were classified as in Table 4.1, according to the main focus of operating sector identified by the interviewees.

Table 4.1: SMEs area of operation within the construction sector

Sector	Percent
Architectural Design	50.5
Structural Design	8
Civil Engineering	4.5
Construction Product Manufacturing	17
Other	20

4.1 Sample Profile

Data were collected about the age of the organization and staff numbers to enable compilation of a company profile of the sample SMEs. Table 4.2 indicates that the majority of the interviewed SMEs have been less than 10 years in business. Table 4.3 shows the number of employees within

Table 4.2 : Age of SMEs

Age (years)	No of SMEs
1-10	40
11-20	18
21-30	11
31-40	6
41-50	4
51- over	9

sample SMEs, and therefore the size classification of each company. Forty-nine of the SMEs which participated in this research project were micro-enterprises with less than 10 employees, 25 SMEs were small sized (11-49 employees) and the remaining companies were medium sized (50-250 employees).

Table 4.3: Number of Employees

No of Employees	No of SMEs
1-10	52
11-49	25
50-249	12

4.2 Training and Development

Learning is an ongoing process. For training and development to be conducted properly, a plan should be drawn up for this purpose. The purpose of a Training Plan is to identify the work to be carried out to achieve agreed objectives. The plan is a general guide - the real treasure found from implementing a training plan is the knowledge an employee achieves. Fifty-one percent of the SMEs participated in this study have a training plan and 40% of the SMEs have a training plan and Training and Development Policy (see Table 4.4).

Table 4.4: Training Policy and Training Plan

		SME have a training plan	
		Yes	No
SMEs have Training and Development Policy	Yes	40%	29%
	No	0	2%

Inductions should be carried out at the start of new employment as they are very useful for the employees and the employers. Most SMEs have generally one new starter joining at any one time, therefore, induction processes should be designed to suit the individual's requirements. These processes usually include the new starters' job role within the enterprise, level of seniority, prior experience, and technical and industry knowledge.

Seventy-two percent of the interviewed SMEs carry out inductions at the start of new staff employment.

The greatest challenge facing the construction industry today is the shortage of skilled labour. One of the causes of this shortage is the introduction of new technologies that require new skills (Mackenzie et al, 2000). Crafts skills shortage has been investigated in other studies (e.g. Mackenzie et al, 2000; Ruiz 2004). These studies did not investigate skills shortages other than crafts skills such as design, CAD and management skills. Ninety percent of the surveyed SMEs have identified skill shortage in their workforce. These skill shortages are in 2D and 3D CAD, IT, skilled tradesman, general architectural and structural design skills, collaboration, information management, electrical engineering, senior management skills, drafting skills and project management. These skill shortages within the SMEs have not been paid attention to in most studies investigating skill shortages. Most of surveyed SMEs do not have any plans to overcome these shortages.

5. DISCUSSION

In order to achieve the largest impact from training, an organisation regardless of the size must set up an effective training strategy which should be linked to the organisation's objectives. The organization does not only need to adopt different approaches but also needs substantial help and support. These approaches are different from one SME to another depending on many issues and circumstances. Many SMEs tried to improve their staff skills but failed to meet the set targets due to many reasons.

SMEs often do not have adequate resources to fully fund the development of skills of their staff. This is regarded by one of the key barriers to training and development of skills. SMEs usually do not have enough resources for training. These include lack of funding for training fees, paying the employees salary and sometimes for the accommodation of the trainees or the training provider in case in house-training.

Inconvenient time has been identified as a key barrier for many SMEs in the construction sector. The size of an enterprise may affects taking training by its employees. A SME with 10 employees, for example, sends one of them for training, it means that 20% of its workforce will be away. It will be difficult for the other employees to do the job. This may also cause that the whole work in hand be disrupted with loss in money and time to the SME.

One of the interviewees commented that when developing a training plan within the company, its size should be taken into consideration, i.e. the small size of the company can prevent it from sending people away on training courses. The work may stop and it is difficult to find time for training during the working hours. He suggested training should be online so that trainees could undertake training at their own convenience.

The other barrier for SMEs to training and development is the location of the venue. SMEs in villages and small towns face difficulties in going to training centres and providers. Most training centres and providers are located in cities and big towns. The other impact of the location of training venue is that if an employee has been recruited and sent for training to one of the training centres in a city he/she may find a job there and move there as these new employees are young and prefer living in cities over living in a small town or village after they have gained some experience and training which enable them to compete in the employment market. This may prevent many SMEs from recruiting young employees and send them for training. Smaller SMEs have difficulty in providing formal training to their staff or release their staff to undertake training to gain new skills. This may make these SMEs less capable of taking new contracts and consequently grow and compete with other SMEs.

6. CONCLUSION

Advances in technology, introduction of many new building materials and methods of construction require employees of construction firms to undertake training. The survey revealed that SMEs in construction are facing difficulties in the development of their employees' skills. These included a lack of resources, lack of knowledge of training provision, financial difficulties, the size of the SME, lack of enthusiasm for growth, or the pressure of work made it difficult. There are also a number of barriers that may hinder the efforts of many training initiatives offered by organisations and government departments to help SMEs to gain a competitive. These include awareness, geographical location and provision of training and other skills development opportunities.

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Entry and Career Barriers applied to the South African Construction Sector: A Study of the Perceptions held by Female Built Environment Management Students

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ABSTRACT AND KEYWORDS

Purpose of this paper

The research study reported in this paper sought to determine the level of awareness of employment barriers, specifically marketing and industry culture and environmental barriers, among female professional built environment management students at the University of Cape Town, as well as the perceived impact of these barriers on their entry into and sustained employment in the construction industry.

Design/methodology/approach

The research methodology can be classed as positivist, and allows for a view from different standpoints by incorporating both qualitative and quantitative methodologies to reduce or eliminate the disadvantages of each individual methodologies.

Findings

Overall, the female professional built environment management students, who represent a next generation of entrants into the construction industry, indicated a strong motivation to effect change from within.

Research limitations/implications

However, previous research has shown that even the most motivated entrants are often emotionally worn down by the male dominated industry culture and environment. The impact of the lack of flexible work practices that allow women to balance work and life (family) commitments, as well as provide job satisfaction with regular promotions and equal remuneration jeopardise the positive findings of this research..

Practical implications (if applicable)

Researchers argue that it makes good business sense to remove discriminatory employment practices and provide equal opportunities – not only does it improve competitiveness, but also unleashes quantifiable and qualitative benefits on the construction industry.

Keywords: professional women in construction, work-life conflict, remuneration discrimination, promotion prospects.

1.1 INTRODUCTION

As the most male dominated industry (Fielden *et al.*, 2000), construction is under great pressure to remove barriers to the entry and retention of women (Menches & Abraham, 2007) in order to both stave off the current skills crisis (*ibid*) and satisfy clients who are demanding different skills and traits (Gurjao, 2006).

The challenge is not with women employed in secretarial or administrative roles, but with the under-representation of women in professional and managerial occupations in the construction industry when compared to other sectors that require high-level professional qualifications, such as law, accountancy and medicine, and which have managed to exhibit near equal numbers of men and women (Gurjao, 2006).

The lack of women in the built environment management professions such as Construction Management, Project Management and Quantity Surveying has resulted in negative consequences for the construction industry in terms of efficiency and effectiveness (Fielden *et al.*, 2000) as well as broader socio-economic concerns (Fielden *et al.*, 2001). This is particularly pertinent for South Africa where the issue of 'transformation' dispensation reflects with broader socio-economic concerns over opening the construction industry up to previously disadvantaged groups including women.

The complex, inter-related factors that inhibit women from considering careers in construction and of entering and sustaining employment, operate as either entry barriers or career barriers, depending on when the barriers come into force during the life stage of women (Fielden *et al.*, 2000). Along with legislative assistance, the development of a critical mass of women entering and staying employed in the construction industry is vital to overcome the four main categories of barriers, namely; marketing, socio-cultural issues, education and industry culture and environment (Dainty *et al.* 2004).

This paper presents research on female cognate students enrolled at the University of Cape Town, who represent the next generation of

female entrants into management occupations in the construction industry. The research investigated the level of awareness of marketing, of industry culture and environmental barriers faced by students, as well as the perceived impact of these barriers on the students' entry into and sustained employment by the South African construction sector.

The rationale for the research is that the transformation of employment and the implementation of employment equity policy in the South African construction industry can only be achieved through the (increased) awareness of the perceptions held by these students of the challenges and attitudinal entry and career barriers have on the career plans of potential entrants and future employees.

1.2 BARRIERS TO EMPLOYMENT

Employment barriers are factors that prohibit women from either considering career opportunities in the construction industry, entering or re-entering employment in the construction industry and/or successfully sustaining their employment in the construction industry (Le Jeune, 2008).

It is not unique for women to experience barriers as their careers develop, but these experiences are likely to be in sharper relief for women in non-traditional occupations such as the construction industry (Bennett *et al.*, 1999). Women take enormous personal and economic risks by choosing non-traditional vocations (Gale, 1994) and are consequently vulnerable to disadvantage and discrimination (Dainty *et al.*, 2004). These barriers exist regardless of national characteristics of labour markets or the broader societal contexts of different countries (Dainty & Lingard, 2006)

Fielden *et al.* (2000) divides the barriers experienced by women in construction into two broad categories; *entry barriers* and *career barriers*. *Entry barriers* restrict the number of women entering the built environment management professions and project back to 'kindergarten' socialization, school education and continue throughout professional training up until and including recruitment, whereas *career barriers* enforce the 'glass ceiling' or 'glass wall' effect where prejudices within the work place give rise to work practices that discriminate against women (Dainty *et al.*, 2004:80).

Although more women are obtaining construction related degrees, the construction industry remains male-dominated (Powell *et al.*, 2005). Students' awareness of the roles women play in the construction industry comes from lecturers, work placements, family members, etc. (Bennett *et al.*, 1999). Researchers refer to the socialisation of women into the male orientated work practices (Bennett *et al.*, 1999) through the active or passive promotion of the "masculine conflictual construction culture" of further and higher education departments, which have "strong vocational orientation to the construction industry" (Gale, 1994:9).

That women may know what lies in store for them may explain the number of women who opt out of a career in the construction industry

(Gurjao, 2006). Where women are lead to believe that their femininity will allow them entry into the industry and guarantee swift promotion, reality frequently leads to their swift exit from the industry (Dainty *et al.*, 2004).

Table 1 Summary of barriers affecting women in construction (Le Jeune, 2008)

Classification and Listing of Barriers	Characteristic	Affect	Cure	Main Authors	
Marketing	The Poor Industry Image	<i>Macho, low tech</i>	<i>Not attractive career option</i>	<i>Improved, updated, "realistic" imagery</i>	Greed, 1991; Gale, 1994; Bennett <i>et al.</i> , 1999; Haupt, 2001; Fielden <i>et al.</i> , 2000, 2001; Dainty <i>et al.</i> , 2004; CIDB, 2004; Gurjao, 2006; Campbell, 2006; Dainty & Lingard, 2006; Menches & Abraham, 2007; Verwey, 2008
	Lack of Knowledge of Career Opportunities	<i>"Bricklaying"?</i>	<i>Not chosen as career option</i>	<i>Engage in partnered modern awareness campaign</i>	
	Lack of Female Role Models	<i>No networks</i>	<i>Fragmentation and isolation</i>	<i>Promote role models</i>	
Socio-cultural issues	Societal roles and cultural beliefs	<i>Getting better at recognising women's rights</i>	<i>Non traditional careers not promoted among women</i>	<i>Early socialisation</i>	Gale, 1994; Bennett <i>et al.</i> , 1999; Freeman, 2003; Codrington & Grant-Marshall, 2004; Ling & Poh, 2004; Mathur-Helm, 2005; South African Construction Sector BBBEE Charter, 2006; Dainty & Lingard, 2006; English, 2006; Gurjao, 2006
	Personal attributes	<i>Lack of confidence in abilities</i>	<i>Domination by men</i>	<i>Bolstering of self-esteem, confidence boosting education</i>	
	Gender theories	<i>Trying to explain the "inexplicable"</i>	<i>Justifying discrimination</i>	<i>Development of "one fits all" encompassing theory, more research</i>	
	Generational Gaps	<i>Work ethic of generations different</i>	<i>Misunderstanding</i>	<i>Greater understanding of and appreciation for generational characteristics</i>	
	Ethnicity	<i>Problematic</i>	<i>Discrimination</i>	<i>Implement equitable employment policies</i>	
Education	Early socialisation	<i>Entrenchment of gender identity</i>	<i>Limited career options</i>	<i>Engage in partnered, modern awareness campaign</i>	Sommerville <i>et al.</i> , 1992; Gale, 1994; Bennett <i>et al.</i> , 1999; Roger and Duffield, 2000; Fielden <i>et al.</i> , 2000, 2001; Powell <i>et al.</i> , 2004, 2005; Chapfika & Kahuria, 2005; Dainty & Lingard, 2006; Gurjao, 2006, Menches & Abraham, 2007
	Entry qualification	<i>Traditional education qualifications</i>	<i>Girls not encouraged to break mould</i>		
	Gender biased school system	<i>Gender biased career advice</i>	<i>Gender stereo typing</i>		
	Professional education and training courses	<i>Leaky pipe syndrome</i>	<i>More women studying, but not joining industry</i>	<i>Construction educators should lead with transformation</i>	
Industry Culture and Environment	Male Dominated Culture	<i>Work Life Conflict</i>	<i>Women leave the industry</i>	<i>Culture shift</i>	Greed, 1991; Gale, 1994; Bennett <i>et al.</i> , 1999; Fielden <i>et al.</i> , 2000, 2001; Greed, 2001; Dainty <i>et al.</i> , 2004; Lingard & Lin, 2005; O'Neil & Bilimoria, 2005; Dainty & Lingard, 2006; Gurjao, 2006; Menches & Abraham, 2007
	Career recruitment, assessment & advancement discrimination	<i>Women are not being promoted</i>	<i>Women leave the industry</i>	<i>Implementation of employment equity policies promoting fair advancement practices</i>	
	Long, Inflexible Working Hours	<i>Work Life Conflict</i>	<i>Women leave the industry</i>	<i>Implementation of employment equity policies promoting alternative work practices</i>	
	Remuneration Discrimination	<i>Women earn less than men</i>	<i>Women leave the industry</i>	<i>Implementation of employment equity policies promoting equal pay</i>	
	Hostile Work Environment	<i>Work Life Conflict</i>	<i>Women leave the industry</i>	<i>Implementation of employment equity policies promoting</i>	

	Industry Intolerance of Career Breaks	Work Life Conflict	Women leave the industry	alternative work practices	
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Why women are unable to sustain employment after entering the construction industry is not well known. It would seem there is a tremendous shortage of women who have more than 20 years' experience in the construction industry (Ellison, 2003). Not only are there not enough senior female role models, who may be able to influence employment policies as well as mentor younger women "up the corporate ladder", but also, there are simply not enough female "bodies" to affect a ground swell of change to the traditional employment practices of the construction industry (Bennett *et al.*, 1999; Fielden *et al.*, 2000; Dainty *et al.*, 2004).

Table 1 summarises the employment barriers identified in the literature that affect the entry and sustained employment of women in the construction industry. For each barrier the barrier's characteristics, its affect on women, and an overview of initiatives suggested or implemented to neutralise the effect of the barrier are listed. However, only those highlighted in Table 1 were selected for the purpose of data gathering and analysis, the results of which are summarised in Table 3.

1.3 ENTRY AND CAREER BARRIERS: CHOICES OF WOMEN

Dainty & Lingard (2006) state that women face one of three choices: stay and fight (at great personal cost), accept and conform (not "rock the boat") or leave the industry (possibly waste the specialist education investment).

Table 2 summarises the consequences of women making these choices when confronted with employment barriers.

1.3.1 Confronting the barriers

Confronting barriers requires "bottom-up" (or grassroots change agents) and "top-down" change agents are responsible for the changes in the construction industry. Bottom-up change agents are individual women or networks of women and minorities who (at the risk of further retribution and marginalisation) promote change by example, and include businesses offering alternative, flexible and inclusive management structures catering for women. Top-down change agents are defined as "governmental initiatives, regulations, and legislation, and funding bodies that exert influence over the construction industry". (Greed, 2000:194; Menches & Abraham, 2007:706) Other role players are industry boards, professional bodies, trade federations and trade unions (Dainty *et al.*, 2004).

1.3.2 Conforming to the industry

Women adopt coping mechanisms to fit into the male dominated workforce, which do not challenge the existing culture or structure of the construction sector (Powell *et al.*, 2005:41). Powell *et al.* (2005: 35,37) citing the study conducted by Evetts (1998) into the coping techniques employed by women engineers, concluded that the three strategies used depended wholly on the personality and individual characteristics of the women who deployed them.

These coping strategies included “fronting it out” (confrontational approach), “playing the little women” (using non-confrontational feminine tactics such as tears) and “building a reputation and earning respect” (most preferred, but difficult to achieve due to career barriers) (*Ibid*). Consequences that arise from this strategy are the perpetuation of the status quo with no guarantee of equal opportunities, women promoting and maintaining industry attitudes to other women, the acceptance of long hours and the geographically transient nature of industry and the forgoing of vocational success (Le Jeune, 2008)

1.3.1 Leaving the industry

Gurjao's (2006) ‘leaky pipeline’ describes a situation where women leave the industry because they fail to *qualify* or are siphoned off into other industries, are unable to *translate* their qualifications into employment, struggle to *persist* in their chosen construction-related profession in the face of employment inequities and do not achieve career *advancement* or progression as readily as male counterparts. Dainty & Lingard (2006:113) suggest that employers be vigilant for signs of both “emotional exhaustion and cynicism” in their employees as these have been identified as predictors of employees’ intentions to leave the organisation. Causes of emotional exhaustion include lack of organisational diversity manifested in inequitable work practices and the lack of support structures (*Ibid*).

Consequences of this strategy are women establishing their own businesses and poor succession management and vertical development (Le Jeune, 2008)

1.4 WHY BREAK DOWN BARRIERS?

Construction clients are demanding different skills and traits (Gurjao, 2006). Women and minorities enhance the quality of skills in any industry and profession (Dainty *et al.*, 2004). The co-operative and collaborative work style of women, not only often results in “win-win” situations, but can also produce creative solutions to problems, enhance long-term business relationships for construction businesses (Menches & Abraham, 2007) and

improve decision-making (Bennett *et al.*, 1999). The nurturing instinct of women can limit confrontation, and motivate 'can do' approaches to problems. Female strengths such as listening skills, empathy, trust and openness, interpersonal understanding and facilitation can benefit customer relationships and management (Gurjao, 2006).

Fundamental change in the construction industry needs to happen from within and, rather than legislation, a well-developed business case for diversity may be the only persuading factor (Dainty *et al.*, 2004). "Research in USA, UK and Scandinavia show a strong relationship between shareholder returns and the proportion of women in higher executive echelons, suggesting that corporate cultures that foster women's careers can also foster profitability" (Gurjao, 2006:29).

1.5 RESEARCH METHODOLOGY

Research is the "art of the possible" (Buchanan *et al.* 1988:55). For most researchers, "the most conveniently accessible subjects are undergraduate student volunteers" (Rugg & Petre, 2007:80) and unsurprisingly for research carried out in a university context, the fieldwork was conducted as a workshop that brought together forty one of fifty (82%) women registered on the undergraduate Construction Studies BSc programme and the Quantity Surveying and Construction Management BSc Honours programme at the University of Cape Town.

The data collection tool comprised a multi-faceted questionnaire, where the first section one sought qualitative information to support data gathered elsewhere in the questionnaire, section two sought to determine the level of awareness and impact of nine chosen entry and career barriers on career plans and section three sought demographical information. The data was analysed using SPSS and frequency tables, cross tabulations and correlations were generated for descriptive data analysis.

1.6 RESEARCH RESULTS AND ANALYSIS

The typical demographic profile of the respondents was that of a black female in her 3rd year of study, aged between 20-22 years. The respondent group consisted of seven 1st year students (70%), ten 2nd year students (63%) and twenty-four 3rd and 4th year students (100%), where 22% of the respondents were between 17 and 19 years old and the remainder aged 20-29+. The population covered all the main ethnic groups in South Africa and was representative of the student body. For further analysis of the data on an ethnic basis see Le Jeune (2008).

Each respondent was asked to evaluate the marketing barriers and barriers related to the industry culture and environment in terms of the (i) respondents' awareness to employment barriers inherent to the

construction industry; (ii) the perceived impact of entry barriers on the respondents' construction career plans; and (iii) the perceived impact of career barriers on the sustainable employment of respondents in the construction industry.

The ranking of the data is summarised in Table 3 below:

Table 3: Summary of Rankings of Barriers (Le Jeune, 2008)

Classification and Listing of Barriers		Aware- ness Rank	Entry Barrier Rank	Career Barrier Rank
		(i)	(ii)	(iii)
Market ing	Lack of Knowledge of Career Opportunities	2	9	3
	The Poor Industry Image	5	5	7
	Lack of Female Role Models	8	4	2
Industry Culture and Environment	Career recruitment, assessment and advancement discrimination	7	6	9
	Industry Intolerance of Career Breaks	3	8	6
	Male Dominated Culture	4	2	1
	Long, Inflexible Working Hours	6	3	8
	Remuneration Discrimination	9	7	5
	Hostile Work Environment	1	1	4

Key: 1 = Least likely to be considered a barrier and 9 = Most likely to be considered a barrier

The highlighted barriers shown in Table 3, were deemed by the students to reflect (i) the barriers they are least aware of, (ii) those considered to be 'entry barriers' and (iii) those considered to be 'career barriers'.

1.6.1 Awareness of barriers

The data revealed awareness of most of the barriers, with the exception of female role models (rank 8), remuneration discrimination (rank 9) and discriminatory industry recruitment, assessment and advancement practices (rank 7). Reasons for these not being identified may be:

- "Youthful" ignorance and lack of exposure to the relatively few **female role models** in the construction industry, such as Ms Bridgette Gasa, President of the CIOB South Africa and Ms Nyami Mandindi, CEO of Intersite;
- The social "taboo" of discussing remuneration preventing comparative discussions between male and female peers on remuneration whilst undergoing practical training, contributing to ignorance among female students of **remuneration discrimination**;

- Lack of experience of **discriminatory recruitment, assessment and advancement practices** among the youthful respondents (83% under 23), due to their current life status as students. It should be noted that the older cohort (23+) did not share the sense of disbelief that such practices existed with the younger generation, reared to believe in employment equity for all ethnicities and genders (Freeman, 2003, possibly due to their greater experience of industry practices).

1.6.2 Impact of Entry Barriers

The students revealed that the entry barrier most likely to impact on their decision to work in the construction industry was the lack of knowledge of career opportunities (rank 9). This sentiment echoes Gale (1994), where he found that the more knowledge of construction industry professional occupations and career opportunities in construction was disseminated, the more women (and men) were likely to select a career in construction.

1.6.3 Impact of Career Barriers

The students revealed that all of the career barriers evoked a “spirit of challenge and change” in the respondents, and that none would result in the majority of respondents (meekly) accepting the status quo or leaving the industry because of the impact of the barriers on their jobs. As the research focussed on those barriers that had minor representation in the “accept it” or “leave industry” choices, the following barriers were therefore chosen as the career barriers most likely, to impact on students’ decisions to remain employed in the construction industry:

1.6.3.1 Marketing: Poor Industry Image (rank 7)

The negative publicity or lack of marketing the truth about the conflict-riven, male dominated culture is responsible for the poor Industry image. It is the disillusionment with the reality of working in the construction industry that may lead to the early retirement of women from built environment management professions. Menches & Abraham (2007) argue that significant change to the image and the culture of construction is necessary to attract and retain more women in the industry.

1.6.3.2 Industry Culture and Environment: Industry Intolerance of Career Breaks and Long Inflexible Working Hours (rank 6 and 8)

The conflict for women between family commitments and careers is not unique to the construction industry. However, this conflict is possibly exacerbated by the combination of project-driven work practices (“Time is

money, get the job done”) and attitudes typical of the male dominated culture (“women belong at home, in the kitchen”). To improve the varied intake and sustained employment of women in the construction industry, Gale (1994) suggested a reduction in conflict. Dainty & Lingard (2006:117) summarised the problem of attraction and retention of women in the construction industry as due to the lack of “supportive work practices, structures and cultures”.

1.6.3.3 Industry Culture and Environment: Remuneration Discrimination and Discriminatory Industry Recruitment, Assessment and Advancement Practices (rank 9)

The “Boys’ club” mentality pervades work practices and management styles of due to the male dominated industry culture. Women are paid less than their male counterparts because of perceptions of weakness, and inequality in ability. Women are excluded from boys’ networks that perpetuate unorthodox recruitment practices; women are required to prove themselves more than men for promotion and are frequently overlooked for advancement because of the threat of “social” commitments (children!). No self-respecting person would stay employed in a career that permitted such blatantly discriminatory practices – why would women?

1.7 RECOMMENDATIONS

The recommendations below are summarised according to what can be done to increase awareness of barriers, and reduce the impact of entry and career barriers:

1.7.1 Improve awareness of barriers to employment

In order to improve the awareness of barriers where the respondents indicated a lack of awareness, the following are suggestions are made:

- A focussed marketing strategy by all participants in the construction industry to afford more frequent and in-depth publicity of female role models employed in the construction industry including equal representation across generational groups and ethnic classifications;
- The Salary Survey Report published annually by the Association of South African Quantity Surveyors should distinguish between gender; and
- The incorporation of best practice in recruitment, assessment and advancement practises into professional practice curricula, to alert and

educate new entrants to the industry of their “rights”, so that any discriminatory practises can be better identified, dealt with or avoided.

1.7.2 Reduce impact of entry barriers, to improve employment intake

To reduce the impact that the lack of knowledge of career opportunities may have on the intake of women in built environment management professions, it is suggested that career guidance teachers and advisors be provided with accurate and adequate information about the diversity of career opportunities available in the construction industry as well as the nature of these occupations (Gale, 1994).

However, parents, peers and family friends, ought to be informed as well. The successful recruitment of women to built environment management professions depends on a well thought-out, targeted and sustained marketing campaign waged through publicity materials, web sites and job fairs (Dainty *et al.*, 2004).

1.7.3 Reduce impact of career barriers, to improve sustainable employment

To reduce the impact that career barriers may have on the sustained employment of women in built environment management professions, a strategic industry-wide approach should be implement the actions and initiatives recommended by Dainty *et al.* (2004:81) to create a “fair and equitable construction industry workplace environment”.

1.8 CONCLUSIONS

Overall, the students of the University of Cape Town represent the new wave of entrants into the construction industry are motivated to affect change from within. In keeping with the conclusion of Bennett *et al.* (1999), the female professional built environment management students echo the sentiments of professional women in the construction industry, who are “positive and optimistic in terms of their own abilities and career development” (*ibid.*: 290-291) From this it may be concluded that the transformation of the South African construction industry in terms of employment equity, is a work in progress, as without a committed built environment management profession student body willing to brave the challenges and attitudinal entry barriers of the construction industry, their positive attitude towards sustained employment, is potentially meaningless.

In conclusion, it is evident that the impact of entry barriers and career barriers are intertwined, without the sustained employment of

women in the construction industry, the construction industry is less likely to become an attractive employment option that can attract new entrants, yet a ground swell for change will only be sustained if the new entrants “stick around”.

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Improving People-centeredness IN H&S Risk management through ICT

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ABSTRACT

Purpose of this paper

This is a conceptual paper aimed at examining the idea of people-centeredness in occupational health and safety risk management on construction sites. The paper considers potential of current innovations and developments in Information and Communication Technology (ICT) to create the enabling environment for the application of people-centred risk management. This is expected to improve the quality of site experience for construction workers by enhancing risk monitoring and control.

Methodology

The paper draws on previous research, publications on risk management, people-centeredness, respect for people in construction, specially selected electronic and hardcopy publications and innovation reviews on ICT such as simulation / visualization, embedded technology, smart sensor networks, GPS, mobile computing and communication in intelligent environments, as basis for extrapolations that could achieve people-centred risk management in the site production process.

Findings

The paper represents the conceptual stage of the research, which is ongoing. Findings at this stage are propositions as the research is now into further investigations for the purpose of describing and modelling an ICT-based people-centred H&S-RM system. There is need for validation of the results in a test case. Nevertheless, findings are indicative of potential for use of ICT in enhancing H&S risk monitoring and control.

Practical implications

There is the possibility of intelligent systems, which could be used to create quality site experience through an all-involving H&S-RM system. In addition, there is the possibility of using intelligent controls, which reduce the occurrence of risk at the work staging area, from plant, equipment and site accommodation.

Value of paper.

The existence of potential utility in current / latest ICT for enhanced risk management on site which could be used to enable people-centred H&S-RM. This will improve quality of site experience for people in construction.

Keywords: Health and Safety, Risk Management, People-centeredness, ICT, Intelligent environments.

1.1 INTRODUCTION

People on construction sites are the men and women who converge in order to collaborate towards the achievement of set construction project goals. Their welfare as individuals has been the topic of many research publications. Issues discussed under the heading include labour, core human resource management issues, and occupational health and safety (OH&S). Particularly, H&S issues have taken centre stage in the recent past, creating areas of specialisation within construction and related industries. In contemporary construction, numerous countries have developed OH&S codes / regulations / guidelines. These H&S regulations guide individuals and construction firms in their practices in order to avoid risky situations, manage potential risks and minimise incidents, avoid accidents and losses (human and material, monetary and time), on site. While individuals are responsible to themselves and people around them, the construction firm is responsible for creating a safe work environment and procedures.

Application of occupational health and safety codes on any construction site places overall responsibility on the main contractor. This situation exposes the main contractor to risks resulting from his employees, sub-contractors and their staff, the use and operation of plant, equipment and site accommodation. In managing these risks it is common practice today, especially for medium to large scale projects, for the main contractor to hire compliance monitoring officers. The H&S officers will have the task of conducting routine checks on site (Ivensky, 2008).

2.1 RISK MANAGEMENT (RM)

Risk management (RM) generally involves identification of the risk, assessment of the risk for clearer understanding and determination of best management approach, elimination and / or control. Within the process of RM, using the principle of effective performance will aid in producing optimal result. The use of this principle involves evaluation and perfection of a safety programme, streamlining of operations for safety, streamlining business risks, and refining the management / administrative philosophy, including aims and objectives, to suit the safety programme. This risk management approach aims at wholesomeness. Two major stages to

performing RM are; the pre-operational and operational stages. Pre-operational planning attempts to manage risks by pre-empting them before construction and putting control measures in place. This is done at the planning stage to reduce or eliminate negative effects of incidents, accidents and losses during construction. Operational Risk management deals with the factors that affect health and safety during actual construction. These would include safety of work procedures and environment, functionality of physical support structures, costs, scheduling, impact of construction activities on the immediate environment and project organisational structure (Furst, 2006; Furst, 2008; Ehrbar & Kellenberger, 2003).

3.1.1 Practice of H&S Risk Management

Risk management has grown into a sub-sector of its own, catering to all industrial sectors. Many individuals and corporate bodies exist presently, specialising in offering risk management services. As a result, patterns of RM practice have been developed. For the construction site a number of services and programmes are offered by RM companies, mainly to the contractors. The services offered include:

1. Work place hazards identification and risk assessment and writing of method statements;
2. H&S audit of activities, training and provision of H&S compliance managers and advisors on site;
3. H&S certification services and production of H&S policy manual;
4. Prevention of losses due to workers' compensation and Property casualty, claims administration;
5. Regular performance reports borne out of continuous monitoring of the contractor;
6. Advisory services on improvement and compliance with best practice.

An appreciable aspect of H&S risk management is ICT integrated. There are online, web-based services that are provided by RM consultancy firms. In addition, a number of companies offer software packages to companies as part of their consultancy services, and for in-house use (Edwards Risk Management Inc., 2009; Safety Services Direct, undated; Randstad, 2009; Matrix Risk Management limited, undated; 4seerisk, 2009).

2.1.1 Issues in H&S Risk Management

The main contractor generally faces risks of legal action, regulatory citations and negative publicity and loss of competitive edge. These risks emanate from injuries on site, H&S violations on the part of the contractor and sub-contractors. (Ivensky, 2008)

While contractors' risks are ultimately financial, people on site face greater dangers. People on construction sites face the risk of injurious and fatal accidents, varying degrees of incapacitation and loss of livelihood. Though the scope of H&S risk management practice today covers a wide range of issues, there are factors which still hamper effectiveness of RM on site.

Firstly, the construction site will always produce surprises and threats which were not covered in planning previously. Therefore auditing, supervision and compliance to OS&H requirements will not completely ensure safety on site with man or machine. Secondly, it is easier to pre-empt risks during planning than during actual construction. During construction, effectiveness of RM is affected by the limitations of monitoring and control. These limitations are caused by lack of ubiquity in the site management process (SMP), which limits human beings tasked with monitoring and control. After planning, ensuring compliance to H&S guidelines in various aspects of the operations remains an area of need. In addressing this need, the contemporary practise of hiring specialists in H&S to perform RM on site has a cost factor attached to it. In order to take care of the cost factor, need for H&S officers is balanced with the need to keep main contractors liabilities and operational costs at a manageable level. While there seems to be nothing wrong with this approach, it gives RM on site a singular focus; ensuring that no development or occurrence costs the contractor in time and money. Such focus gradually makes the RM essentially contractor-centred. In addition, there are usually issues of responsibility for H&S on site between the prime contractor in any project and the subcontractors. This is usually determined by contract between the two parties, but it could also create problems of authority. It could create grey areas with regards to spheres of responsibility for the different parties concerned, (Forster, 1989; Ivensky, 2008; Ozumba & Shakantu, 2008b, c).

The statement of issues above is not exhaustive but it points to the following possible deductions:

1. There is need for RM and other aspects of OH&S to be re-focused onto people-centeredness.
2. The prime contractor's capacity to perform effective OH&S management on site needs to be increased in order to encourage and enable a more people-oriented practice of H&S - RM.
3. Overhead costs will limit the prime contractor's effort with regards to 2 above.

The deductions above suggest the need for a different mindset towards the administration of the entire scope of H&S services in construction. An increase in people-oriented practice of H&S - RM is required..

Respect for people is a basic ingredient in H&S regulation. H&S / RM codes are generally geared towards people on site generally and not the prime or sub-contractor's protection or self preservation. For example, the Health and Safety Commission (HSC) in UK has outlined its own principles on sensible risk management, which is essentially people-oriented. They

are as follows: Ensuring the protection of workers and the general public, aiming at the reduction of real risks that give benefits to society, encouraging improvement through innovative ideas, making known, and enforcing rights and responsibilities for RM. In addition, compliance codes provide for the contractor to achieve these aims within what is reasonably practicable (HSC, 2008; State Government of Victoria, Australia, Department of Human Services, 2007; Queensland Government, Department of Employment and Industrial Relations, 2009).

The reasoning then seems to be that the contractor is liable in so far as it depends on the contractor, within the contractor's sphere of responsibility, and as long as the contractor can reasonably intervene or arrest the situation. This puts greater burden of responsibility on prime contractors of contemporary construction sites. Covering the sphere of responsibility described above would require an increase in real-time management capacity for the contractor. The increased capacity would enable the contractor address issues in H&S RM raised above. However the practice of H&S – RM for construction presently does not seem to address these issues. Providers of RM services seem to be oriented generally towards the contractor as the client.

Against this background, the paper proposes people-centred approach to H&S – RM that is backed by information and communication technology integration.

3.1 PEOPLE-CENTEREDNESS IN H&S RISK MANAGEMENT (H&S-RM)

The concept of people-centeredness assumes that equal treatment of all human beings in any given project with dignity, enabling / empowering people to do the job right and according to guidelines instead of being dictatorial will bring out the best. The most important component with which to move towards people-centeredness in the construction industry is respect for people in construction, which proceeds from a mindset that respects humanity and aims at giving people quality site experience during the course of a project. An all-inclusive approach to OH&S RM would create the ideal situation on site, and would require the full awareness and participation of the entire site population. It would require the distribution of some portion of the monitoring and control function to both human and technological agents within site. This should be achieved without building in additional tasks in to the job descriptions of people on site. A good approach would be for a system of mutual responsibility for potential risks, which is built in as part of normal responsibility of each site member to the nearest colleague, (Smallwood, 2004; IHADUP, 2007; RICHO, 2008).

Achieving the scenario described above in contemporary construction would require more than manual systems can offer. Construction sites need to be turned into intelligent job sites with full sensing of all objects, both human and material. Speed and seamlessness of information and communication is required for real time risk management to be completely effective. Different levels of information access, retrieval and feedback should be enabled with security to ensure data integrity. Industry

Information and communication technologies are required to aid the efficiency of site information and communication flow. The academia and industry are capable of producing control systems with the aid of modern technology, to deal with the complex and dynamic environment of the construction site. Most importantly advanced technology is accessible to construction industry stakeholders that could be adapted to various uses. Even so, when technology is imposed or simply added through improper implementation, it aggravates current problems (Prichard, 2002; Ozumba & Shakantu, 2008a, b; FIATECH, 2007).

2.1.1 ICT – based approach to a people-centred H&S-RM

ICT is a prime process enhancement agent that has been used in construction with considerable success. Integration of ICT in construction has been going on from the earliest beginnings of the technology. Problems in construction ICT on aspects of the site have been mostly out of inadequate implementation approaches (Cabarello, 2002; Howard, 1998; Ozumba & Shakantu, 2008a, b, c).

Present state of ICT integration may not serve to encourage people-centeredness completely in H&S-RM on site. Most web-based services and offering of software packages still address aspects such as planning, programming, accounting, evaluation, legal matters. While this level of ICT integration is necessary, it does not adequately address the need for real-time H&S -RM on site. ICT integration for RM seems to be influenced by the nature if integration in other areas or RM such as the financial sector. Also the meaning of real-time management in construction is not exactly the same as it is in the banking industry for example. There is need to consider fully, the peculiar nature of the construction site, its activities, population make up and stakeholders. Such an approach will enable technology implementation with measurable usefulness and cost savings.

From the paper's perspective, the success of ICT integration in this context lies with the approach to implementing ICT as a framework. Imposition of ICT products on construction processes and sub-processes would generally result in less impressive results. Factors required for successful implementation of ICT in construction site processes include acceptability, usability and user-friendliness. Adaptation of potential utility in available ICT seems to be the approach that achieves the desired goal in ICT implementation. Discovering potential utility in latest ICT and determining ways of adapting these to H&S – RM need areas would give a more effective solution. The proposed approach involves adaptation of case studies from related sectors.

The Nexsys Real-Time Risk Management system is an example from the mining sector. Nexsys system was developed through the collaboration of by Commonwealth Scientific and Industrial Research Organisation (CSIRO), and Japan Coal Energy Centre (JCOAL). The Nexsys is an ICT based risk management decision support system used by mine operators.

It reports hazards in the mine using real-time monitoring of a wide range of data. Using mobile wireless computing and intelligent sensor networks it is able to provide operators with precise information on the state of every area and aspect of the mine in real – time. (Haustein et al., 2008; Ozumba & Shakantu, 2008,a, b, c).

Adapting the frameworks / designs of such relevant cases, in addition to existing potential utility in latest ICT would enable expediency in this new approach. At this stage of the research, there are indications that potential utility exists in current and latest ICT which can be adapted to existing systems in order to create the enabling environment. Drawing on previous research in areas such as RFID, smart sensor networks, ubiquitous computing, mobile and wireless technology, the paper is able to identify potential utility that can be adapted towards achieving the all-inclusive, all-involving, mutual responsibility, people-centred H&S-RM on site.

5.1 CONCLUSION

As stated earlier this is a conceptual paper. It is part of a wider research agenda focusing on construction ICT. The paper has attempted to introduce the concept of a people-centred H&S – RM system, which sits on an ICT framework. The ICT framework would be achieved by adaptation of potential utility in the form of products, ideas and systems.

The following areas constitute the future steps for the research:

1. Fleshing out of the proper requirements for a people-centred H&S-RM on site.
2. Fleshing out of the proper ICT requirements for a people-centred H&S-RM on site.
3. Technical requirements for an enabling ICT framework that can support such a system following the brief description given in the paper.
4. Possible adaptations of systems developed in other industries.
5. Existing potential utility in latest ICT and possible adaptations to identified need areas.

The next stage of the research involves further review of relevant literature on H&S – RM, and investigations for data that will be used to generate descriptions of adaptation framework for the type of risk management system described in the paper.

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Experiential Learning Programme at Nelson Mandela Metropolitan University (NMMU): Students' Perceptions.

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ABSTRACT

Purpose of this paper

The purpose of this research was to conduct a 'snapshot analysis' of randomly selected student reports and disseminate output during the forthcoming conference on: 'People in Construction' Conference scheduled to be held in Port Elizabeth, South Africa between 12 and 14 July 2009. The aim of the research is to: contribute to the Built Environment Body of knowledge (BEBOK); further understanding of the experiences of the students in industry and identify deficient areas for continuous improvement.

Design/methodology/approach

A record based study was conducted on a randomly selected sample of 30 student reports for the period 2005 to 2007. The study was limited to an approximate sample of 300 National Diploma Students who were registered for the programme during that period. Data abstracted from the selected reports have been analysed to portray the perceptions of the students relative to the experiential training programme for the period under study.

Findings

Findings from the research include: effective acquisition of new knowledge from the mentors and relevance of tasks assigned to civil engineering. The findings clearly indicate the critical role the mentors are playing in the training. Furthermore, tasks assigned are relevant to the civil engineering programme.

Research limitations/implications

This paper represents research based on examination of existing documents. Respondents to the questionnaires had long graduated and therefore it was not possible to triangulate by conducting field interviews. However, the analysis represents an important step towards establishing a continuous process of evaluation of student feedback in the future.

Originality/value of paper.

The findings from the research have not identified any significant deficiencies in the current programme. However, it is important to note areas of concern, especially those areas with low mean scores such as: effectiveness of acquisition of new knowledge from workmates; contribution to organizational performance; personal satisfaction of ELP training; relevance of courses and general rating of the programme. The identified areas need improvements and or further research.

Keywords: Experiential, Learning, Snapshot, Analysis, Perceptions

1.1 INTRODUCTION

The experiential learning programme for the National Diploma in civil engineering serves to provide students with the opportunity of industry exposure in diverse fields such as: administration; drawing; surveying; design; contracts; construction; material testing among others. The programme forms part of the core courses, which students must complete successfully before being awarded a diploma. According to Ross(2009), experiential learning is “any process or engagement that accords a learner an opportunity to learn about a certain phenomena”.

The programme is accredited by the Engineering Council of South Africa (ECSA) and is recognized for professional registration. During the year long training, students are required to maintain a record of experiential learning in an approved logbook and prepare a technical report, which they then submit for evaluation by the department of civil engineering staff. Furthermore students are supposed to fill and return a confidential

questionnaire designed to glean student perceptions of the experiential learning programme.

1.1.1 Engineering Council of South Africa (ECSA) guidelines

The Engineering Council of South Africa provides guidelines for training programmes for candidates wishing to be registered as professionals in the following categories; Professional Engineer; Professional Engineering Technologist; Professional Certified Engineer, and Professional Engineering Technician. Candidates for registration in the listed categories required to complete a monitored mentorship programme within the institutions of higher learning who offer accredited programmes and or in the work place.

1.1.2 Engineers Registration Board of Kenya (ERBK) guidelines

The draft document for the Engineers Bill (2008) provides for the establishment of the Engineers Registration Board of Kenya (ERBK).

According to the draft bill (Engineers Registration Board Act, 2008), there will be three categories of registration: Trainee Engineers; Professional Engineers, and Consulting Engineers. Part of the core functions of the ERBK is to train young engineers.

Furthermore, the ERBK is required to maintain a register of registered persons relative to: date of entry; address; qualifications; category; discipline; nationality and specific discipline in which the person is registered.

1.1.3 Engineer-In-Training Programme in North America

In Canada and the United States of America, the Engineer in Training (EIT) is defined as:

“Someone who has obtained a degree from an accredited institution that qualifies for registration with one of the provincial or territorial engineering professional associations, whereas in the US, an EIT is someone who has qualified for, taken and passed fundamentals of engineering examination (FE exam)”.

1.2 ENTRY INTO EXPERIENTIAL LEARNING PROGRAMME (ELP)

Students are required to register at NMMU for the appropriate module of the experiential training at the start of the semester in which training commences. Furthermore, it is the responsibility of the student to arrange entry into the training programme. However, the university does provide support in the identification of potential training agencies. The contractual agreement relative to the training is between the agency and the student.

The experiential training administrator then captures student data relative to: student number; surname; postal address, telephone number; e-mail address; module number; commencement and completion date. The power of experiential learning cannot be underestimated, (David, 2001)

1.2.1 Student particulars

The following student particulars are captured into the database: name; student number; module; training agency; start and finish date and student signature. The list includes also an indication of the semester. A student needs to develop a clear vision from the start for successful completion, Rossouw, *et al* (2003).

1.2.2 Tasks of training

Students are required to train for at least a minimum of eight (8) weeks training in any four of the following core areas: administration; drawing; surveying; design; contracts; construction; material testing and other field as shown in Table 2.1

Table 2.1 depicts the specific areas covered relative to each task.

Tasks	Focus
Administration	Office control, filing, planning, programming, personnel management and computer applications.
Drawing	Drawing for roads and railways structures
Surveying	Levelling, tacheometry, setting out and coordination
Design	Design of elements for roads, railways and water
Contracts	Supervision and contract documentation
Construction	Construction of building and associated works
Materials	Testing of soils, asphalt, aggregates and concrete

Data Source: Experiential Training Manual, Civil Engineering Department

1.3 QUALITY CONTROL

Upon identification of training agency and registration in the NMMU database, a student is allocated to a mentor. The role of the mentor is to monitor and evaluate the student's performance relative to progress made towards the achievement of the set objectives. Upon successful completion of the training component in a given semester, the mentor verifies the results as an accurate record of the student's progress.

The certification relative to the acquisition of desired level of proficiency by the student in accordance with the guidelines is a key milestone in the entire process. Furthermore, the guidelines provide for the endorsement of

the logbook by the mentor and monitor, who are key role players in the training programme.

1.4 DUTIES AND RESPONSIBILITIES

According to the Department of Civil Engineering (No date) experiential training manual, duties and responsibilities for each key player is clearly defined. Students who are ready to start training are required to register with NMMU at the beginning of the semester for the appropriate module of experiential training. During the duration of the training the student maintains and regularly updates the logbook details. At the end of the semester, the student submits logbook and technical reports, which must be certified by the mentor. The mentor's role is to: scope is followed and adhered to; supply guidelines to the student; check; verify and endorse the logbook and technical reports.

The monitor notes and approves student logbooks; marks the student technical report; advices; and when called upon to do, guides the student during the training. Furthermore, the monitor may at his/her discretion contact the mentor to verify certain information supplied by the student and or reported in the reports.

1.5 ACCREDITATION

The experiential training programme forms one of the compulsory modules offered for the National Diploma programme and in particular is accredited by the Engineering Council of South Africa (ECSA). Furthermore, all qualifications offered at the NMMU are accredited by the South African Qualifications Authority (SAQA), (School of Engineering, 2009).

1.6 DIPLOMA AWARD

A student may only apply for the award of a diploma once all academic and practical training is complete. A student applying for the award of a diploma must provide the following: student name; student number; identity number; postal address; telephone number; e-mail address and signed form.

2. RESULTS

Table 2.2 and 2.3 show summary results of student perceptions on a random sample of 30 questionnaires that were examined. The whole sample was drawn from completed reports for the past three years. The questionnaires were subsequently analysed relative to the following broad categories: effectiveness; satisfaction; quality; frequency, and other nominal data. Perceptions based on 'Likert scale' ratings between '0' to '5'.

Table 2.2: Effectiveness

	Mean Score	Very Much	Much	Moderate	Little	very Little	Unsure
N=30							
Effectiveness							
Effectiveness of acquisition of new knowledge from supervisor		17	8	2	0	0	3
	4.1	56.7	26.7	6.7	0.0	0.0	10.0
Effectiveness of acquisition of new knowledge from workmates		12	11	4	0	0	3
	3.9	40.0	36.7	13.3	0.0	0.0	10.0
Contribution to organizational performance		3	20	3	1	0	3
	3.5	10.0	66.7	10.0	3.3	0.0	10.0

Table 2.3: Satisfaction and Quality

	Mean Score	Very Much	Much	Moderate	Little	very Little	Unsure
N=30							
Satisfaction and Quality							
Personal satisfaction of ELP training		13	10	4	0	0	3
	3.9	43.3	33.3	13.3	0.0	0.0	10.0
Relevancy of courses at NMMU to ELP		10	11	4	0	0	3
	3.5	33.3	36.7	13.3	0.0	0.0	10.0
Relevance of tasks to civil engineering		17	10	0	0	0	3
	4.2	56.7	33.3	0.0	0.0	0.0	10.0
Rating of ELP Programme		10	13	4	0	0	3
	3.8	33.3	43.3	13.3	0.0	0.0	10.0
N=30							
Tasks							
On whether they enjoyed their work		10	17	0	0	0	3
	3.9	33.3	56.7	0.0	0.0	0.0	10.0
Briefing before allocation of duties		19	7	0	0	0	2

	4.1	63.3	23.3	0.0	0.0	0.0	6.7
Understanding of tasks		20	20	0	0	0	3
	6.0	66.7	66.7	0.0	0.0	0.0	10.0
Work stimulated my creative ability		3	20	3	1	0	3
	3.5	10.0	66.7	10.0	3.3	0.0	10.0
Opportunity for independent thinking		10	17	0	0	0	3
	3.9	33.3	56.7	0.0	0.0	0.0	10.0
Link between theory and practice		12	15	0	0	0	3
	4.0	40.0	50.0	0.0	0.0	0.0	10.0
Allocated tasks were manageable		17	9	0	0	0	4
	4.0	56.7	30.0	0.0	0.0	0.0	13.3

Tables 2.2 and 2.3 depict results of examination of questionnaires from student respondents attached to the experiential training programme. The analysis was done relative to key aspects of: effectiveness; satisfaction; quality and tasks. The results indicate: the programme is effective in terms of acquisition of new knowledge from supervisors (mentors) and workmates. Students derive personal satisfaction from the programme; courses at NMMU are relevant and tasks assigned add value in the field of civil engineering.

3. CONCLUSIONS

The findings from the research makes invaluable contribution towards the experiential training programme at NMMU relative to: accreditation; quality of programme; effectiveness and general level of satisfaction amongst the trainees. Furthermore, the findings enhance our understanding of the relevance and positive rating of the programme.

4. RECOMMENDATIONS

Areas which have been identified such as, effectiveness of acquisition of new knowledge from workmates and contribution to organizational performance needs follow up so as to improve the interrelationships and sustainability of the programme. A robust partnership approach needs to be rigorously implemented so as to ensure all the key four partners: students; mentors, monitor and administrator in the training add maximum value to the programme

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The Attraction and Retention of Quantity Surveyors in South Africa

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ABSTRACTS AND PAPERS

Purpose of this research

The aim of this research was to establish if there really is a shortage of Quantity Surveyors, and to determine the causes as well as effective measures which could be taken to alleviate the shortage.

Design/Methodology

The core of the research was the survey of the literature which looked at all the aspects of the construction industry, the training and marketing of quantity surveyors as well as motivating and de-motivating factors influencing employees in an organisation. Questionnaires were sent out and conducted interviews with relevant parties. A random selection process was used to identify possible subjects out of a list of registered companies under the Construction Industry Development Board (cidb) of companies in the Gauteng Province. Open ended questions were used, which addressed the subjects focusing mostly on recruitment and training of quantity surveyors in the industry.

Findings

The responses received from the subjects of the study indicated some dissatisfaction with the remuneration, treatment from supervisors and the graduates consulted were not exposed to any mentoring programme for their training. Another factor which could contribute to the lack of motivation is the fact that there is no room for any promotion opportunities.

Research Limitations/Implications

A lack of participation from many quantity surveying firms was experienced. Not all questionnaires were returned, and relative to those received, questions were not answered correctly, or some not at all. This made the analysis difficult, but not impossible.

Practical Implications

It is hoped that this research will engender a further investigation into why a shortage of quantity surveyors is being experienced in the South African construction industry. Furthermore, it is hoped the findings will influence other young quantity surveying professionals to take initiatives to promote the growth and survival of our profession.

What is Original/Value of Paper?

It is believed that the findings will help in the transformation of the image and culture of the construction industry, which will contribute to attracting new entrants to the industry. Ultimately, it is clear that there is a future in the quantity surveying area of construction due to this shortage.

1. INTRODUCTION

The construction industry is currently facing a boom; this has been happening over the past two years and before that it faced fifteen years of depression. The demand for professional construction industry skills was at a standstill until two years ago before the current boom in the construction industry.

It can be seen that the construction sector is undergoing a major boom and rising housing demand. The Gauteng province, inclusive of Johannesburg and Pretoria alone represented 38.8% of the value of recorded building plans, with Western Cape coming second with 29.8%. Murray & Roberts (M & R) CEO Brian Bruce believes that South Africa's construction economy which has been in retreat for three decades is on the cusp of a new cycle of multi-decade growth. "Many people in this industry do not have that memory. Most people only know what it is like to live in an industry in crises and we can see this in terms of the lack of preparation that has been taking place over the last few years. There has been no understanding of what lies ahead, and that is manifesting itself in talk of skills shortages and leadership crises" Bruce elaborated.

A press conference was held in Cape Town (2007) where the Public Works Minister, Thoko Didiza stated that the growth in the construction industry was certain to happen irrespective of whether the

2010 World Cup took place or not. It is estimated that the current boom in the construction industry is likely to last for at least the next ten years. "Development of infrastructure as well as the growth in the private sector such as residential and retail development should cause the growth spurt in construction to last for years." Despite all of this anticipated growth there have been problems. South Africa is encountering a supply side constraint. This means that South Africa's construction sector does not have the required skills to meet the boom in the construction industry. An unprecedented skills shortage has been observed in the supply of Quantity Surveyors in the South African construction industry. During the period between 1981 and 2002 the construction industry's contribution to the country's GDP declined from 12.2% in 1981 to 5.2% in 2002. This led to many skilled personnel departing from the construction industry due to a lack of opportunities.

"One must acknowledge that there has been a brain drain that has denuded a certain percentage of every profession, a drain that I believe, in the case of our profession, stemmed from the depression in the Construction Industry. The current skills shortage created by such condition was exacerbated by the fact that during the depression there wasn't the money to develop skills" a quote by Gerald Chapman (2008) CEO of Protech Khuthele engineering company.

This research is modeled to address the conditions causing the shortage of Quantity Surveyors and the impact it has on the production of work, moreover the research will try to establish some effective and efficient solutions to attract and retain Quantity Surveyors amongst other professions in the industry thus alleviating the shortage.

2. MARKETING/ADVERTISING THE QUANTITY SURVEYING SERVICES

It was recorded that the first quantity surveyors in South Africa originated from Britain and came to South Africa bringing their professional skills (Law, 1985). As professions specialized out of the building professions such as quantity surveyors, architects and other engineers, the move to form associations became apparent. This inspired the amalgamation of these professions bringing their ideas together highlighting their shared interest within the industry (Bizzel, 2002).

Quantity Surveyors have been continuously scrutinized in the light of other professionals in the construction industry intruding into the work done by the quantity surveyors. This has led the quantity surveying profession to develop itself further in order to survive in the industry and formed the Association of South African Quantity Surveyors. To stay in existence the profession needs to market itself and continuously reinvent itself. There's a great need for better marketing of the profession's services,

it is of the utmost importance to establish a good relationship between schools, universities, technikons and the professional associations and other institutions.

Furthermore, a greater public exposure through the media can be beneficial to the profession's continued existence. The public has little or no information regarding the quantity surveying profession. One of the subjects when asked how they knew about the role of quantity surveyors said they had heard of the profession from a mechanical engineer who said it was all about counting the number of materials needed for a building to be constructed. That explanation turned them off the profession as it made them think it was all they did? The term 'quantity surveying' is limiting to what it is that a quantity surveyor really does.

The lack of public knowledge and awareness of the profession's existence and its role will have a serious impact on the recruitment of trainee quantity surveying professionals. A good marketing strategy that will sell the profession's expertise will be effective in conveying the right information about the quantity surveying profession and remove any misconceptions about the profession.

Marketing has become a pervasive and influential force throughout the professions. In a few short years marketing has shed its old image of being something unethical and unnecessary and has come to be viewed as an essential element in building and maintaining a profitable and rewarding professional practice (Kotler, 1983). In the past, there were laws prohibiting advertising professional services. Since the relaxation of these laws many quantity surveying firms have been advertising in journals associated with the construction industry. One aspect essential for successful marketing is communication which is to inform, persuade and remind (Nixon, 1995). Clear understanding of the work of a quantity surveyor is critical before undertaking a marketing strategy.

3. PUBLIC RELATIONS

By definition, public relations is the management function which evaluates public attitudes, identifies the policies and procedures of an organization with the public interest, and executes a program of action to earn public understanding and acceptance. In carrying out its objectives, an enterprise or industry not only does it need to consider the interests of its clients but also those of the public who might have an impact on an organization's ability to achieve its objectives. Although organizations must put their primary energy toward managing their clientele effectively, their success will be affected by how the public views their activities (Kotler, 1983).

4. TRAINING

According to Addai (2007), "Training is a process in which individuals are being taught to follow a certain way of doing things and also follow the same standards in order to be productive for the success of their organizations." Another definition of training is "The systematic process of changing the behaviour and/or attitudes of people in a certain direction to increase goal achievement within the organization." (Van Dyk et al., 1992)

By identifying the correct training methods organizations will be able to choose the relevant training programs. Staff appraisals occur when a superior has an individual's performance evaluated. The superior would advise the individual on ways to improve the performance through training (Addai, 2007). An analysis of skills is done to evaluate the individual's progress and to ensure that the training method chosen is effective. If not, another should be considered. Skills analysis enables the trainer to establish the differences between an experienced and inexperienced learner (Addai, 2007).

The training process is made up of three phases: pre-training, training and post-training:

- Pre-training - This is where the need for the training is developed and performance improvement is required (Lynton, 1990);
- Training - This is a process in which a trainee is taught a new way of doing work and to improve productivity for the benefit of the organization (Lynton, 1990), and
- Post-training - This is where trainees go back to their organizations and implement what they have learnt at the training, improvement being a priority (Lynton, 1990).

5. WHY THE NEED FOR TRAINING?

The main reason for going through any kind of training is to develop the trainees' skills, for employees to be on the same level and have the same approach to given tasks and to follow the relevant standards set by different councils such as the RICS, ASAQS, and ECSA (Addai, 2007). By training an individual it enables him/her to be well equipped to undertake the job thus promoting efficiency in his work and reduction in losses due to poor worker quality.

6. POSSIBLE TRAINING METHODS

By choosing the appropriate training programs organizations can ensure that work of the required quality is delivered. There are different effective types of training that can be employed by organizations which include the following:

- Workplace training;
- Vocational training;
- Mentoring training;
- Apprenticeship training;
- Co-operative education training;
- On-the-job training;
- Vestibule training;
- In-basket training, and
- Coaching.

All of the above are fully defined by Addai (2007)

There are several training models by authorities that can be successfully applied. Some of the recommended models are:

- Nadler's critical events model;
- High-impact training model by Bersin, and
- The concept of Outcomes-Based Education and Training by Spady.

7. TRAINING IN SOUTH AFRICA

There are many models of training that are currently in place in South Africa run by several organizations. According to Erasmus (2003) these training models are aimed to be the foundation for people to achieve national qualifications through formal and informal learning and in the process contribute to the government's aims of equality, quality, and acceptance of inequalities. This has led to training legislation being put in place by the government of South Africa. This is mainly made up of two acts the Skills Development Act 97 of 1998 (SDA) and the Skills Development Levies Act 9 of 1999.

However, this research was aimed at attracting and retaining of professional Quantity Surveyors in the South African construction industry. Membership of the RICS is normally gained with an approved degree in Quantity Surveying and the completion of the competence-based training programme. (www.prospects.ac.uk). There is a need for an administered period in which Quantity Surveyors are supervised by a professional Quantity Surveyor (RICS, 1983). Quantity Surveyors should be trained on how to carry out a project from the inception to the completion. They should know the following aspects: inception of brief; general and continuing services; preliminary services (initial feasibility and programme);

implementation (cost planning); tender and contractual arrangements; tender and contract documentation; selection of tenders; tender and report, and lastly contracts.

To enable the Quantity Surveying graduate to acquire the necessary skills and experience, the graduate must fulfill the requirement of the Assessment of Professional Competence (Addai, 2007). When a candidate applies to enter the APC, the employer (usually a principal, partner or person responsible for training) must prepare a programme and sign a declaration that appropriate experience and supervision will be provided. Candidates are required to obtain a minimum of 600 working days professional training and experience, within a minimum period of 33 months (Addai, 2007).

A log book should be kept by the graduate to monitor the day-to-day experience that he is acquiring. This book is usually provided by the council. This book will enable the council to assess the candidate's formal writing ability and the experience that is being gained. The company in which the candidate is working must assign a supervisor to each candidate. The supervisor will then aid the candidate in gaining the skills and expertise required for the job including making him confident in the tasks that he is executing. The supervisor then has to sign the logbook as proof that the candidate has participated in the training program. This certifies that the candidate has achieved the required period of training together with the necessary breadth and quality of experience in all areas (Addai, 2007).

The supervisor is usually a professional Quantity Surveyor who is normally a senior person within the organization that he is working in. The supervisor must sign the candidate's diary on a weekly basis and the logbook must be signed during each three month interval and interim reports need to be certified. The supervisor is responsible for ensuring that, as part of the candidate's training and experience, the candidate is given the opportunity to attend at least twenty hours of continuous professional development during the training period (<http://www.sacqsp.org.za/>).

For the RICS, this involves at least two years of structured learning in employment, leading to a RICS professional assessment interview known as the Assessment of Professional Competence (APC). Successful completion of the APC entitles the holder to use the letters MRICS after their name (<http://www.connexions-direct.com/jobs4u>).

International standards required of Quantity Surveyors differ in Australia as follows:

- a) The member must have a minimum of ten years general professional experience as a qualified Quantity Surveyor;
- b) The member must be a corporate member of the AIQS i.e. an Associate or fellow of the AIQS;
- c) The member must have achieved a satisfactory level of continuing professional development (CPD) over the last three years;

- d) The member must have worked on appropriate construction projects in appropriate positions over the last ten years;
- e) The member must have undertaken specific training as an expert witness, or
- f) Have appropriate experience as an expert witness (<http://www.aiqs.com.au>).

An expert witness is a witness, who by virtue of education, training, skill, or experience is believed to have knowledge in a particular subject beyond that of the average person, sufficient that others may officially rely upon the witness's specialized opinion about an evidence or facts within the scope of their expertise (<http://en.wikipedia.org>).

Training is a vital source for acquiring skills and expertise for an individual in an organization; it has long term benefits for both the employer and employee and should be properly implemented.

8. PSYCHOLOGY OF MOTIVATION TO WORK

The social psychology of work began in the 1930s which required psychologists to determine the relationship between **job-productivity** and **job-satisfaction**. Management was further expected to establish the extent to which working conditions in an organization affected labour turnover and productivity (Argyle, 1972).

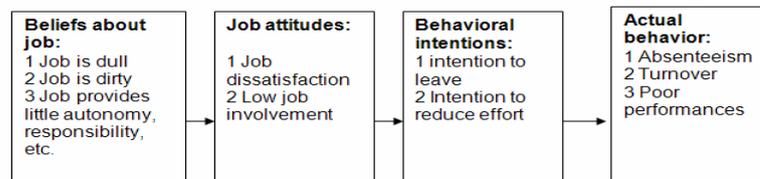
The assumption that job-satisfaction induces motivation and that the satisfied worker will show greater dedication to his work, has been questioned by many psychologists of this study. Yankelovich (2001) observed that "no one truly knows the relationship between work satisfaction and productivity." The distinction made by Lawler (1975) stated that "performance is determined by people's efforts to obtain the goals and outcomes they desire, and satisfaction is determined by the outcomes people actually obtain." Job satisfaction as a motivational factor will aid in determining what the individual wants and if he can be placed in a position where his needs are met through a level acceptable to both the individual and the employer (Biesheuvel, 1985).

9. JOB EXPECTATIONS AND JOB ATTITUDES

All individuals have certain expectations when entering an organization. These may stem from beliefs about the job and the rewards associated with satisfactory performance. The expectations are believed to be influenced by an individual's characteristics, availability of information about the organization and alternative job opportunities. The more appealing the

alternative job opportunities, the greater the chances of employee turnover in an organization.

Beliefs, Attitudes, Intentions, and Behaviour (source: Fishbein, 1967)



(Steers & Porter, 1975)

The diagram above illustrates that poor image of an organization might have a negative influence on the employee, resulting in poor performance from both the organization and the employee.

Employees seek to work for the best employer, and organizations are striving to be the “best company to work for.” This competition amongst employers fosters an environment that seeks to acquire the best talent, motivates employees to improve performance, develops employees so they can grow and contribute skill and ultimately instilling a sense of loyalty, thus resulting in lower turnover (Phillips, 2003).

10. MANAGING EMPLOYEE RETENTION

Employee turnover is becoming a serious problem for a lot of organizations. Phillips (2003) stated that keeping and managing the turnover rate below target and industry norm is a challenging issue facing businesses. The problem has been undervalued and unappreciated by business leaders and this is primarily due to some assumptions about turnover. Most businesses fail to identify the real causes of turnover adequately, the solutions to the problem are often mismatched with the cause of turnover and many Human Resources managers underestimate the true cost of employee turnover.

“From an organizational perspective, employee turnover can represent a significant cost in terms of recruiting, training, socialization, and disruption, as well as a variety of indirect costs. Given the significance of turnover, it is important for the manager and prospective manager to be able to analyze, understand, and effectively manage employee turnover.” (Mobley, 1982)

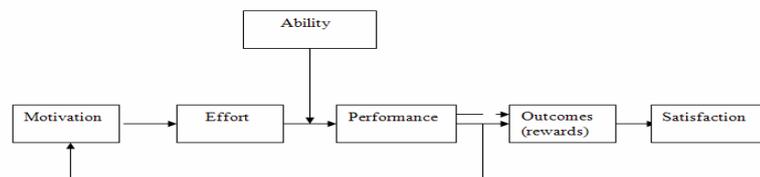
Steel (2005) pointed out that some organizations manage to handle the turnover issue effectively, whereas others are still struggling with it. The

issues are not often externally driven, but rather rooted within the company. At times the approach used to tackle the problem is not effective enough. Skinner (1961), a well known psychologist, recognized the powerful impact of compliments and other forms of positive reinforcement. He noted that if an individual receives some type of positive reinforcement after exhibiting effective performance, the likelihood of similar performance occurring in the future is increased.

Research on job choice, career choice, and turnover clearly shows that the rewards an organization offers influences who is attracted to work for it and who will continue to work for it (Porter, 2003). Organizations that offer the highest salaries tend to attract more workers than organizations that offer less. This will thus result in workers being retained, and a lower turnover rate. Replacing an employee can cost at least five times his or her monthly salary.

Effort Performance Expectancy-Individuals also attach a certain probability of success to behaviour (Porter, 2003). This is an assessment of how much effort an individual is prepared to put forth to achieve his/her goal. Motivation is seen as a force impelling an individual to expend effort (Porter, 2003).

11. THE EXPECTANCY-THEORY MODEL



12. DESIGN/METHODOLOGY

The core of the research was the survey of the literature which addressed all aspects of the construction industry, the training and marketing of quantity surveyors as well as motivating and de-motivating factors influencing employees in some organizations. Questionnaires were sent out and open unstructured interviews conducted with relevant subjects. This allowed subjects to answer freely without any limitations. A random selection process was used to identify possible subjects out of a list of companies registered with the cidb in the Gauteng Province. Open ended questions were used, which addressed the subjects focusing mostly on recruitment and training of quantity surveyors in the industry.

The aim of the research was to find how the construction industry was viewed as a whole by students in general and given the current

situation faced by the country regarding the scarcity of Quantity Surveyors, how the Quantity Surveying companies thought this matter could be resolved and what steps could be taken to attract the quantity surveyors back into the South African construction industry including retaining them.

In terms of this research we defined attraction as the inward force pulling an individual back into their place of work within their respective organization. The dictionary meaning however is 'In general an attraction draws one object towards another one' (<http://en.wikipedia.org>) and according to our understanding retention is being able to retain a individual in their original place of origin and the dictionary meaning 'is the ability to keep employees within an organization' (<http://en.wikipedia.org>).

13. SURVEY RESPONSE

There were some problems encountered along the way in collecting the data. Some subjects did not fill in the questionnaires. Some instruments were not returned and others were badly answered. The total number of questionnaires which were distributed was forty-two. Of these, Quantity Surveying companies received ten and returned eight. The ASAQS was given one and one was returned. Quantity Surveying graduates received ten and returned seven. Quantity Surveying students received twenty, which were all returned. The Department of Public Works was forwarded one questionnaire, which was returned. The total number of questionnaires returned was thirty seven, which equates to a response rate of 88%.

14. FINDINGS

The responses received from our subjects, showed some dissatisfaction with the remuneration, treatment from supervisors and the graduates consulted were not exposed to any mentoring programme for their training. Another factor which could contribute to the lack of motivation is the fact that there is no room for any promotion opportunities.

15. RESEARCH LIMITATIONS/IMPLICATIONS

We experienced a lack of participation from other quantity surveying firms. Not all questionnaires were returned, from those received, the questions were not answered correctly some not at all. This made the analysis difficult, but not impossible.

16. PRACTICAL IMPLICATIONS

We hope this research will probe a further investigation into why we are experiencing a shortage of quantity surveyors in the South African construction industry. Furthermore, we hope it will influence other young quantity surveying professionals to take the initiative in the growth and survival of our profession.

17. WHAT IS ORIGINAL/VALUE OF PAPER?

This research, we believe could help in the transformation of the image and culture of the construction industry in order to attract new entrants. When all is said done, there is a clear indication that there is a future in the quantity surveying area of construction due to this shortage.

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Skilling the Contracts Manager: A Critical Look At The PPP Contract Structure In Enhancing Skills Transfer In South Africa

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ABSTRACT AND KEYWORDS

Purpose:

As part of its BEE endeavour the South African government has identified PPPs as a vehicle to efficiently transfer skills to emerging Previously Disadvantaged Individuals (PDIs) managers. The *ex post* distortional phenomenon of moral hazard abound in many contracts, it is however here demonstrated that the adoption of a self-monitoring contract in a PPP set-up can smother moral hazard and enhance skills transfer and empowerment of the PDIs.

Design:

Recourse is sought from the economic theory of Principal agent theory as a methodology of interpretation because of the nature of PPPs in delegating responsibility to the consortium (agent). A phenomenological approach was adopted where all the key management players in the consortium were interviewed.

Findings:

The rigour of self-monitoring contractual regimen compels the consortium to nurture the PDIs in order to adhere to service level agreements, and avoid penalty escalations which have a negative bearing on the bottom line and could ultimately lead to contract termination. The centrality of BEE in the contract creates an incubatory environment, as the PDIs involvement cannot be compromised without contractual implications.

Value:

This work provides a review of the achievements of a PPP in skills transfer to black junior managers and provides a possible model of practice for other PPPs.

Key words: moral hazard, agent, PDI, BEE

1.1 INTRODUCTION

The history of racial repression and exclusion in South Africa has created a black segment of society that is disproportionately under-represented in management positions. Whereas the BEE policy main aim is to uplift the economic condition of all the people that were previously marginalised, it also seeks to attain a racially reflective representativity across all levels of management in organisations, whether private or public. However it has long been recognised that there is a severe lack of skills and adequate relevant experience among PDIs. It is with this realization that PPPs were singled out as a context for intervention, because the longevity of their tenure makes them a good vehicle to empower the PDIs in South Africa (National Treasury, 2004). Their large size accommodates widespread inclusiveness, which makes them invaluable for BEE (Zarenda, 2001). The inclusive nature of PPPs can accommodate the black-owned SMMEs which may need a more stable operating environment than in traditional procurement arrangements so that they can be nurtured and are less likely to suffer from high mortality, because of the presence of a sustainable cash flow.

According to the World Bank (2008) governments find PPPs to be very effective in ensuring that public facilities are delivered on time and on budget, are properly maintained and are able to deliver public services in the context of restrained resources. The South African government as the largest buyer and biggest spender on infrastructure has adopted PPPs to deliver secondary socio-economic benefits beyond infrastructure provision. However the enormity and complexity of these arrangements, and the scarce skills in the government to monitor and regulate the contract once construction and delivery has begun, might lead to a principal agent problem (OECD, 2008).

This study looks at a PPP procured 850-bed referral hospital in Durban, named after the first South African Nobel Prize winner chief Albert Luthuli. Inkosi Albert Luthuli Central Hospital (IALCH) was first opened to the public in 2002, and was the first provincial PPP project to be completed in South Africa. It is a world class hospital and boasts of being the first paperless hospital in Africa, as all patients records are captured and

accessed electronically. Being the first PPP in the province there was from conception a strong involvement of four key departments; National Treasury, Provincial Treasury, National Health and Provincial Health. The national departments played an overseer role, but there was a concerted effort to ensure that there was a strong BEE involvement in this scheme such that, by percentage shareholding it has a high apportionment than the *BEE Codes of Good Practice in PPPs* which were only promulgated later.

1.1.1 PRINCIPAL AGENT THEORY

The Principal Agent (PA) Theory is an Economic theory which seeks to explain the employer/employee relationship. Its main tenet is that the agent (employee) should not be trusted and as such rigorous monitoring mechanisms should always be implemented in order to curb any opportunism by the agent. The view of the PA theory is that an agent as a rational player will always seek to maximize his/her utility with the least possible expense (Jensen and Meckling, 1976). This is of particular interest to PPPs. because of their complexity and size, which makes it very difficult to monitor everything the agent does at all times. However implementing a rigorous monitoring regimen not only increases transaction costs but sometimes it has a “crowding out” effect on the agent who might be willing to cooperate and align his/her interest to the goals of the principal. So it is mutually beneficial to devise a monitoring regimen that is not solely punitive but induces cooperation as well.

But monitoring as a governance mechanism is indispensable if opportunism is to be stifled. This is pertinent, because according to the PA theory the human being is rational, self-interested, opportunistic (Eisenhardt, 1989) and calculating individual who is seeking to attain rewards and minimise punishments, especially financial punishments (Donaldson and Davi, 1991). Asymmetric information breeds opportunism especially when it favours the agent and it may manifest itself *ex ante* as “adverse selection” where the agent chooses an agent who has not completely bought into the vision of the principal. *Ex post* opportunism may manifest itself as “moral hazard” where the principal is not sure whether the agent has put in maximum effort that will increase principal’s utility, or just enough to be compliant in order to maximize the agent’s own utility at the principal’s expense. This is very important in a complex and long-term contractual arrangement like a PPP where the results of the agent’s efforts sometimes take years to be realised.

1.1.2 PRINCIPAL AGENT THEORY AND PPPS

PPPs have a rigorous selection process in identifying a suitable consortium. The Request for Qualification (RFQ) stage, Request for Proposals (RFP) stage and protracted negotiations all contribute in trying to “screen out” the unsuitable candidates, and reduce adverse selection. This

is more important in a BEE drive where some players might see it more as a compliance issue to get a contract and then put it aside once the operations begin in order to maximize their utility in the project. Opportunism of window dressing and fronting is endemic in most industries especially construction, but PPPs because of their long-term nature are more likely to expose any shirking on the BEE issue. The PPP contract is driven by service level agreements, punitive penalties and incentivising remunerations. The size of the contracts, the speciality requirements, and the financial risks involved before contract award in the PPP means that there will always be large industry players (established white firms) in any scheme. All these mechanisms contribute in minimizing moral hazard during operations, and they may minimize shirking on BEE where PDIs are normally made to play peripheral roles in projects, although their inclusion legitimized the contract award. The marginalization of PDIs apparently does not contribute to their empowerment, professional growth and training as entrepreneurs. It is shown below the role a self-monitoring contract has in enhancing BEE.

Albert Luthuli hospital is run through an elaborate self-monitoring contract administered through a call centre. All the players (see figure 45.1 below) in the operations log a call with the call centre, ranging from complaints about the service of other service providers or the ordering of consumables from the suppliers. The contract stipulates the response time for each and every call, and before the time elapses there are reminders to check if the call has been attended to and find where the bottlenecks could be. If the call is not addressed within a stipulated time then there is an escalation of penalty points. If these points accumulate beyond a specified number it automatically translates into a fine. Consequently everyone involved in operations has to make sure that their response is professional, timeous and to a specified level. So on the issue of service delivery no company can afford to be slow, sloppy or unprofessional in their approach, and this has created a very efficiently run establishment. It is the aim of this paper to see if this has translated into building a professional, growing PDI contracts manager.

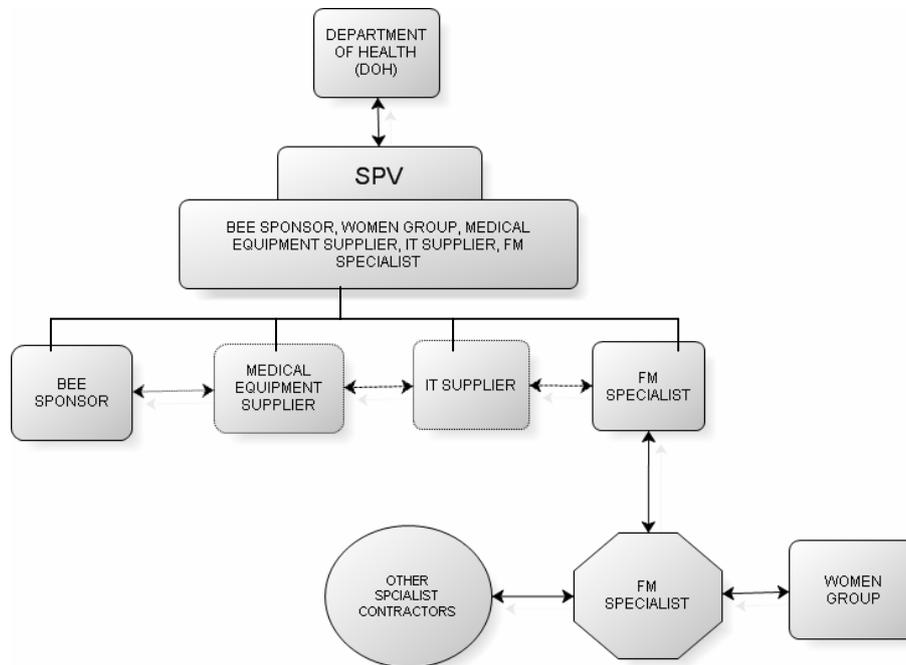


Figure 45.1 The organisational structure at IALCH.

1.2 IALCH PROJECT STRUCTURE

As can be seen from figure 45.1 above the involvement of the PDI is at every level although the women group which made up of two companies is not represented at the second level (sub-contractor level) below the SPV level. In all the BEE component at the SPV level owns 40% in shareholding and the main BEE sponsor company owns 40% of shareholding in the two operators at the second level; that is 40% in medical supplier and 40% in IT supplier. The women's group is involved as a sub-sub-contractor at the third level, under the Facility Management. The Facility Management (FM) component is divided into soft and hard services. The hard services are done exclusively by the FM company and the soft services are sub-contracted out to twelve different companies. Where the women's group are involved in providing the services, they have formed a partnership with the FM company where the FM company owns 60% of the shareholding and the two women-owned companies collectively own the other 40%. A lot of soft services are undertaken by this women group under the guidance of the FM company. The highly specialized soft services are sub-contracted to specialist BEE companies who are not part of the consortium, and who

work on a renewable contract basis. At the level of sub-sub-contractor each and every sub-sub-contract is managed by a contracts manager. Table 45.1 below gives a picture of the PDIs contracts managers who are involved in managing the site's different components of soft services.

Table 1.1 Responsibility and experience of the contracts managers

NO	Activity	Contracts Manager Gender	Job Experience At Commencement	Staff Complement	Company Ownership
1	CLEANING	FEMALE/B	None (lawyer)	300	W/G
2	CATERING	FEMALE/B	2	35	PVT
3	LINEN	FEMALE/B	2	34	W/G
4	CRECHE	FEMALE/W	10+	14	W/G & PVT JV
5	ACCOMODATION	FEMALE/B	4	9	W/G & PVT JV
6	LANDSCAPING	FEMALE/B	5	20	PVT
7	PORTERING	FEMALE/B	5	70	W/G
8	STERILE SUPPLY DPT.	FEMALE/B	10+	62	W/G
9	WAREHOUSING	MALE/B	5	25	PVT
10	WASTE	MALE/B	None	6	PVT
11	MAIL	MALE/B	None	5	PVT
12	SECURITY	MALE/W	22	93	PVT

Legend: Pvt = Private; W/G = Women Group; B = Black; W = White

1.3 METHODOLOGY

A phenomenological approach was deemed appropriate for this study as it deals with human behaviour. This route was taken because the study of the behaviour of agents in PPPs settings is fundamentally a study of human behaviour. Human behaviour is a very complex dynamic area which cannot easily be investigated mechanically with only numbers as a sole source of data. The researcher has to be embedded in the environment of the subjects in order to have a deeper meaning of the data and must gain the perspective of the subjects about aspects of the subject under investigation. The positivist approach could explain the prevalence of the phenomenon or the frequency of its occurrence with the assistance of the statistical techniques, but the principal reason for undertaking this research was to have a deeper and richer appreciation of the underlying reasons. It was also seeking to find a pattern in the data gathered and make appropriate propositions based on the contextual data and the research subjects' perspectives. A qualitative approach was deemed to be better

suited to yield desired results because the intention was to find meaning from the research subjects' perspective and the artefacts found in their environment. On the other hand if a quantitative approach could have been adopted, the questions asked will be a pale shadow of the original phenomenon as they will be too restricted, although precision will be gained, it will be at a loss to subtlety (Cupchik, 2001). A positivistic approach which relies on quantitative analysis will fail the researcher by not bringing up the understanding of the 'meanings' that are embedded in an environment (Filmer *et al*, 1972). This is where qualitative research becomes very useful because it is by definition stronger on long narratives than on statistical tables (Silverman, 2006).

The main interest in this research is to find the how and the why of the efficacy of PPP BEE delivery and as such a case study was regarded as suitable in providing a deeper insight (Yin, 1994). Albert Luthuli was regarded as a suitable critical case because it has been running for seven years making it one of the oldest, it also has a wider PDI spread of inclusivity. It therefore is a case most likely to either confirm incontrovertibly the proposition or irrefutably falsify it (Flyvbjerg, 2006). Interviews formed a critical part of this research and through them respondents related their lived experiences. It was not expected that their stories were going to be objective 'facts' but they were rather authentic accounts of subjective experiences. That is why as much as possible it was intended "to formulate questions and provide an atmosphere conducive to open and undistorted communication" (Holstein and Gubrium, 1997, p. 116). Open-ended interviews were held with all the managers involved in the scheme and probes were used in order to focus the discussion on the subject but otherwise, they were given a freedom to relate their live experiences.

1.4 FINDINGS

After conducting interviews with all the managers at all levels of the project there were pertinent BEE observations made. Chiefly the centrality of BEE seems to have been understood by all from tendering, negotiations through operation, as the staff is fairly racially representative across the board. One government official said "at the time of this project we did want to see very high participation by BEE entities in the project". There also appears to have been an effort by all companies to appoint PDI contracts managers wherever skills could be found. Those who had no managerial experience but had been working in those specific fields, we brought on site and mentored for some time, before they assumed the responsibility. It was particularly poignant that two thirds of contracts managers were women, and they were even entrusted with jobs that are physically demanding, a traditional reserve for men. A positive step in nurturing women managers to make forays into all the areas they believe they can handle as individuals.

The FM operator has done a lot of work to create a conducive environment for all the sub-contractor managers and their staff. The following observations were made by the respondents. (a) “yes...we work as partners .. that is what we are with *FM company*. at the end of the day if as a sub-contractor I am not performing well it affects all of us service providers”. (b) “The relationship with FM company has improved quite a lot from the first day I started working here.....initially it wasn't that good, I would say we've ironed out some of the challenges the... relationship has grown”. The general standards of the PPP run hospital with international players has created high professional standards and growth. The respondents put it in this fashion: (a) “it's good in that it keeps you awake all the time to make sure that your service is up to standard”. (b) “If you get used to doing the things the right way you won't have problems”. (c) “Everything is actually run in a proper manner. Everything even when it comes to cleanliness and the way every person in this hospital works needs to be done accordingly. Nobody does it the way they think it should be done it is done the way it should be done”.

There is widespread confidence among contracts managers that the experience gained here could be used in future entrepreneurship endeavours. (a) “It has helped me to realized how much one can do even opening you own company. And you have realized that doors are there, they are opened”. (b) “I would like to see myself owning my own company one day”. (c) “I think we are the bestif we can be the best here we can be the best anywhere”. The FM operator keeps everyone alert and adhering to standards by employing Quality Inspectors who randomly inspects all the activities in the hospital. These are some of the views on their impact: (a) “Everything is being monitored every second of the day. So all service providers are keeping up to whatever service standards they need to keep up to”. (b) “Their Quality Inspectors who are on site they go around the hospital in making sure that we are adhering to the standard that was put forward”. (c) “They have people whose job is to do this everyday...they walk around the whole hospital. They walk around with a board inspecting every office in the whole yard. (d) “Its contributing a lot because I would imagine if they were not here the service providers would be doing whatever they feel like doing”.

The FM operator has a very interactive approach to empowering the women group. They share the same office space, they have given them access to all documents and systems, they let them manage the site although the operator is ultimately accountable and they give them the resources to manage. They sit in the Women Group meetings and advice them if there is going to be any infringement on the project agreement. One of the FM company managers put it in these words: “we have regular meetings where we share ideas and share knowledge and they are really integrated into our system and we don't see them as a separate entity”. The Women's Group representative had this to say about their involvement in the soft service: “They actually let us do everything....they actually let us

do everything in terms of soft services. We are running our own show...you know.. even ..in everything. even managing the contractors that we have, we do it ourselves. There is no interference in terms of that”.

These findings show that the self-monitoring governance mechanism at IALCH appears to have mitigated moral hazard on project deliverables including BEE. This has not only led to BEE delivery but it has induced goal congruency between the principal (government) and the agent (consortium). The government emphasis on a strong PDI involvement at all levels has resulted in a substantial PDI contracts manager involvement. The high standards at IALCH have resulted in a situation where properly skilling PDI contracts managers is imperative. To achieve this the FM company has created an environment where there is team spirit between, the company and PDI contracts managers on the one hand, while on the other there is a robust monitoring through Quality Inspectors to ensure PDI managers contractual compliance. This has assisted in empowering PDI contracts managers most of whom have entrepreneurial ambitions beyond the project.

1.5 CONCLUSIONS

Several conclusions were made after conducting this study. Although it is acknowledged that each and every project would have different players with different attitudes towards BEE. Lessons that can be gleaned from IALCH are that the centrality of BEE and the service level agreement creates an environment where the main partners in a PPP approach BEE as a part of the project deliverables. The high level of service delivery expectations in PPPs and the fact that big established companies have to deliver through PDIs, makes the skilling and uplifting of PDI standards a business imperative.

In order to deliver service at a required level big experienced companies adopt a posture that creates a harmonious working relationship with PDIs in order to enhance project output. A mixture of penalties and constructive monitoring assist the PDIs in fine tuning their skills and gives them enough confidence to go on independently beyond the project. The level of cooperation and interaction between the big companies and PDIs reduces any BEE moral hazard.

The above discourse leads to the conclusion that the structure and nature of PPPs, provide an incubatory environment for PDIs contracts managers and enhances a better platform for BEE. Thus where moral hazard seem hard to curb in other procurement methods, the self-monitoring governance mechanism of PPPs minimizes the agent shirking on BEE when it is put at the centre of the project performance. The lessons garnered here are insightful to practitioners involved in PPPs on the appropriate skills transfer mechanisms to PDI contracts managers and other PDI middle managers in general.

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The Individual's Perception of Risk in The Electrical Construction Industry

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Purpose of this paper

The current approach to health and safety (H&S) management, in the South African engineering environment, is based on conformance with legislated H&S standards only. Such standards rely heavily on knowledge where very little cognisance is given to the human behavioural component as influenced by the individual's perception of risk. Perception of risk is likely to vary from one country to another depending upon cultural norms and what legal opportunities exist for control and regulation of risk. Risk perception and the individual's attitude towards H&S are related to a tendency of responding to a given situation in a particular way, and by not considering this, the current approach of forcible compliance with standards only, creates a tendency of resistance. The fact that South Africa has such a diverse cultural, political and historical background results in a far wider difference in risk perception, and as such would have a great impact on H&S management.

The purpose of the study is to determine what influence the individual's perception of risk has on H&S practises in the South-African electrical construction industry.

Design / Methodology / Approach

The exploratory phase of the study entails a questionnaire survey which investigates electrical workers' perceptions of electrical construction risk in relation to H&S practices.

Findings

The findings of the exploratory survey indicate that there is a link between human risk taking behaviour as influenced by the individual's perception of risk. Such behaviour is affected by cultural norms, levels of training, and the unique environment of electrical construction sites.

Research limitations / Implications

The findings emanate from an exploratory survey using a convenience sample. The observations provide an indication of the relevance of the research hypotheses, and the degree of understanding and appreciation

electrical construction workers have of risk taking behaviour related to H&S.

Practical implications

The findings amplify the need for a different approach to H&S management in the electrical construction industry that not only relies on policy and procedures or legislative standards, but also acknowledge the human behaviour component.

Value

The findings provide documentary evidence for the need for training interventions in altering risk taking behaviour relative to electrical construction practices.

Keywords: risk behaviour, construction, risk

1. INTRODUCTION

In most electrical construction environments, individuals usually perform specific tasks on their own, with this in mind it would be advantageous to understand how an individual's perception of risk allows him or her to perform certain job functions in a healthy and safe manner. The selection process of persons to perform certain tasks should incorporate both the specific aspects of the job and the characteristics of that individual that make them best suited to undertake such tasks.

Risk perception and the individual's attitudes towards H&S is related to a tendency of responding in a given situation in a particular way, and by not taking this into consideration the current approach of forcible compliance with standards, creates a tendency of resistance. According to Stranks (1994) the attitudes of individuals towards H&S comprise of a cognitive component and an affective component. The cognitive component is concerned with thoughts and knowledge related to perceiving, remembering, judging, reasoning, and the analysis of a scenario. The affective component on the other hand, is concerned with emotions or feelings of attraction or revulsion. Both of these components play a critical role in an individual's risk behaviour profile.

Slovic (1997) postulates that reaction to risk can be attributed to sensitivity to technical, social and psychological qualities of hazards that are not well modelled in technical risk assessments. The importance of social values in risk perception and risk acceptance has thus become apparent. According to Lussier, (1997) people are a manager's most valuable resource and as such need to be maintained by understanding the potential an individual has to contribute to accidents; management will better care for this most valuable resource of an organisation.

Given that risk perception is argued to be quantifiable, an increasing number of studies have focused on cultural and national differences in risk perception. A few studies have focused on countries such as Japan and China, but developing countries on the whole have been ignored (Thomas et al., 2003). The need for research relative to this critical component of H&S management is indicative of the increase in serious accidents in the electrical construction industry of South Africa.

2. REVIEW OF THE LITERATURE

2.1 H&S in the electrical construction industry

The South African electrical construction environment is faced with unique problems which in totality reflect on the wider problems facing construction in South Africa. Skill shortages due to a change in legislation and funding of apprentices, technicians and engineers and the ineffective implementation of training by selective Sector Educational and Training Authorities (SETAs) resulted in a shortage of trained engineering staff.

Due to these factors and the ineffective management of applicable legislation and standards, the quality of services is deteriorating. A study conducted by Paivinen (2006) to determine risk perceptions of electrical tradesmen, determined that electrocutions were not rated as a serious risk compared to that of working at heights. Paivinen (2006) postulates that electrocution may be such a close work associated risk that its risk is underestimated in risk analysis by electricians.

Due to the physical environment of electrical construction work, the perception of danger is related to competence rather than the reliance on human sense.

In South Africa electrical construction organisations cannot expect to manage H&S in the same context as other developed countries due to the following internal factors. These are:

- A low skilled work force;
- An expanding economy;
- A unique cultural diversity;
- A low level of investment in human capital;
- A history of a large section of the population not exposed to technology, and
- A work force being exposed at a fast pace to complex technology.

According to Hall et al. (2009) The profile of the engineering and construction industry in South Africa has been enhanced and demand for related human capital and leadership talent has increased. The primary challenge lies in the development of basic skills, the procurement and

development of strategic and professional leadership and the protection of experience in South Africa.

It is assumed that with a better understanding of the electrical construction worker's psychological perception to work environmental risk, a model can be developed that will better address H&S more effectively in this environment.

The electrical construction industry is unique in the danger it poses to service providers as well as users, in that the perception of what is dangerous is not easily judged and the result of exposure can be more extreme than in other industries (Winterfeldt et al., 1981) as cited by (Trimpop & Zimlong, 2007).

2.2 Cultural Values and H&S

According to Lonner and Malpass (1994) as quoted by Smallwood (2000) cultural values affect the view about risk. They cite Hofstede's conditions that the value of avoiding uncertainty has a direct effect on risk perception. Weber et al. (1998) indicate that norms and values in a given culture influence the behaviour of members of that culture. In addition to this, events and circumstances over many generations contribute to the creation of those values as a cultural adaptation. Cultural norms can have a direct influence on the individual's perception of risk and to what extent risk will be taken.

Perez et al. (2007) believe that the study of culture could facilitate understanding as to when and why people behave in a safe manner at work. Cultural values thus affect the way in which people think and behave when faced with a safety-related issue.

2.3 Motivational behaviour

According to Stranks (1994) human factors affecting H&S related behaviour are defined as a wide range of issues which include: the perceptual, physical and mental capabilities of individuals, the influence of equipment and system design on such person's performance, and the organizational characteristics that influence such individuals' behaviour.

To determine what motivates an individual to either intentionally or unintentionally behave in a certain risk taking manner there is a need to understand human motivational analysis. McClelland (1985) indicates that human motivation has to do with the 'why' of behaviour, as contrasted with the 'how' or 'what' of behaviour. The role of unintentional actions in incidents, or as Sigmund Freud names it 'unconscious intent', is a factor contributing to incidents not always taken into account. According to McClelland (1985) Freud's early work showed that peoples' motives for what they do in everyday life are often unconscious.

Ai Lin Teo et al (2005) determined that positive reinforcements motivates workers to perform their jobs in a safe manner and is desirable above negative reinforcements that although the same outcome may be achieved a negative climate would be created.

Regarding the issue of 'how' to address the human ('failure') element, a person intuitively looks toward inadequate, or lack of training and instruction. This aspect of appropriate training, education and instruction being a pre-requisite to achieving human H&S 'compliance' appears frequently in the construction literature (Edwards et al., 2008). Human risk behaviour thus involves more than mere action or impulses.

2.4 Perception of risk

The individual's psychological make up affects their attitude towards H&S management in either acceptance or rejection of standards imposed on them. To understand why people accept certain risks and reject others there is a need to understand the psychological processes that lead to either rejection or acceptance (Trimpop and Zimlong, 2000).

Human behaviour and H&S relates to factors affecting psychology, sociology, and the anthropology of humans. Individual human factors that affect decision making in taking or rejecting risks relates to both the external socio environment as well as the individual's beliefs.

Trimpop and Zimlong (2006) quote (Slovic et al., 1980) who conclude from factor-analytical studies and interviews, that risk is assessed differently by the dimensions of controllability, voluntarism, dreadfulness, and whether the type of risks are known.

Mitchell (1999) indicates that although physical harm can be measured by experts using specific measurement tools. Psychosocial risk is less easily calculated. Although psychometric scales, in some cases, could be devised to measure such phenomena, the risk is so complex and potentially changeable, that it is difficult to measure accurately. An objective measure of risk is therefore difficult to obtain, but that is not to say that it does not exist. All that can be easily measured is the subjective or perceived risk.

According to Wilde (1986) as quoted by Trimpop and Zimlong (2006) people adjust their risk taking behaviour towards their target level of perceived risk. This means that people will behave more cautiously and accept fewer risks when they feel threatened and conversely, they will behave more daringly and accept higher levels of risk when they feel safe and secure. Stallen and Vlek (1981) indicate that the subjective perception of risk is the basis for risk acceptance regardless of the objective or quantified nature. Dey (2001) found that the probability and severity of each risk factor are determined through active involvement of the experienced persons from the field in an interactive environment. The experience of risk therefore is not only an experience of the physical properties of the

situation, but also a process of learning and understanding the potential of specific aspects of the risk environment.

Risk can be related to the probability of an incident occurring. According to Ridley and Channing (1999) risk reflects both the likelihood that harm will occur and its severity, and hence these factors should be taken into account when undertaking either qualitative or quantitative risk assessment.

Risk is a complex concept. It is the natural consequence of uncertainty and is part of human activity. It means different things to different people, and is intimately linked to personal or collective psychology although analysts give it the trappings of objectivity (Stillman, 1997). Risk in totality to an organisation is the threat of loss to any of its assets. In terms of its most important asset, human resources, the threat of loss of individual employees injuring themselves or others is a serious risk that needs management intervention. According to Smallwood (2000) the determination of risk involves human judgment about physical properties and probabilities.

3. RESEARCH

3.1 Sample stratum and response rate

The sample stratum consisted of members of the Western Cape branch of the Institute of Certificated Mechanical and Electrical Engineers of South Africa (ICMEE), the South African Electrical Contracting Association (ECA), the South African Federation of Hospital Engineers (SAFHE), the hospital group Netcare members only, and the South African Institute of Electrical Engineers (SAIEE), Southern Cape branch only.

Table 1 presents the size of the sample strata, the number of completed questionnaires included in the analysis of the data, and the net response rates relative to each of the sample strata, including a mean.

Table 1. Response rates for the sample strata

Measure	ICMEE	ECA	SAFH E	SAIEE	Mean
Analysed (No.)	12	11	10	8	10.25
Sample stratum No.)	145	450	42	64	701
Response rate (%)	8.3	2.4	23.8	13	11.8

Table 2 indicates the importance of five parameters in terms of a mean score ranging between 1.00 and 5.00, based upon percentage responses to a scale of 1 (not important) to 5 (very important).

It is notable that the mean scores are all above the midpoint score of 3.00, which indicates that in general the respondents can be deemed to perceive the parameters as prevalent. The mean score for the impact of culture and perception of hazards is $> 3.40 \leq 4.20$, the respondents can be deemed to perceive them to be between important to more than important / more than important. Given that the mean scores for motivational incentives and the influence of management are $> 2.60 \leq 3.40$, the respondents can be deemed to perceive them to be between less than important to important / important. It is significant that risk perception and the impact of culture are ranked first and second. Furthermore, it is notable that the role of H&S legislation in altering risk taking behaviour is ranked last with a mean score of 2.68, which means that the current legislative approach is not seen as a motivation for better H&S management.

Table 2. Degree of importance of various parameters to respondents' organizations.

Parameter	ICMEE		ECA		SAFHE		SAIEE		Mean	
	Mean score	Ran k								
Cultural impact	4.22	1	4.13	1	2.88	4	3.00	4	3.56	1
Perception of hazards	3.39	2	3.50	2	3.44	1	3.25	1	3.39	2
Motivational incentives	2.83	3	3.19	3	2.81	5	3.00	4	2.96	3
Management influence	2.61	4	2.25	5	2.94	3	3.13	2	2.73	4
Role of H&S legislation	2.44	5	2.58	4	3.71	2	2.00	5	2.68	5

Table 3 indicates the impact of risk perception in the electrical construction industry in terms of a mean score ranging between 0.00 and 5.00, based upon percentage responses to a scale of 1 (minor) to 5 (major). Given that effectively a six-point scale ('no impact' linked to a five-point) was used, and that the difference between 0.00 and 5.00 is five, ranges with an extent of 0.83 (5 / 6) are used to discuss the degree of central tendency.

Firstly, it is notable that the mean scores for twelve of the fourteen manifestations are above the midpoint score of 2.50, which indicates that in general the related manifestations can be deemed to be prevalent.

The manifestations falling within the upper range of mean scores $> 4.17 \leq 5.00$ - between an near impact to impact / impact, are discussed first. The importance attribute to training in altering risk taking behaviour of

electrical construction workers is a significant indication of the need for knowledgeable construction workers.

The manifestations falling within the second range of mean scores $> 3.33 \leq 4.17$ - between an impact to near major impact / near major impact: The manifestation, electrical workers will perceive hazards differently than in other industries, is significant in terms of the view of the electrical engineering environment in acknowledging their unique work environment.

The existence of different cultures' perception of risk is indicative of the importance that cultural influences can have on risk perception. The high ranking at level three, of the influence that H&S standards have on risk perception, reiterates the importance of knowledge in altering risk taking behaviour and the influence in individuals risk perception.

The third range of manifestations, those with mean scores $> 2.50 \leq 3.33$ - between a near minor impact to impact / impact, are discussed below. Management competency is related to risk taking behaviour, is significant as the importance and relation between management competencies is rank highly in the relation between management and accidents and indicative of the need to not only address workers but also management competency. The framework of legislation, which prevents risk taking behaviour, is ranked seventh, which, it is notable lower that the manifestation of the influence of safety standard with a mean score of 2.92, which is 7.59% lower.

The ranking of safe work procedures differ among electrical construction workers is notable, in comparison to the manifestation, ranked fourth, of the influence of safety standards where the later is guidance to uniformity in work procedures.

Financially gain or other advances results in unsafe behaviour is ranked lower at position nine which indicates than manifestations such as training and cultural influences, ranked first and third, have a greater impact on risk perception.

Although ranked tenth, the indication that management training will not be the solution to risk taking behaviour, is ranked below management competency is related to risk taking behaviour, ranked six, effectively 9.73% lower than the latter, it is nevertheless a manifestation, for the need for competent management that includes both experience and relevant knowledge.

The last range of manifestations, those with mean scores $> 1.67 \leq 2.50$ - between a minor impact to near minor impact / near minor impact, are discussed below. The mean score and eleventh ranking of review that better government policing will prevent risk taking behaviour is notable as this low ranking provides the view of the current perception on the effectiveness of government inspectorates.

The mean score of the twelfth ranked manifestation, namely that H&S legislation can alter risk perception of unsafe acts, is notable in that legislation is not viewed as the strongest drivers in altering risk perception.

The view of the thirteenth manifestation that unsafe behaviour is the norm for general electrical workers, at a mean score of 2.33 can be described as the tendency and belief of the industry not to accept unsafe behaviour.

The last ranking of review that management practises do not promote H&S behaviour, are significant as the implication are that management do promote healthy and safe behaviour, but as per the manifestation ranked six that this does not imply that management has the relevant competency.

4. CONCLUSIONS AND RECOMMENDATIONS

The approach to H&S in South Africa should be expanded to take into account human behaviour factors related to the individual's psychological behaviour in relation to the capacity for analysing risk factors in a work environment. Further, should such psychological traits take into account South Africa's unique environment of different cultures and the effect change in economic expansions and technologies have on people. Weber and Hsee (1998) found consistent and reliable cross-cultural differences in risk perception and indicated that the effects of different cultural backgrounds of workers on H&S management are not always incorporated into H&S management.

Edwards et al. (2008) postulate that non compliance with H&S rules includes worker apathy and ignorance (which in turn can result from inadequate or absence of training and instruction); pressure to get the job done as quickly as possible; and lack of supervision. This aspect of 'human acts or omissions' and their relationship to H&S failings generally in construction, is well documented.

The use of standards alone is no guarantee that an organisation's H&S management system will reduce incidents of loss. Standards used in South Africa in relation to H&S are usually developed or obtained from other sources such as the International Labour Organisation (ILO). The ILO has, as one of its key functions the creation of international standards on labour and social matters where such standards are contained in conventions and recommendations.

Regarding the issue of 'how' to address the human ('failure') element, one intuitively looks toward inadequate, or lack of training and instruction. This aspect of appropriate training, education and instruction being a pre-requisite to achieving human H&S 'compliance' appears frequently in the construction literature (Edwards et al., 2008). Developing workers' competency by increasing their knowledge through training and by identifying individuals with low risk taking behaviour for high risk tasks should form part of the H&S system processes.

The future management of H&S must include the development of that section or part of this field that will concentrate on the component that interact on the process that influence human behaviour in evaluating

specific job task where this component can have significant influence on human risk behaviour.

Consequently, it can be concluded that the impact of human risk perception in the electrical construction industry is significant and forms part of that section in H&S management not always addressed.

Table 3. The impact of risk perception in the electrical construction industry

Aspect	ICMEE		ECA		SAFHE	
	Mean score	Rank	Mean score	Rank	Mean score	Rank
Training can alter risk taking behaviour of electrical construction workers	4.44	1	4.25	1	4.50	1
Electrical workers will perceive hazards differently	3.78	3	4.00	3	3.75	4=
Existence of different cultures perception of risk	4.22	2	4.13	2	2.88	10
The influence of safety standards on risk perception	3.00	6	3.00	6=	3.63	6
Electrical accidents are relates to management incompetence	3.11	5	2.25	10=	3.50	7
Management competency is related to risk taking behaviour	3.56	4	3.00	6=	3.88	3
The framework of legislation, prevents risk taking behaviour	2.67	8=	2.75	8=	3.75	4=
Safe work procedures differ among electrical construction workers	3.00	6	3.50	4	3.25	9
Financially gain or other advances results in unsafe behaviour	2.67	8=	3.38	5	2.00	13
management training not the solution to risk taking behaviour	2.00	12=	1.75	14	2.50	11
Better government policing will prevent risk taking behaviour	2.67	8=	2.75	8=	4.00	2
Health and safety legislation can alter risk perception of unsafe acts	2.00	12=	2.25	10=	3.38	8
Unsafe behaviour is the norm for general electrical workers	2.33	11	2.25	10=	2.25	12
Management practises do not promote safe behaviour	1.78	14	2.00	13	1.88	14

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Mitigating Construction Health, Safety, and Ergonomic Risks: Perceptions of Architectural Design Professionals

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ABSTRACT

Purpose

This paper presents the findings of an exploratory survey regarding the perceptions of architectural design professionals with regard to the mitigation of construction health, safety, and ergonomic risks through appropriate design.

Design

A review of literature preceded a questionnaire survey distributed to a regional population of professional architectural designers.

Findings

The most significant findings include: architectural designers do not adequately conduct hazard identification and risk assessments during the design process; appropriate design and specification can mitigate health, safety and ergonomic risks; design education inadequately prepares architectural designers in terms of construction health, safety and ergonomics and associated risks can be mitigated through improved design education.

Value

The perceptions, although arising from an exploratory survey, contribute significantly towards the finalisation of a research proposal for a PhD study, and provide an indication of the need and direction for the study, which ultimately aims at mitigating construction health, safety, and ergonomic risks.

Keywords: architectural designers; construction health, safety, and ergonomics.

1. INTRODUCTION

While the majority of construction designers strive toward 'beauty' in order to satisfy clients, as demonstrated by De Botton (2007) in his book *The Architecture of Happiness*, the risks, in terms of health, safety, and ergonomics, to the constructors is inadequately considered by the designers. The "... safety of the construction worker is often left solely to the contractor." (Szymberski, 1997)

Construction work is hazardous and the exposure to health, safety and ergonomic risks is enormous. Such risks give rise to a high incidence of illness, injury and fatalities, which a number of studies suggest could have been avoided, reduced or even eliminated (Mroszczyk, 2005; Schneider; Smallwood, 2006).

The traditional means of measuring project success is the interrelationship of cost, quality and time. This approach has little effect on mitigating hazardous construction work, which can lead to environmental damage, be counter productive, render poor quality and cause time overruns, which cumulatively increase construction costs (Schneider; Smallwood, 2006).

Hinze (2005) actively promotes the need for a paradigm shift through a proactive approach by suggesting that construction designers are in a position to make design decisions, which impact positively on the health and safety of constructors.

Toole and Gambatese (2006) capture the notions of the 'traditional approach' and 'being proactive' by suggesting that construction designs are reviewed to include health and safety considerations as well as to meet the traditional expectancies, and refer to this process as 'constructability'.

Beyond the logical dimensions of constructability, there is also the issue of professional ethics and legislation, which considers expectancies of professional conduct within a legal framework. The Constitution of South Africa serves to protect the citizens, while the Occupational Health and Safety Act strives toward protection of workers in all sectors. The South African Construction Regulations spell out the responsibilities of all people involved in the construction industry, including architectural design professionals, while the Architectural Professions Act ensures competence and integrity of 'designers'.

In summary, if architectural designers competently consider professional ethics and legislation together with a proactive approach to designing for constructability, the high incidence of illness, injury and fatalities, can be avoided, reduced or even eliminated.

The objectives of the initial exploratory phase questionnaire are to determine the perceptions of architectural designers relative to:

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- The extent to which design dictates construction relative to health safety and ergonomic risks;
- The extent to which architectural designers conduct hazard identification and risk assessments during the design process;
- The level of design skills relative to construction health, safety and ergonomics;
- The extent to which appropriate design can mitigate health safety and ergonomic risks, and
- The appropriateness of design education, in terms of health, safety and ergonomics, in mitigation of construction risks.

2. REVIEW OF THE LITERATURE

2.1 The Traditional Approach

Construction work is extremely hazardous and the exposure to health, safety and ergonomic risks is enormous. Such risks give rise to a high incidence of illness, injury and fatalities (Mrosczyk, 2005; Schneider; Smallwood, 2006).

Traditionally, construction health and safety is the responsibility of the contractors and other site professionals, and entails the construction work undertaken between the design and the completion of a structure (Mrosczyk, 2005).

There are numerous economic forces at play within the construction industry, which impact on construction health, safety and ergonomics. These are traditionally viewed, and used to assess project success, as the interrelationship of cost, quality and time. Unfortunately, this traditional approach has little effect on mitigating project risk, which leads to a high incidence of ill health, injury and death (Schneider; Smallwood, 2006). Such incidence can create environmental damage, lead to reduced productivity, sacrifice quality, extend the duration of projects and ultimately increase construction costs (Smallwood, 2006).

2.2 Professional Ethics and Legislation

Pearl (2005) quotes numerous texts to elaborate the differing opinions relating to professional ethics, in order to achieve a specific purpose. He speaks of principles which guide decisions of right and wrong conduct relative to specific groups, professions or society, as well as requiring such decisions to be of higher conduct than dictated by law, a test for the conscience of the professional.

The Constitution of South Africa (Republic of South Africa, 1996) makes founding provisions, which include 'human dignity', among others,

and the 'rights' of the citizens of the country. By law, the state must respect, promote and fulfil these rights. Relative to this paper, everyone has the right to "an environment that is not harmful to their health or well-being."

Occupational health and safety in South Africa is legislated by the OH&S Act No. 85 of 1993, and all organisations are legally required to abide by the Act for the protection of workers. Underpinning this Act, and relative to the construction industry, the new South African Construction Regulations were promulgated on 18 July 2003 (Geminiani *et al.*, 2005).

More specifically, Smallwood and Haupt (2005) contend that the intent, *inter alia*, of the South African Construction Regulations is to ensure multi-stakeholder responsibility for construction health and safety. Responsible parties include clients, designers and quantity surveyors, as well as the principal contractors. Their roles are not all elaborated here, however designers are required to, *inter alia*, provide the client with relevant design information which has an effect on cost, inform the contractor of likely construction risks, provide a geo-science technical report, advise on methods and sequence of construction, and modify the design where construction risks are apparent (Republic of South Africa, 2003).

The argument for professional ethics and legislation is enhanced by the professional, ethical and legal requirements of The Architectural Professions Act, No. 44 of 2000, which prohibits any practise in architecture without appropriate registration and provides a code of conduct ensuring that registered persons competently carry out their duties with integrity (SACAP, 2008), a case for construction health, safety and ergonomics itself.

2.3 Risk management through effective planning

With reference to safety, health, environment and quality (SHEQ) management, Cameron *et al.* (2005) see effective planning as being essential if projects are to be completed according to schedule and budget and without the negative experiences arising from construction risks.

The Construction Design and Management (CDM) regulations of 1994, since superseded by the new CDM regulations of 2007, served toward development of the 'gateway' approach in which five specific project phases, which need effective planning, were identified, namely the concept, feasibility, design, construction and maintenance phases (Cameron *et al.*, 2005). The 'gateway' approach, simply put, creates a method of assessing designers' and contractors' work and provides a model which includes performance assessments, at given intervals, throughout the construction phases.

These are not all elaborated here, but the initial two phases are briefly included to demonstrate the planning initiative and the 'gateway' approach. The 'concept' phase allows for a needs analysis which includes

the possible need for the project and defines the user needs, which is followed by 'gateway 1' involving a strategic assessment. The 'feasibility' phase then follows and is divided into two sections. The first of these includes a needs analysis providing for options to meet user needs and considers preparation of a business case. This paves the way for 'gateway 2' involving a project risk assessment. Section 2 of the 'feasibility' phase includes a needs analysis of the project brief, the feasibility study options, and the procurement strategy. 'Gateway 3' then follows requiring a procurement strategy assessment.

The 'gateway' approach ensures interim assessments that consider H&S risks, among others, at various project phases, prior to continuing with the subsequent phases (Cameron *et al.*, 2005). Such risk management through effective planning at the early stages of construction projects facilitates management of the traditional economic forces within construction projects, as well as the health, safety, and environmental risks, while still promoting quality in construction (Cameron *et al.*, 2005).

2.4 Mitigation of Construction Risks through Appropriate Design

The 'design' phase follows the concept and feasibility phases as demonstrated by Cameron *et al.* (2005), and forms the crux of this paper.

Hinze (2005) actively promotes the need for a paradigm shift from simply monitoring H&S performance to proactively improving H&S performance through continuous operational improvement, and further supports the proactive approach by suggesting that decisions made by construction designers can have a positive impact on the H&S of construction workers. Projects with a H&S focus during the design phase are more likely to render good H&S performances (Hinze, 2005).

Toole and Gambatese (2006) capture the notions of the 'traditional approach' and 'being proactive' by suggesting that "... design is reviewed to ensure it can be constructed safe(l)y, as well as meet cost, schedule and quality goals", and refer to this process as 'constructability'. Toole and Gambatese (2006) further suggest that 'Designing for Construction Safety' (DfCS) has three intrinsic qualities, recognising that:

- The construction industry is extremely dangerous and that a multi-stakeholder approach can mitigate construction risks;
- Construction risks can be mitigated through involvement of adequately educated professionals making design decisions, and that
- Design professionals are in a position to make decisions which affect H&S during the early stages of construction projects.

In short, designers should make appropriate design decisions which not only consider cost, quality and schedule, but must be all inclusive in terms of mitigating construction health, safety, and ergonomic risks. The question

arises as to the extent to which design professionals can be expected to design for health, safety and ergonomics, and how they can approach the issue at hand?

Hetherington (1995) suggests that design professionals are only expected to consider projected risks which are identifiable during the design process and that professional designers will have different input at different stages and each should aim toward reducing construction H&S risks, and further suggests that there are three main stages in the design process where construction H&S can be addressed through design interventions, namely:

- Concept stage¹, where fundamental decisions about the design are taken such as the location of structures on a building site;
- Design evolution, where earlier stages of the design process may be influenced by later decisions for example the arrangement for fixing curtain walling, and
- Detailed specifications, where decisions could further influence H&S for example the solvent content of glues and adhesives to be used for fixings.

Clients should ensure that the contractors they appoint are competent. Professional designers can only assume that the appointed contractors are sufficiently competent to execute their designs. It is important that designers therefore provide the necessary information along with their design documentation to ensure that potential risks and associated issues are clearly identified (Hetherington, 1995).

2.5 The appropriateness of design education

Toole and Gambatese (2008) reinforce the contention of Hecker *et al.* (2005), as well as Toole (2005), by suggesting that construction designers have insufficient knowledge of construction safety and relative construction processes required to adequately address mitigation of risks through design, and that people with suitable education in H&S would contribute to best design decisions. Further suggestion is that that a strong emphasis on 'designing for constructability' must be ensured through education (Toole & Gambatese, 2006).

In discussing Prevention through Design (PtD), Schulte *et al.* (2008) suggest that education can be enhanced through two mechanisms, namely through expansion of curriculum and through stimulation of professional accreditation.

¹ This is the 'concept stage' of design and should not be confused with the 'concept phase' suggested in the 'Gateway' approach, as documented by Cameron *et al.* (2005).

H&S education is inappropriate and optimisation of construction design programmes at tertiary education institutions is essential. Further education, in the form of Continuing Professional Development (CPD) courses will raise awareness levels in terms of H&S and a subsequent change of perceptions (Smallwood, 2006).

3. METHODOLOGY

The research conducted was quantitative in nature and aimed toward determining the perceptions of architectural design professionals with regard to mitigation of construction health, safety, and ergonomic risks through appropriate design.

A survey of the literature preceded the questionnaire survey conducted among 102 members of the East Cape Institute of Architects. 18 responses were received, which equates to a response rate of 17.5%. The questionnaire survey method was chosen over an interview method as respondents are considered more likely to divulge information more honestly in their own time and in the state of privacy. Furthermore, survey questionnaires were used because of the cost effectiveness thereof and the limited time available to administer the survey.

The questionnaire was designed to determine, *inter alia*, the perceptions of professional architectural designers with regard to the mitigation of construction health, safety and ergonomic risks through appropriate design. Fifteen statements were presented, the respondents being required to indicate on a scale of 1 (strongly disagree) to 5 (strongly agree), the extent to which they concur therewith. An 'unsure' option was included in order to eliminate doubtful responses. An open ended question was then included to solicit general comments pertaining to the objectives of the survey.

In terms of the perceptions of professional architectural designers, the objectives were to determine the:

- Extent to which design dictates construction relative to health, safety, and ergonomic risks;
- Extent to which architectural designers conduct hazard identification and risk assessments during the design process;
- Level of design skills relative to construction health, safety, and ergonomics
- Extent to which appropriate design can mitigate health, safety, and ergonomic risks, and
- Appropriateness of design education, in terms of health, safety, and ergonomics, and the mitigation of construction risks.

4. FINDINGS

Table 1 indicates the degree of concurrence with statements related to designing for construction health, safety, and ergonomics.

Mean scores $\geq 4.2 \leq 5.0$ indicate that the degree of concurrence can be deemed to be between agree to strongly agree / strongly agree, while mean scores of $\geq 3.4 \leq 4.2$ indicate that the degree of concurrence can be deemed to be between neutral to agree / agree. Mean scores $\geq 2.6 \leq 3.4$ indicate that the degree of concurrence can be deemed to be between disagree to neutral / neutral, while mean scores of $\geq 1.8 \leq 2.6$ indicate that the degree of concurrence can be deemed to be between strongly disagree to disagree / disagree.

The degree of concurrence is represented in terms of percentage responses to a scale of 1 (strongly disagree) to 5 (strongly agree), and a corresponding mean score between 1.00 and 5.00.

Table 1: Degree of concurrence with statements related to designing for construction health, safety, and ergonomics.

Statement	Response (%)						Mean score
	Unsure	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Appropriate design and specification can mitigate the use of hazardous materials, which cause illness and terminal disease	5.6	0.0	5.6	11.1	50.0	27.8	4.05
Design dictates construction	0.0	0.0	0.0	27.8	55.6	16.7	3.89
Improved design education in terms of construction health, safety and ergonomics can mitigate hazardous construction work	11.1	11.1	16.7	5.6	38.9	16.7	3.43
Constructors are injured, including fatal occurrences, due to exposure to hazardous construction work	5.6	5.6	16.7	16.7	44.4	11.1	3.41
Appropriate design can mitigate hazardous construction work, which places constructors at risk	5.6	5.6	16.7	27.8	33.3	11.1	3.29
Designers do not conduct hazard identification and risk assessments during the design process	0.0	5.6	16.7	33.3	22.2	11.1	3.27
Appropriate design can lead to the improvement of construction health, safety and ergonomics	0.00	11.1	22.2	11.1	50.0	5.6	3.20
Constructors become ill, including terminal diseases, due to exposure to hazardous construction materials	16.7	0.0	22.2	27.8	22.2	5.6	3.14
Constructors experience work-related							

musculoskeletal disorders (WMDs) due to the nature of construction work	33.3	5.6	16.7	16.7	22.2	5.6	3.08
Design education inadequately prepares construction designers in terms of construction health, safety and ergonomics	11.1	16.7	16.7	22.2	16.7	16.7	3.00
Appropriate design can mitigate construction accidents, which cause injuries and fatalities	5.6	16.7	11.1	38.9	27.8	0.00	2.82
Design dictates construction leading to hazardous work being undertaken by constructors	0.0	16.7	33.3	22.2	27.8	0.0	2.61
Designers lack 'designing for construction health, safety and ergonomics' skills	5.6	22.2	27.8	16.7	27.7	0.0	2.52
Constructors are placed at risk due to a lack of 'designing for construction health, safety and ergonomics' skills	5.6	16.7	33.3	33.3	5.6	5.6	2.47
Appropriate design can mitigate the incidence of constructors experiencing WMDs	33.3	11.1	16.7	22.2	5.6	0.0	2.40

The mean score of 4.05 relative to "Appropriate design and specification can mitigate the use of hazardous materials, which cause illness and terminal disease" indicates that the degree of concurrence is between neutral and agree / agree. This mean score concurs to some degree with the mean score of 3.14 relative to "Constructors become ill, including terminal diseases, due to exposure to hazardous construction materials" indicating that the mean score is between disagree and neutral / neutral, however the 16.7% unsure answer should be noted.

The mean score of 3.89 relative to "Design dictates construction" is discordant with the mean score of 2.61 relative to "Design dictates construction leading to hazardous work been undertaken by constructors", but concurs with the mean score of 3.41 relative to "Constructors are injured, including fatal occurrences, due to exposure to hazardous construction work" and the mean score of 3.29 relative to "Appropriate design can mitigate hazardous construction work, which places constructors at risk". The mean score of the latter (3.29) also concurs with the mean score of 3.20 relative to "Appropriate design can lead to the improvement of construction health, safety and ergonomics", but less concurrent with the mean score of 2.82 relative to "Appropriate design can mitigate construction accidents, which cause injuries and fatalities" and the mean scores of 3.14 and 3.08 respectively, relative to "Constructors become ill, including terminal diseases, due to exposure to hazardous construction materials" and "Constructors experience work-related musculoskeletal disorders (WMDs) due to the nature of construction work", but the unsure responses of 16.7% and 33.3% respectively must be noted. The lowest ranking mean score of 2.40 relative to "Appropriate design can mitigate the incidence of constructors experiencing WMDs" is discordant with the mentioned mean score of 3.29, but once again the unsure response of 33.3% should be noted.

The mean score of 3.43 relative to “Improved design education in terms of construction health, safety and ergonomics can mitigate hazardous construction work” concurs with the mean score of 3.00 relative to “Design education inadequately prepares construction designers in terms of construction health, safety and ergonomics”, but is in discordance with the mean scores of 2.52 and 2.47 respectively with regard to “Designers lack ‘designing for construction health, safety and ergonomics’ skills” and “Constructors are placed at risk due to a lack of ‘designing for construction health, safety and ergonomics’ skills”.

The mean score of 3.27 relative to “Designers do not conduct hazard identification and risk assessments during the design process” is in discordance with the mean scores of the previously mentioned 2.52 and 2.47 respectively with regard to “Designers lack ‘designing for construction health, safety and ergonomics’ skills” and “Constructors are placed at risk due to a lack of ‘designing for construction health, safety and ergonomics’ skills”.

Respondents were also given an open ended concluding question: “Do you have any comments in general regarding designing for construction health, safety and ergonomics?” 44.4% had no comment, 33.3% had one, 5.6% had two, 11.1% had three, and 5.55% had four, which equates to a mean of 1.0 comments per respondent. These are demonstrated as follows:

- “ Take note that any construction site can be hazardous depending on the behaviour of the ‘constructors’ on site”;
- “There are many safety procedures related to dangerous areas of construction, most of which are not followed by the constructors”;
- “The nature of construction work is dangerous”;
- “It is extremely rare for designers to specify hazardous materials – 99% of materials are accepted common-use materials”;
- “Building at 1m can be as dangerous as at 20m – The contractor is responsible for using appropriate technology and systems”;
- “Design cannot take a back seat due to improper health designs”;
- “Although designers need to be more aware and practiced in appropriate and safe design, I feel that the constructors whos(e) job place them at risk, to (where possible) liais(e) & suggest optimum methods to ensure safety and achieve design requirements”;
- “Practical training lectures would be useful for CPD purposes”;
- More emphasis should be placed on CHS in training in the construction industry”;
- “By law, architects must instruct their client to appoint an H&S consultant to draw up an H&S plan and ensure that this is implemented. This is not a normal part of an architects work. Should a client ask the architect to do this, that’s a different story”;

- “Construction work is dangerous by nature”;
- “All materials if not used correctly, can be dangerous”;
- A Professional contractor should have all the necessary skills and equipment to be able to deal with any design”;
- “90% of all designs are conventional construction with no more than average risk”;
- “Construction by it’s nature is hazardous (High rise, basements, machinery etc). How this is managed is the contractor’s responsibility. However, architects need to be informed by the industry how to assist safety thro’ designs”;
- “Besides that the design may be challenging and unconventional, constructors like short cuts and cutting costs even if it means carryout works unsafely. There is always a way to carry out works safely, but it is costly for unconventional projects”;
- The client, the designer and constructor must always take responsibility to ensure that the works is carried out safely. We cannot point finger to one party it’s a joint responsibility”, and
- “There must always be health and safety officer on site 24hrs to makes sure works are carried out safely”.

5. CONCLUSIONS

Given the objectives and methodology of the study, it is likely that the responses received were from the more committed architectural designers.

The responses from the open ended question in particular, indicate that architectural designers perceive H&S to be the contractor’s problem and constitute a mindset that does not promote a multi-stakeholder approach to H&S.

The study indicates that architectural designers do not adequately conduct hazard identification and risk assessments during the design process, yet consider their designing for construction health, safety, and ergonomics skills to be adequate.

They concur that appropriate design and specification can mitigate health, safety, and ergonomic risks, especially in terms of hazardous materials usage, which causes illness and terminal disease. However, with respect to this and work-related musculoskeletal disease (WMDs) there appears to be some doubt, or lack of knowledge, as demonstrated by the number of ‘unsure’ answers.

The respondents also concur that design education inadequately prepares architectural designers in terms of construction health, safety and ergonomics and further concur that the associated risks can be mitigated through improved design education.

6. RECOMMENDATIONS

Further research in relation to designing for construction health, safety, and ergonomics is essential and design education must fully integrate health, safety, and ergonomic issues into the design process. This must be addressed by tertiary education institutions which offer architectural design programmes, as well as through Continuing Professional Development (CPD) programmes.

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TG592009-43

Professionals' Perceptions Regarding Factors Influencing Project Delivery Time

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ABSTRACT AND KEYWORD

Purpose of this paper

Timely completion of projects has eluded construction managers from time immemorial. Despite development in construction time planning, activity duration estimation and schedule development, the problem of delays in construction still persists. This has continued to be a problem of concern to clients, contractors, and researchers. Based on the aforementioned, the study aims to determine the factors which most influence construction project delivery time in the building construction industry in South Africa.

Design/methodology/approach

This study is at the exploratory phase, and the methodology adopted is that of a preliminary survey of the literature and an exploratory survey of professional groups in the construction industry namely: contractors in the form of Executive Committee of the East Cape Master Builders Association (ECMBA), and members of the South Africa Institute of Architectural Technologists (SAIAT).

Findings

The findings of the study indicate that the Architectural technologists rated factors related to construction higher, and the contractors rated factors relating to design higher with regard to these factors' influence on project delivery. The Architectural Technologists rated quality of management during construction, constructability of design, and motivation of staff as factors which exert the most influence on construction project delivery time, while the contractors rated quality of management during construction, quality of management during design, and design coordination as factors exerting the most influence on construction processes. Both groups rated

economic policy as the factor least influencing construction project delivery time.

Research limitations/implications (if applicable)

The EC MBA sample was small and regional and the SAIAT was large and national, based on the experience and integrity of these personnel surveyed, the findings can be said to be reliable.

Practical implications (if applicable)

Based on the findings of the study stated, recommendations to mitigate the effects of influences on project delivery time are proposed. Firstly, adequate motivation of staff, this will lead to high productivity. Secondly, paying greater attention to quality of management during construction will reduce or eliminate delays on construction projects.

Keywords: Construction, project delivery, delays, professionals, perceptions

1. INTRODUCTION

The problem of delays in the construction industry is a global phenomenon (Sambisivan and Soon, 2006). It is not in the interest of parties to a contract for projects to be delayed. This situation arises as a result of the influence factors controlling the execution of projects have on project delivery with respect to cost, quality, and time. When projects are delayed, it is an indication of the level of competence of either the consultants or contractors. Observation has revealed that peculiar problems, as far as project management is concerned, still exist (Jha and Iyer, 2005).

The introduction of complex projects involving the use of large quantities of concrete and steel resulting in the engagement of multiple designers, contractors, subcontractors, construction managers, consultants and specialists, has made the management of projects complex. This implies that, unless management has a firm control of the construction processes, scheduled delivery time may be exceeded. Coordination of project tasks forms one of the primary factors for successful project delivery, so also is supervision and materials availability. Jha and Iyer (2005) define coordination as unifying, harmonizing and integrating different agencies involved in any industry with multiple objectives. The following constitute items that require coordination on site: materials delivery and storage; movement and maintenance of machines; techniques, and human resource requirements.

The availability of materials on site is very important to enable projects to be delivered on time or as per schedule. Availability means having an adequate quantity of materials according to the requisite quality standards at all times. Availability of materials on site will ensure that the project does not run out of stock of any materials. This will reduce the rate of rejection of materials and leading to the reduction or elimination of stoppage of work and delays.

Supervision entails that, management ensures that the right method of construction is used; that the specified materials are used in construction and are correctly placed, and that the targeted plan is achieved. A process of obtaining feedback on activities or accomplished tasks should be instituted. This will enable a monitoring plan and indicate where there is deficiency, so that efforts can be directed towards these areas.

In the past, the building construction industry has been criticized for its lack of use of new technology and machines. The development and use of powered equipment, such as: the powered jigsaw; circular saw; universal screw driver; planner; rotary hammer, and mechanically lifting machines has a considerable impact on the time taken to complete tasks and projects overall. The utilization of panels and standard boxes / moulds for column and beams has a great impact on construction time reduction regarding utilization of new technology.

An improvement of the construction methods, tools, plants and equipment identified by Tam *et al.*, (2002) is declared to be the most likely approach to reducing time; cost, and improving the quality of a project delivered. Processes and equipment do not operate themselves and given that they are operated by human resources, operational knowledge and application of these construction inputs (resources) requires a certain competency level. This will result in an improvement in the performance on projects. Based on the aforementioned, the study aims to determine the factors which most influence construction project delivery time from the view point of two sample strata involved in the building construction industry in South Africa.

2. PREVIOUS STUDIES

Prior to 2000, several research studies were conducted in different parts of the world with respect to the causes of construction delays. A summary of these various studies is presented in Table 1 adopted from Toor and Ogunlana (2008). The various types of studies that were conducted are: causes of delays in construction project delivery; the effects of delay, and others on the predictive model for construction period estimation. From these studies, seventy problems that have potential to initiate delays on a project were identified. These were classified into fourteen groups, and they form the theoretical framework of this study.

3. METHODOLOGY

A pilot survey was conducted to assess the perceptions of the members of the Executive Committee of the East Cape Master Builders Association (ECMBA) and Architectural technologists through the use of a questionnaire. Descriptive statistics in the form of frequencies and a measure of central tendency in the form of a mean score (MS) were generated from the analysis of the data. Ratings relative to 'does not' and a range of 1 (minor) to 5 (major), were converted to percentages, and a MS ranging between 0.00 and 5.00. Given that effectively a six-point scale - 'does not' linked to a five-point scale was used, and that the difference between 0 and 5 is five, the midpoint of the range is 2.50.

In terms of ranking, where factors had the same MS, the factor with the lower standard deviation was afforded priority ranking.

Generally, the survey sample is considered to be reliable because: they have well over five years of experience, and they have handled both small and large projects, which include residential units, office complexes, and shopping malls. The questionnaire was delivered per e-mail and facsimile to the members of the Executive Committee of the ECMBA - the second option yielded better results. Secondly, the questionnaire was distributed at a seminar held by the South African Institute of Architectural Technologist (SAIAT). A total of eleven completed questionnaires were received from the total of twenty-four members of the Executive Committee of the ECMBA, which represents a 45.8% response rate. According to Pheng and Chuan (2005) this response rate is acceptable in construction research using such a data gathering method. A total of fifty-nine questionnaires were returned completed out of a total of one hundred circulated at the SAIAT seminar, which equates to a response rate of 59

Table 1 Top 10 problems causing construction delays in previous studies

Sullivan & Hans (1986)	Okpala & Anikekwu (1988)	Ogunlan et al (1996)	Kaming <i>et al.</i> (1997)	Chan & Kumaraswamy (1998)	Assaf <i>et al.</i> (1995)
UK	Nigeria	Thailand	Indonesia	Hong Kong	Saudi Arabia
Waiting for information	Contractors' difficulties in receiving interim payments from public agencies	Materials procurement	Design changes	Poor site management	Cash flow problems faced by contractors
Changed orders	Contractors' financial difficulties	Waiting for information	Poor labour productivity	Unforeseen ground conditions	Delay in the preparation of contractor submission
Ground problems/Site inspection	Inadequate public agencies' budgets	Poor contractor management	Inadequate planning	Delays in design information	Difficulties in obtaining work permits
Bad weather	Deficiencies in contractors' organizations	Labourers/tradesmen shortages	Locational restriction of the project	Lack of communication between consultant and contractor	Government tendering system requirement of selecting the lowest bidder
Design complexity	Deficiencies in planning and scheduling	Waiting for information	Skilled labour shortage	Inadequate contractor experience	Delay in progress payment by the owner
M & E subcontractors	Frequent variation/changed orders	Design delays	Equipment shortage	Low speed of decision making involving all project teams	Effects of subsurface conditions of soil
Obstructions	Difficulties in obtaining Construction materials	Planning and scheduling deficiencies	Materials shortage	Client-oriented variations	Delay in mobilization
M & E plant procurement	Deficiencies in public agencies' organizations	Construction plant shortages	Inaccurate prediction of equipment production rate	Necessary variations of works	Changes in scope of project
Materials procurement	Contractors' unrealistic tenders	Change orders	Inaccurate prediction of craftsmen production rate	Delays in subcontractors' work	Ineffective planning and scheduling of project by the contractor
Statutory undertakers	Unrealistic contract duration imposed by public agencies	Contractor's financial difficulties	Inaccuracy of materials estimate	Improper control over site resource allocation	Shortage of manpower (skilled, semi-skilled, and unskilled labour)
Lim and Mohamed (2000)	Frimpong <i>et al.</i> (2004)	Long <i>et al.</i>	Faridi and El-Sayegh (2006)	Assaf and Al-Hejji (2006)	Sambasivan and Soon (2007)
Malaysia	Ghana	Vietnam	UAE	Saudi Arabia (consultants)	Malaysia

Table 1 continued
Electrical transmission lines

Groundwater projects	Large construction projects	General (construction industry)	Different projects	General (Construction industry)
Lacked experience	Monthly payment difficulties	Slow site clearance	Difficulties in financing project by contractor	Improper planning
Lacked site supervision	Poor contract management	Slow government permits	Inadequate contractor's experience	Site management
Lacked appropriate skills	Material procurement	Inaccurate time estimating	Shortage of labour	Inadequate contractor experience
Lacked knowledge	Inflation	Lack of capable representatives	Delay in progress payments by owner.	Financial and payments Completed work
Commercial interests	Contractors' financial difficulties	Contractors' financial difficulties	Delay in material delivery	Subcontractors
Lacked feedback	Escalation of material prices	Improper planning and scheduling	Poor site management and supervision by contractor	Shortage in material
Unforeseen circumstances	Cash flow during Construction	Unsatisfactory site	Ineffective planning and scheduling of project by contractor	Labour supply
Unusual site conditions	Planning and scheduling deficiencies	Inadequate experience	Type of project bidding and award	Equipment availability and failure
lacked follow-up	Bad weather	Obsolete technology	Poor qualification of the contractor's technical staff	Lack of communication between the parties
Inadequate planning	Deficiencies in cost estimates prepared	Lack of responsibility	Low productivity level of labour	Mistakes during construction stage

SOURCE: ADAPTED FROM TOOR AND OGUNLANA (2008)

3.1. Data Presentation and Discussion

Tables 2 and 3 indicate the extent to which factors affect project delivery time performance in terms of percentages relative to 'does not' and a scale of 1 (minor) and 5 (major), and a MS between 0.00 and 5.00. Given that the MSs for all the fourteen factors are above the midpoint score of 2.50, in general, all the factors can be deemed to exert influence on project time delivery performance.

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Table 2 Perceptions of Architectural Technologists regarding the extent to which factors influence construction project delivery time performance

Factor	Response (%)							MS	Rank
	Unsure	Does not	Minor Major						
			1	2	3	4	5		
Quality of management during construction	0.0	0.0	0.0	0.0	0.0	18.2	81.8	4.82	1
Constructability of design	0.0	10.0	0.0	0.0	0.0	30.0	70.0	4.70	2
Motivation of staff	0.0	0.0	0.0	0.0	18.2	9.1	72.7	4.55	3
Physical environmental considerations	0.0	0.0	0.0	0.0	9.1	36.4	54.5	4.45	4
Design coordination	0.0	0.0	0.0	0.0	9.1	45.5	45.5	4.36	5
Management techniques used for planning and control	0.0	0.0	0.0	0.0	18.2	36.4	45.5	4.27	6
Quality of management during construction	0.0	0.0	0.0	9.1	18.2	9.1	63.6	4.27	7
Site access	0.0	0.0	0.0	0.0	27.3	27.3	45.5	4.18	8
Site ground conditions	0.00	0.0	0.0	9.1	9.1	9.1	45.5	4.18	9
Management style	0.0	0/0	0.0	0.0	27.3	45.5	27.3	4.00	10
Client understanding of the design, procurement and construction processes	0.0	0.0	0.0	9.1	18.2	18.2	45.5	3.73	11
Economic policy	9.1	0.0	0.0	9.1	27.3	18.2	18.2	3.70	12
Socio-political	9.1	0.0	9.1	9.1	36.4	18.2	9.1	2.80	14

conditions
State of the
nation's
economy

Table 3 Perceptions of the ECMBA Executive regarding the extent to which factors influence construction project delivery time performance

Factor	Response (%)							MS	Rank
	Unsure	Does not	Minor..... Major						
			1	2	3	4	5		
Quality of management during construction	0.0	0.0	0.0	0.0	9.1	27.3	63.6	4.55	1
Quality of management during design	11.1	0.0	0.0	11.1	0.0	33.3	44.4	4.25	2
Design coordination	0.0	0.0	0.0	0.0	27.3	27.3	45.5	4.18	3
Motivation of staff	0.0	0.0	0.0	0.0	0.0	90.9	9.1	4.09	4
Management techniques used for planning and control	0.0	0.0	0.0	0.0	18.2	54.5	27.3	4.09	5
Constructability of design	0.0	0.0	0.0	27.3	0.0	27.3	45.5	3.91	6
Site ground conditions	0.0	0.0	0.0	9.1	36.4	18.2	36.4	3.82	7
Client understanding of the design, procurement and construction processes	0.0	0.0	0.0	18.2	27.3	9.1	45.5	3.82	8
Management style	0.0	0.0	0.0	9.1	27.3	54.5	9.1	3.64	9
Site access	0.0	0.0	20.0	10.0	20.0	40.0	10.0	3.10	10
Socio-political conditions	0.0	0.0	9.1	18.2	45.5	18.2	9.1	3.00	11
Physical environmental considerations	0.0	0.0	18.2	18.2	9.1	54.5	0.0	3.00	12
State of the nation's economy	9.1	9.1	0.0	27.3	9.1	36.4	9.1	3.00	13
Economic policy	18.2	0.0	9.1	27.3	36.4	9.1	0.0	2.56	14

A comparative analysis of perceptions of Architectural technologists and contractors as presented in Tables 2 and 3.

The factor that exerts the most influence regarding project delivery time, according to Architectural technologists and the members of the Executive Committee of the ECMBA is quality of management during construction. The level of control achieved dictates the promptness with which a project will be delivered. Control in this regard includes: control over technology of construction, that is usage of the right and advanced methods of construction to avoid repetition of work (getting the work done right first time); control over human resources; control over machines (movement and maintenance) to avoid machine breakdowns and response to breakdowns of machine, (repairs); and control of materials in order to avoid situations leading to a lack of materials on site, which will entail regular stock taking and ordering of materials long before they are finished.

Relative to Architectural technologists, constructability of design is ranked second, whereas relative to the ECMBA it is ranked sixth. It may be due to the fact that, an architectural technologist's occupation is primarily the design of buildings. Additionally, the combination of similar work and the use of modular units contribute to speedy construction of buildings.

Motivation of staff is ranked third relative to Architectural technologists and ranked fourth relative to the ECMBA. In any circumstance, motivation influences the behaviour of workers. Depending on the level of motivation given, it could positively or negatively affect the execution of work. Motivation is used as an inducement for higher productivity. This implies that when there is a high level of motivation, work is accomplished faster.

Physical environmental conditions are ranked fourth relative to Architectural technologists, while it is ranked twelfth relative to the ECMBA. The sub-factors which contribute negatively to project delivery from this factor are rainfall, and temperature. Workers stop work when it is raining, the accumulation of which over a long period could have an adverse effect on project delivery, as do high temperatures and extreme cold conditions.

Design coordination is ranked as the fifth highest factor relative to Architectural technologists and third relative to the ECMBA. When there is ambiguity in design, in the form of inaccuracy of dimensions and missing information it results in delays in the accomplishment of tasks and in the delivery of the project. Architectural technologists might have responded as they did due to their knowledge of design. They are aware that the effort and time required to effect changes or make shop drawings might be enormous.

Quality of management during design is ranked sixth relative to Architectural technologists and second relative to the ECMBA. In order to achieve design which is devoid of missing information and inaccurate dimensions, much time must be invested at the design stage to ensure that all information is in place prior to the awarding of a contract. Drawings must be debated and vetted and a critical analysis of design must be done and approved in-house before submission to a local authority for vetting.

Management techniques used for planning and control is ranked seventh relative to Architectural technologists and fifth relative to the ECMBA. The likely reason for this ranking is that architectural technologists are responsible for the production of building designs on behalf of the client. Once this is completed and the contract is placed; architects represent the client and press for delivery of the project on time from the contractor. A contractor is requested to submit a work schedule for the project, with which the architect and other consultants demand adherence.

Site ground conditions are ranked eighth relative to Architectural technologists and seventh relative to the ECMBA. When a soil test is not done and underground services are not discovered prior to the commencement of a project it adversely affects the delivery time of the project.

Site access is ranked ninth relative to Architectural technologists and tenth relative to the ECMBA. There is also a close relationship in the rating of this factor in terms of influencing power over project delivery time. Associated problems of site access are delay of materials and the constant breakdown of contractors' trucks and vans due to poor site access.

Economic policy is ranked tenth relative to Architectural technologists and fourteenth, relative to the ECMBA. As a result of the process to be undergone to remedy lapses (time to making funds available and time for replacing order). Economic policy may affect the interest rate and consequently affect the importation of equipment as specified in designs. Final cost and time may be affected due to undergoing the process needed to remedy lapses stemming from policy change.

Client understanding of the design procurement and construction processes is ranked eleventh relative to Architectural technologists and eighth relative to the ECMBA. The responsibility of a client regarding project procurement in the traditional contract system is vested in the architects. Due to this, architects do not see the need for the client to have any knowledge of the design, procurement and construction processes of the facilities they propose to build. Otherwise, the services of the architect and builder would not be required. The client could then build their facility.

Management style is ranked twelfth relative to Architectural technologists and ninth relative to the ECMBA. Management style directly affects the contractor and it reflects on the method employed in getting the workforce to achieve targeted plans.

Socio-political conditions are ranked thirteenth relative to architectural technologists and twelfth relative to the ECMBA. Based on the mean score, it has more of a minor effect than a major effect on project delivery time according to both groups, and sub-factors such as strike, civil war, and commotion are those that contribute to the delay in project delivery time in this category.

The state of the nation's economy is the factor that least influences project delivery time according to the perceptions of Architectural technologists, while it is ranked thirteenth relative to the ECMBA. In

essence it can be deemed to influence project delivery time more to a minor than a major extent.

4. CONCLUSIONS AND RECOMMENDATIONS

Both groups of professionals agree that quality of management during construction is the factor which has the most influence on project delivery time. Factors that relate to construction are recognized by Architectural technologists as having more influence than factors that are related to the design of the project. These are: constructability of design; design coordination, and management during design. Factors that are closely ranked: site ground conditions, and site access. The factors that least influence project delivery time are: state of the nation's economy, and socio-political considerations. Recommendations include that greater attention to quality of management during construction and motivating workers will reduce or eliminate delays on construction projects

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Appropriateness of Eurocentric Health Measurement Tools

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ABSTRACT

Purpose of this paper

Medical surveillance is a relatively new phenomenon in the South African Construction Industry in comparison to general industry. In construction, medical surveillance is limited to prescribed categories of workers. The traditional medical surveillance instrument has been shown to identify health issues. In 1981 the 'Work Ability Index' (WAI) was introduced by the Finnish Institute of Occupational Health (FIOH) to determine work ability among older workers, and their propensity for disability.

Design methodology/Approach

This paper examines some of the literature relating to the current medical surveillance systems used in South Africa, and the WAI. A portion of the findings of a South African pilot study using the WAI, are discussed.

Findings

Literature indicates a decline in health status after 45 years of age, whereas the South African sample indicates a decline after 35 years of age in both men and women. Cardiovascular diseases were noted as being the

second highest of all groups and musculoskeletal disorders 50% lower in comparison to the other groups.

Research Limitations

The sample size is small in comparison to those of international literature. Further study is required to determine whether the WAI would be able to be used in occupational health care in the South African setting.

KEYWORDS: Medical Surveillance, Work Ability Index, Construction Industry, Construction

1. INTRODUCTION

The Construction Industry is an important part of a country's economy. Construction workers' are therefore an important asset, and given the high rates of occupational injury, loss of skills, and migrant labour, could be deemed to be a vulnerable group. Construction health and safety (H&S) is complex and cannot be considered in the same manner as H&S in general industry. Work is hard, highly physical in nature, and generally occurs in difficult conditions. Construction workers normally work as contract workers, and could have up to five employers per annum (Ringen, Englund, Seegal, McCann and Lemen, 2000). Construction workers have one of the highest rates of work related illness of all occupational groups (HSE, 2008).

The International Labour Organisation (ILO) and World Health Organisation (WHO) Committee on Occupational Health (OH) produced a definition of Occupational Health: *'Occupational Health should aim at – the promotion and maintenance of the highest degree of physical, mental and social well being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; placing and maintenance of a worker in an occupational environment adapted to his physiological and psychological equipment and, to summarise, the adaptation of work to people and of each person to their job'* (cbh, 2008).

Medical surveillance is a measurement tool that measures the health status of workers exposed during their work, as defined by the WHO and ILO, in a variety of ways. In the South African setting, the occupational health industry has developed instrumentation that is widely utilized to measure the health status of workers. In 1981 the Finnish Institute of Occupational Health (FIOH) developed the 'Work Ability Index' (WAI) as an alternative measurement instrument. This paper attempts to determine whether the WAI could be used in the South African context, as there is often criticism placed on the importing of information, rather than using or developing technology or tools that are African.

2. THE CASE FOR MEASUREMENT OF CONSTRUCTION WORKER HEALTH

In the United Kingdom (UK), an estimated 2.8 million working days are lost due to an illness caused, or made worse by a current or most recent job in construction. The estimated annual cost of work related ill health to the UK construction industry is £760 million; with the overall cost to society being significantly higher. With serious staff shortages and skills, it is predicted that each year, approximately 87000 workers will be required to replace those leaving the industry through retirement and other reasons, in order to maintain the industry's development (HSE, 2008). In comparison, 45% of construction workers in the European Union (EU) say their work affects their health. Workers in the construction sector have greater exposure to biological, chemical and ergonomic risk factors, as well as noise and temperature. The costs of accidents and ill health in the sector are known to be high, yet are unmeasured. Furthermore there is a shift in the European workforce. Workers are ageing, with females, contract and migrant workers increasing (OSHA, 2009).

South African information is limited in availability relative to illness and injury. Statistics from the Compensation Commissioner were last updated in 1999, therefore very outdated (CidB. 2009). The Construction Industry has the option to register with Federated Employers Mutual Association (FEMA) or the Compensation Commissioner to cover occupational injuries and disease. However FEMA only covers approximately 20% of the Construction Industry and statistics therefore cannot be deemed to be representative. As there is under reporting for occupational diseases, there is minimal information published for the industry.

Historically less effort has been directed towards health matters in the construction industry in favour of the more high profile, and perhaps more easily solvable problem of H&S. Reasons for this discrepancy or difference in emphasis include:

- That health is seen as a complex issue;
- That long term strategies are required;
- That benefits are not immediate and are consequently difficult to demonstrate;
- That exposure to hazards with different health risks can be multiple and vary in nature and level;
- That health has a low profile;

- The 'macho culture' inherent in the workforce;
- The mobile and temporary nature of the workforce, and
- A lack of health expertise within the industry (Deacon *et al.*, 2004).

3. AGEING, VULNERABLE WORKERS

According to Ilmarinen (2001), chronological ageing starts at birth and ends at death. Therefore, anyone between 15-64 years of age could be considered an ageing worker. However, the definition of an ageing worker is based on the period when major changes occur in relevant work related functions. Major changes are those that occur during the course of working life. Physical functioning capacities decline after the age of 30 years, and can become critical after the following 15-20 years if the physical demands of work do not decline.

Most conventional industries have a Human Resources (HR) department to manage workers, their placement, and changes to the type of employment (OSHA, 2009). However, in construction the aforementioned is better practice and applies to larger construction companies that have an HR department. Absenteeism statistics are not used as an indicator in the H&S field in SA construction, therefore figures are unknown.

Older workers are a new challenge in occupational health. Human resources requirements change with age especially where related to health. A survey in the EU in 2000 indicated a total of 40% of men and women >45 years of age who reported that work affects their musculoskeletal and psychosocial symptoms. A total of 40% also reported work-induced stress symptoms. Sickness absence rates of at least 3 days/year were reported as to be caused by work in 33% of men and 38% of women. In general, the survey showed that work-related health problems are common among men and women >45 years of age (Ilmarinen, 2006).

4. MEDICAL SURVEILLANCE

There is evidence that there is a relationship between chronic diseases, working conditions and associated risk factors. Examples include: biomechanical loading of the spinal column and whole body vibration predispose to lower-back injuries and related disorders. Stressful occupations such as truck driving, and manual labour can not only affect the intervertebral discs, but are associated with the development of cardiovascular diseases (Carbone *et al.*, 2005). Medical surveillance consists of a number of interventions by Occupational Health professionals. Interventions occur prior to commencing work (pre-placement), at periodic intervals depending upon the nature of risks and exposure, and when exiting employment (Deacon *et al.*, 2004, cbh, 2008).

4.1 PSYCHOSOCIAL ISSUES

The prevention of harm to workers from psychosocial risks such as work-related stress and bullying is linked to attitudes to ageing. Negativity and discrimination can have a direct impact on the health and safety of workers (OSHA, 2009).

Goedhard and Goedhard (2005) cite perceived work stress as an important part of job demands. Where stress is high there are negative consequences relative to performance. High levels of stress include raised absenteeism, reduced work ability and potentially the development of disease.

4.2 THE CONVENTIONAL METHOD OF MEDICAL SURVEILLANCE

The conventional medical surveillance instrument used to measure a workers health status is a clinical, quantitative tool, used to determine the state of health at a particular moment in time. It is not known where the medical surveillance instrument originated. Detailed information collected seeks to identify any signs or symptoms of occupational and non-occupational diseases. Information collected is grouped into sectors and include, *inter alia*:

- Full medical and surgical history;
- Occupational history;
- Family history;
- Social aspects (substance usage, smoking, social activities), and a
- Full physical examination (of all systems) (Deacon et al., 2004).

Each sector of information collected has a particular role in terms of determining the workers level of fitness and suitability relative to the work done. On completion of the intervention, a level of fitness is noted. The levels of fitness are indicated in table 1. Workers identified with signs or symptoms of disease are referred for diagnosis, or for treatment. The OH professional would be expected to refer a worker for further interventions should the findings be between levels 2 and 5.

Table 1. Levels of fitness

FITNESS OUTCOME	LEVEL
Able to perform the work without any harmful effects.	1
Able to perform the work, but with reduced efficiency or effectiveness	2
Able for perform the work, although this may have a harmful effect on the medical condition.	3
Able to perform the work, but not without an unacceptable risk to his/her health and safety and/or the health and safety of other workers or the community.	4
Physically or mentally incapable of performing the work in question.	5

Findings from a research study by Deacon et al. (2004) among construction workers' indicated that 97% were fit to do their job, with 3% requiring urgent attention. However, a large number of those that were fit had to be referred for further treatment, or be treated for ailments that could become worse if not treated. The purpose of the study was to determine, among other, whether such an instrument would be able to identify health issues of non-occupational as well as occupational.

5. THE WORK ABILITY INDEX

The WAI was developed in 1981 by the FIOH (FIOSH, 1998) as an instrument to be used in occupational health care. Its key purpose is to determine the worker's individual ability to perform work. The questions take into account the physical and psychological demands of work, including the worker's current health status and resources. The WAI collects qualitative information relative to the workers' own opinion of health status, rated against own lifetime best. Each question is scored and the OH professional would recommend further interventions based on the overall score provided.

The WAI allows OH professionals to determine specific workers and working environments needing support and/or workplace improvement. Support would be needed when workers' ability is reduced, and there is potential of disability or not being able to continue with current employment.

The WAI uses a scoring system that classifies workers into various categories ranging from 'poor' to 'excellent'. Each classification has an outcome ranging from having to 'restore work ability' (where the work ability is 'poor'), to 'maintaining work ability' (where work ability is 'excellent'). Table 2 indicates the classification of the WAI.

Table 2. WAI Category Classification.

Points	Work Ability	Objective Measures	of
7-27	Poor	Restore work ability	
28-36	Moderate	Improve work ability	
37-43	Good	Support work ability	
44-49	Excellent	Maintain work ability	

The information collated in the WAI is a general and surgical history. Scores are given a weighting and thus an outcome is determined. The WAI is designed to determine a longitudinal profile of worker health status. The desired outcome of adequate OH care is quality of life. Workers who are healthy have good work ability, production is raised, quality of life is good and this in turn related to an active and meaningful 'third age' (retirement).

The WAI is used in Europe extensively. Research by Ilmarinen (2006) using the WAI, indicated that a number of workers reached their working peak prior to age 50, and within five years, 15-25% reported a significant reduction in their ability to work. The cohorts were in physically demanding jobs of which some mentally demanding positions. It is because of the aforementioned that those within the 45 or 50 year age group have often been used as the base criterion for the term "ageing worker". Clearly prevention is easier if started earlier. The need for early action has been emphasised by the low participation rates of workers who are aged 55 years or older, including the early exit of this age group from work life all over the world. As Individuals age differently preventive measures are more challenging.

5.1 SOUTH AFRICA AND THE WAI

The WAI was used to measure the work ability of construction workers employed by a South African parastatal, and 2 of their Contractors. A total of 123 workers participated in the study. A total of 74% indicated they were married, and 80% had college or university education. A further 32% indicated at least grade 9 education. Table 3 indicates the ages of the respondents.

Table 3. Age distribution of respondents.

Age Categories	% Respondents
<25	4.07
26-35	31.71
36-45	35.77
46-55	22.76
>55	5.69

Table 4 indicates the distribution of the WAI scores for both genders and across the age categories. There were no women in the age categories over 46-55 and older. Only 7.14% (1 no.) of the men indicated their health to be 'poor' among the 46-55 year age group. The majority of the cohort ranked 'good'. It is notable that the women across all the age groups had much higher scores in the moderate range in comparison to the men.

Table 4. Distribution of respondents: gender and age.

WAI	<25		26-35		36-45		46-55	>55
	Men	Women	Men	Women	Men	Women	Men	Men
Poor	0.00	0.00	0.00	0.00	0.00	0.00	7.14	0.00
Moderate	0.00	33.33	6.25	21.74	7.89	33.33	17.86	42.86
Good	100.00	66.67	43.75	47.83	55.26	33.33	57.14	42.86
Excellent	0.00	0.00	50.00	30.43	36.84	33.33	17.86	14.29
n	2	3	16	22	38	6	28	7

Figure 1 indicates the WAI scores of the male and female respondents across the age categories. Literature indicated that there is a decline in health status after 45 years of age. These data indicate that there is a decline after 35 years of age. The aforementioned finding is similar in the female cohort.

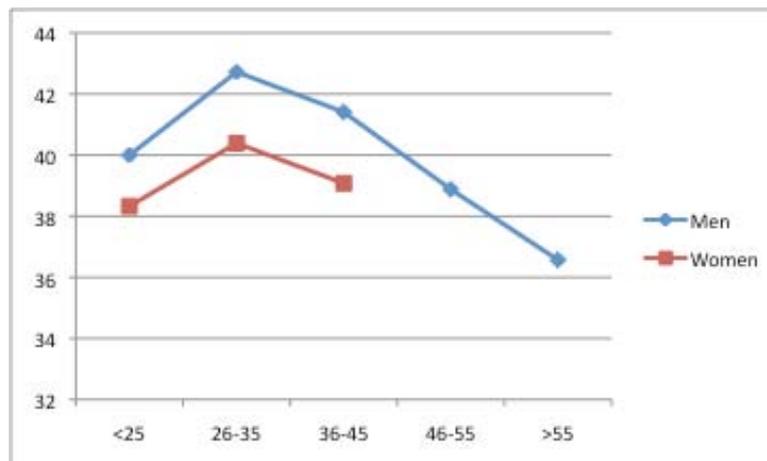


Figure 1. WAI score of respondents.

Table 5 indicates a comparison between EU data of various occupational categories and the South African cohort. The diseases listed in the questionnaire are listed. The highest score among most of the groups is 'injury due to an accident'. Cardiovascular and Respiratory diseases ranked second and third respectively. Musculoskeletal diseases ranked fourth among this category. It is of significance that this category is 50% lower than the next group. Neurological and digestive disorders were lowest in comparison. Tumours and Cancers were second highest in this category.

Table 5. Prevalence of current diseases across various occupational categories.

Current Diseases	Clerks	Nurses	Physicians- Biologist	Heavy Manual workers	Light manual workers	Construction (SA)
n	196	529	270	247	207	123
Injury due to an accident	17.35	26.47	22.22	27.53	14.49	20.33
Musculoskeletal disease	27.55	38.37	26.30	48.18	24.64	11.38
Cardiovascular disease	17.86	10.59	14.07	14.17	14.98	16.26
Respiratory disease	15.82	18.34	11.85	28.74	11.59	13.01
Mental disorder	4.59	6.05	4.07	4.45	4.35	2.44
Neurological or sensory disease	11.73	12.10	10.74	47.37	17.39	9.76
Digestive disease/condition	16.33	24.20	16.67	16.60	10.63	4.07
Genitourinary disease	8.16	12.85	5.56	6.07	6.76	7.32
Skin disease	9.69	17.77	15.56	9.31	5.31	6.50
Tumour or cancer	2.04	3.40	0.74	0.00	0.48	3.25
Endocrine or metabolic disease	6.12	9.83	5.93	10.53	4.35	2.44
Blood disease	1.53	10.21	3.70	1.21	1.93	0.81

6. CONCLUSIONS AND RECOMMENDATIONS

The distinct difference between the traditional medical surveillance instrument and the WAI is that of workers' own perceptions of their ability to

work. Absenteeism levels are known to be high in Europe, and occupational injuries and diseases are well documented. However the WAI does not include a physical examination to confirm the evidence given by the worker, or to identify any new signs or symptoms in existence. Nor is any occupational history taken to determine previous exposure to risk. A notable factor identified among the South African cohort is the decrease in WAI score from the age of 35 years, which is at least 10 years less than literature indicates. The aforementioned needs further research to determine if those data are reproducible.

Unfortunately the data in the research by Deacon *et al.*, 2004 was not collated in terms of individual prevalence, but should be done in the future to better compare these data. Further research using a much larger sample is required. In-depth comparisons with the WAI and the traditional medical surveillance instrument are recommended.

The Construction industry does not apply to the concept of medical surveillance in the same manner as general industry. Absenteeism statistics need to be reported on as part of the H&S statistics to identify workers at risk. Early interventions relative to abnormalities detected are clearly needed and need to be managed by Contractors. Toolbox talks covering health issues could be a means of dealing with educating workers as part of ongoing health promotion programmes.

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Role Playing is not Enough: Improved Education for Design Professionals in Relation to People with Disabilities

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ABSTRACT

Purpose:

The principles of Universal Design (UD) are discussed in this paper. The application of these to building and urban design has ensured a better quality of life for users with disabilities. To create an accessible environment the design profession needs to adopt new attitudes and the design process and its teaching strategies must change.

Design education with role playing and participatory design activities is discussed.

Design Methodology/approach:

A teaching experience is presented, with the goal to develop student awareness of users with special needs. New design communication instruments were developed, such as tactile maps, for the user participation, with special attention given to visually impaired users.

Findings:

Role playing as a means of bringing students closer to the issues of users with disabilities was shown to be insufficient and the creation of a collaborative design process was important to increase student's sensibility. The active participation of users with disabilities ensured that

future professionals have deeper attitudes towards users and are able to create quality environment.

Originality/Value:

The inclusion of visually impaired users in the design process is seen as original in design pedagogies and the use of tactile maps for design documentation as an important contribution to research in the area of design methods. The construction industry is seen to profit also from acting professionals sensitive to needs of people with special needs, both as users of the built environment and workers on building sites.

Keywords: Universal Design, architectural education, design process, spatial orientation, people with visual disabilities.

1. INTRODUCTION

Many efforts have been made in the last thirty years to make the world and particularly the built environment more accessible to people with a variety of disabilities. Regulations and laws have been introduced to ensure that the planning, design and construction of buildings and urban places provides adequately for such users. Barriers, mostly physical, have been removed and research has formed principles and concepts on which to base decision-making in the building industry. Universal Design (UD) has gained importance as a research area.

The training of design professionals, architects, industrial and interior designers as well as engineers, has felt the influence of these trends. Many universities have made efforts to include the principles of UD in their curricula. Role playing has been introduced in discussion groups in higher education already in the 1980s (Radford & Stevens, 1988; Quayle & Paterson 1989). Ostroff (WELCH 1995) encouraged the development of educational programs for UD in five courses: architecture, industrial, interior and landscape design as well as urban planning. Ostroff's proposal included financial support for new educational programs and was inspired by a design studio experiment from the 1970s, when Ray Lifchez (1987) introduced studio consultants and jury members with disabilities at the College of Environmental Design at UC, Berkeley. Thus, participation of special users in design classes has been a fairly long standing pedagogical tool, especially in architecture schools. However, although several schools of architecture will stage studio design projects with users, it is in exceptional cases that the learning participation techniques are a key concern (Luck, 2007). According to Johnson (1979), user participation in the design process is not only a question of an application of some new design method, but should be an aid in the decision-making process, thus representing various viewpoints and

enriching design debates. The professional designer must learn to act with ethics and responsibility in serving the needs of others. Thus, user expectations must be guided towards a proper understanding of a design's response to needs, to avoid disappointment and dissolution. From this, the education of future professionals must deal with questions of ethics. Students need to gain confidence in dealing with conflicting user needs and adopt adequate professional attitudes towards users with varying physical and cognitive abilities.

To contribute to the discussion of preparing planners, designers and engineers in dealing with the concepts of UD in their professional activities, this paper presents a building design education experiment in which role playing and user participation was an important collaborative factor. Both architecture and civil engineering students were part of this experiment and the visually impaired were chosen as user participants.

2. DESIGN EDUCATION

Building design is still an intuitive business, with outcomes depending on professional experience and to some extent talent. New compositions of design teams may alleviate subjectivity through participatory input of various expertises. Architects, engineers, special consultants and the users (and or clients) should work in collaboration during the whole building production and use process to bring forward the rich culture and history of various disciplines (Gomes da Silva & Kowaltowski, 2007). Some impositions from regulations and environmental impact assessments have incorporated more objective measures into the design decision-making process. Such impositions may be criticized as curtailing the creative process, but have in fact increased professional responsibility.

Restrictions are seen as well as important aspects of the design process, in so far that studies on creativity have shown that limits are essential to the creative process (Boden, 1999 & Kowaltowski et al., 2007).

There is a need to deepen the conceptual knowledge of designers on first principles of many new concepts, such as sustainability and UD. Architects are inclined to rely on their intuition rather than hard science when it comes to detailed decisions. Engineers on the other hand often rely on tried and existing solutions, with certain reluctance to experimentation. New team compositions are necessary to make use of the positive aspects of both personalities. Also, the new team should share the same knowledge and achieve what is termed collective intelligence, with an adequate level of coherence within a design team. The information transfer rate must be rapid to ensure that differences in the relevant knowledge among team members are small. Communication has to be cooperative and collaborative with a high level of coherence among individuals, where design participants learn to think and act more context oriented. Design education should focus on the strategic, tactical and operational

management of a building or urban design process. Productivity and a recognized quality of design solutions continue high in the agenda of professional practice and of formal design education.

Most design education occurs through the studio system and how students are stimulated in their design efforts is less related to the pedagogy applied, then to the personalities (instructors) present and their individual ways of approaching design. Many studies have examined the typical studio design teaching method in relation to diverse aspects (learning experiences, efficiency, quality of designs, etc.). Viewing architecture as pure art has often been identified as a problem and studies of typical professional practices have uncovered that architects often lack knowledge on, or fail to anticipate, user needs (Salama, 1995). Importance given to the artistic content may cause architects to ignore social aspects in design and to emphasize their self-expression. The aesthetic or formal bias is further reinforced by most architectural publications, used as teaching material in design disciplines (Kowaltowski et al., 2006A). Even technical aspects, evaluation results and user satisfaction rates are rarely present in architectural journals, used by student's indesign classes.

Schön (1983) describes design as a reflective conversation with the design situation, thus addressing the human thought-processes and the language (drawings and models) used to make design decisions. In design education, the question of preconception, prejudgment or prejudice must be addressed, since students, although without previous experience in design per-se, do not come to the studio as a "tabula rasa". The preunderstandings students bring to their academic work come from their personal life experience and studio instructors may attempt, in vain, to free the student's mindset of such presuppositions. A more appropriate approach considers engaging students in questioning such presuppositions, expanding, or rejecting responses in the design dialogue (Snodgrass and Coyne, 2006).

Six basic teaching methods can be identified in the studio setting (Kowaltowski et al., 2006B):

1. Studio teaching based on a given architectural program and site for a specific design project or architectural typology;
2. Studio teaching based on the discussion of an architectural program, elaborated by students and its appropriate urban setting;
3. Introduction into the studio of an actual, local design problem and the development of a participatory process, with problem analysis and solution justification by students;
4. Teaching design as a combination of architectural theory with practical design activities;
5. Teaching design using "form generation" methods and formal architectural languages;
6. Teaching design to explore specific CAD design tools.

The third method is mainly applied in design studios with a goal of introducing the principles of UD. However most design problems will encompass simulated situations and case studies of the real world are rarely present. The inclusion of users is often seen as a way of mitigated this lack of reality, but must be used with caution in relation to the expectation and non-delivery of solutions-problem pointed out previously.

According to the UNESCO/UIA Charter (2005) architectural education requires continuous learning through the interaction of practice and training. Also the application of various educational methods should develop a cultural richness and allow flexible curricula to be responsive to changing demands. Awareness of responsibilities toward human, social and cultural values is stressed in the charter, as well as understanding professional ethics and codes of conduct. Finally students need skills with the ability to act and to communicate ideas through collaboration. Speaking, writing, drawing, modeling and evaluation skills are important. The traditional design studio meets some of the goals of the UIA charter, especially with regard to interactive learning between student and teachers. Design education must concentrate attention to the application of innovative teaching methods at the analysis pre-design phase. Furthermore the reality of a design problem must be brought to the attention of students, and direct or inspire their interests away from what is usually more attractive, the latest shiny architectural masterpiece hailed in glossy magazines (Morrow, 2001).

Educating engineers in universal and accessible design is also discussed in the literature, showing however that most higher education engineering curricula are already overloaded and academicians are reluctant to add one more issue to be taught. In the 4 late 1980s Universities in the USA have been engaged, through a NSF program, in developing research to aid the disabled (Erlandson, Enderle & Winters, 2006). This program provided an opportunity for students to experiment with practical and creative problem solving to improve the quality of life for persons with disabilities. Future engineers need to know and understand first and foremost the legal mandates that will apply to their professional design activities. The establishment of specific design requirements and guidelines must be taught. Engineering students should be exposed to applied information on current technologies, especially in the area of rehabilitation design.

Through the introduction of UD in engineering schools, service education can be fostered as well. Reality may be introduced through the participation of hospitals and schools that can refer interested individuals or groups to provide engineering students with practical and real creative problem solving opportunities. Civil Engineering can be considered a case apart, where users in general must be considered in design solutions, such as urban infrastructure and individual necessities are less likely to be considered. Thus these students must learn to perceive the urban world with increased awareness of user need conflicts and incorporate into

design constrains the limits of persons with disabilities. Civil Engineers as construction supervisors also must learn to accept and work with disabilities of the labor force on site.

From the literature on design education it becomes clear that efforts to introduce the principles of UD responsibly exist, but that most schools have been slow to respond to new influences and movements. Also no consensus as yet exists of what the best methods are in bringing about a change in attitude in students, reflected in the design quality they produce. Some of the more promising pedagogical methods, which are seen to overcome the difficulties pointed out above, can be participatory procedures and role playing. Both methods are seen as techniques for encouraging reflection in design, reflection as the reconsideration of an idea or experience and consciousness.

Retrospection, introspection and self-knowledge are facets of such reflective act (Quayle & Paterson, 1998).

Creative thinking strategies in design education include visual thinking techniques, unstructured brainstorming and role playing, developing a questioning attitude, thinking in alternatives and engaging in non argumentative conversations (making deals, agreeing to disagree). Being of a more ambiguous nature than what most engineering students are used to, they often have a poor attitude to experiments with “creative methods”.

Architecture students are more readily open to engaging in such exercises, although not always for the purpose of producing innovative solutions, rather than enjoying the activity per se (having fun!).

Role playing is defined as the experiencing of a problem under an unfamiliar set of constraints so that one's own ideas may emerge and understanding increases. It allows students to interact with others in certain roles. One of the many forms of role playing, empathy exercises allow students to experience the views of a variety of users, with an increase in a student's ability to recognize his/her own and other peoples feelings. In relation to reflection, role playing can be used to diffuse a student's close proximity to a project and engage the student in a more objective and creative mode of thinking (Quayle & Paterson, 1998).

The second most advocated teaching method, to increase awareness of students of the special necessities of users with disabilities, is the introduction of such users into the learning environment. This can be achieved through asking students to document the lives of people with disabilities, or actually work and live side by side with, for example a blind person. These are often the rare moments in design education when an architecture or engineering student makes an effort to observe with scrutiny such humble objects as an ordinary lavatory, doorway or access ramp (Morrow, 2001).

Most participatory design occurs not in the classroom, but in professional practice with users acting as participants in the design decision-making process (Sanoff, 2000; Luck 5

2007). Thus users are no longer mere design recipients, but engaged design decision makers. In design education, where hypothetical problems are discussed, effective engagement is absent and this aspect may weaken the impact of user participation on the design process of students. As stated before, an ethical problem may also arise in raising user expectations through enthusiastic student encouragement, later impossible to deliver. Till (2005) pointed out that in many public works situations consultations with a population have risks. Till called such inclusion of users as pseudo participation, judging such practices as poor in most cases.

The introduction of users with disabilities in a participatory design process usually transcends the dialogue between designers and potential users. The perception of the future built environment usually occurs through the reading of a design, represented essentially through graphic documentation. This graphic representation is specific for each of the traditional phases of a design process (sketch plan, preliminary design, final design and construction documentation), targeting different readers and agents of a typical design and construction cycle. For the users, it is important that the graphic symbols help to understand key aspects of a space, its size and wayfinding within a building complex. Thus participatory design processes, especially those involving users with visual impairments, must pay attention to these factors and future design professional must go beyond the usual two-dimensional drawings required in most design studios, to include richer sensorial values in their design representations. Designing with and for users has become a mainstay of interaction design, to better understand how products and spaces are used and to inform future designs. Training design professionals for interaction design touches on several key issues of expertise: ethics of conduct and representational as well as ethnographic skill development (Luck, 2007). Thus being able to adequately convey ideas with respect for others and insight of special needs are important pedagogical goals.

3. A TEACHING EXPERIMENT

An educational experience is presented in this paper. In the second semester of 2005 and again in 2006 courses were given in the School of Civil Engineering, Architecture and Urban Design of the State University of Campinas, UNICAMP, Brazil, which emphasized the principles of UD. Both second year architecture and civil engineering students participated in these classes. The course activities included theoretical and practical classes, student seminars, technical visits and a final design project. Practical activities included urban design assessments. Role playing of users with different difficulties (motor, visual and hearing) was performed (Figure1) and students designed university community service buildings as



Figure 1a.



Figure 1b.

Figure 1: Role playing activities in a design course with UD in mind.

their final project. Interaction design was included with user participation of several persons with different degrees of visual disabilities.

The goal of the courses was to heighten future design professionals' perception of the difficulties in incorporating the UD principles into the design process and create a greater awareness and sensibility in students. The visually impaired were especially chosen as users in the design projects students developed during the course. This condition was emphasized to make students rethink design presentation and documentation, traditionally based on drawings, models and other visual iconography. Three subjects structured the courses: building performance assessment, environmental perception and UD. As pedagogical tools participatory design methods, role playing and awareness heightening activities were applied.

The evaluation of this teaching experiment is seen as a research on the appropriateness of design pedagogy. The study touched on issue of qualitative spatial inclusion and encouragement of students to apply the principles of UD as well as the development of tools to improve design interpretation by users with varying degrees of visual disabilities.

A further methodological concept was analyzed in the experiment. Through the introduction of tactile maps as special design models, reading and understanding of design solutions by users with visual impairment was assessed. Pseudo-users were present in the study. The design and fabrication of tactile maps was supported by classes on such models building used in other disciplines. Emphasis was given on the scales of models, materials used, color coding and symbols present. The participant volunteers evaluated the design solutions and the usability and robustness of the tactile maps or special design models produced by students of their design solutions. A tactile and visual pathway for reading the models was included in all tactile maps of this teaching experiment. The teaching experiment was finally analyzed as to: assimilation/perception by students of the principles of UD for a building design project; assimilation/perception by volunteer participant users of the proposed environment through the manipulation of tactile maps; evaluation of the usability (handling by users) of tactile maps.

During the second offering of the course in 2006 three groups of students developed three different types of buildings. Project “A” was a public service building, called Poupatempo (Save time), Project “B”, a small visiting professors housing complex and Project “C”, a student union building. Figure 2 shows the tactile maps produced by the three student groups. Design development proceeded in parallel to the special awareness activities presented above in a typical design studio environment. Instructors discussed the design development individually with the groups and students periodically presented their progress to the class as a whole.



Tactile map of project “A”.



Tactile map of project “B”.



Tactile maps of project “C” Ground floor and site plan

Figure 2: Tactile maps of student projects of the teaching experience.

Once the design proposals were transformed into tactile maps, the final participatory phase of the experience started. The volunteer groups with low vision analyzed the maps and traditional design models to evaluate their understanding of the proposals. They also evaluated the ease of understanding the maps in relation to colors, materials and symbols and Braille legends used. During the first offering of the course teachers learned that such maps must be robust to withstand the typical handling during a participatory session. Thus some types of models were shown to be too fragile and confusing for people with subnormal vision. Figure 3 shows the dynamics of reading the tactile maps in the participatory process between students and volunteers. The reflection shiny material of the tactile map “C” also caused confusion with volunteers, as well as color coding of spaces, read by people with subnormal vision as contrast not related to the legend used.

In some cases too the volunteers confused the tactile route marked on the maps with the wall protrusion indications, making the understanding of the design more difficult.



Student helping in manipulation of map



Volunteer using special magnifying lens to help in the reading of the map.

Figure 3: User participation with volunteers with subnormal vision

4. DISCUSSION

The role playing exercise was shown to be important to increase students' awareness.

On the other hand, limitations in provoking deep-rooted design centered approaches became apparent during this experience. The walk-through and wheelchair exercise brought forward a heightened perception of details, mostly in the form of barriers to students. However, the fact that the exercise was only a role playing activity became evident when students inadvertently used their own abilities (non-deficient) to overcome obstacles (Figure 1b). These "slips" of behavior as a person with a specific difficulty were in large part unnoticed by students, but in some cases registered in photographs and later commented in diaries. Further activities must be implemented to bring about changes in professional attitudes in relation to the accessibility issues that transcend role playing.

The studio design project with users taught students and teachers many lessons and gave valuable feed back to students. When presenting their ideas to participating users it became clear to students that their first approaches toward designing an inclusive environment were often wrong. They proposed simple, open and flexible spaces without any encroachments, barriers, columns, and level and direction changes. Through this approach students thought they would avoid difficulties for the blind, by removing any obstacle in the day-to-day use of such spaces.

However, the visually impaired user needs references for wayfinding and these can be in the form of architectural elements.

Flexibility was considered an inappropriate design concept, since persons with sight deficiencies need permanent conditions to gain confidence in an environment and reduce the need for new learning (getting-around on their own) periods. Also, acoustics plays a role in defining space for such users. The reverberation of sound coming from walls, floors, ceilings define the dimensions of spaces to people without sight. Often such users will snap their fingers in new places to obtain such signals and orient their paces. The introduction of some elements, which enhance such acoustic effects, was also considered important, such as the introduction of a fountain with water noises could help in wayfinding.

Although the visually impaired cannot see details in the built environment, they often have some discernment of contrast or light. Architecture should therefore use this ability to orient users. Thus, pools of light may be introduced to mark special areas of importance.

Color contrast can also be explored to define surfaces. Care must be taken not to confuse users. Finally students learned that non-orthogonal configurations are more difficult to comprehend by people without vision. The tracing of the wayfinding paths on tactile maps confused most volunteers in project "A". Although the project was organized with a central functional distribution scheme, students had to help volunteers in the manipulation of the map and needed to revert to extensive verbal explanations. This result does not mean that more accessible designs should avoid radial functional organizations. However, such schemes need careful detailing to improve way finding.

The activity of handling of tactile maps showed that the tactile and visual pathway highlighted in the maps occurred efficiently. Additionally students learned from users, as active partners in the design process, The creative process is no longer a "lonely" activity and students felt more secure in their proposals, since they were shared with users. Subjectivity was reduced and justifications were produced with more confidence. The presence of volunteer users with real disabilities heightened students awareness such users encounter in their daily lives and reinforced the lessons learned through role playing. From this close contact with real disabilities the true sense of the difficulties of users was made clear. The teaching experience taught students that traditional ways of design are no longer sufficient. Students noted that especially, other than visual sensorial perceptions must be introduced into design analysis and criticism. A rich diversity of design communication media was considered essential in the new design process with UD in mind. The participation of users (volunteers) in a learning environment demands new communication skills as well from students. The reading of drawings and handling of maps and models was insufficient in all cases. Verbal communication between students and the pseudo-users was of great help in the recognition of intentions of design solutions. But at times frustration occurred when verbal

and tactile explanations were insufficient. These frustrations alerted students to design errors and a further important communication skill was learned, that of listening, rather than talking. Several studies, since Schön (1983) have shown that the activity of design is a form of social constructivism and acknowledges that design occurs in conversation. Thus, design facilitation is produced in talk (Luck, 2007). In formal education the opportunities of observing seamless conversations where the users quickly understand the subject being discussed are important, as are the opportunities of performing as design interpreters.

5. CONCLUSION

The teaching experience described here was positive in relation to learning levels of students, increasing their awareness and perceptive sensitivities towards accessibility issues. Knowledge on participatory design processes with users with degrees of disabilities was also accumulated. Role playing was shown not to be enough and the combination of user participation is recommended. Further research is needed to develop teaching methods to change future design professionals' attitudes towards inclusive design. Studies must be devised to elucidate queries such as: Do students need to come in contact with the principles of UD constantly in their design courses, or is a specific 9 class content sufficient? How can the design process (and the teaching design process) ensure participation of users with different disabilities?

More research is necessary to define design documentation for users with impaired vision. Questions should be asked: What scales are appropriate for tactile models or maps? What textures should be used? Where and how can color contrast be used in drawings? Should drawings use Braille? To that effect the authors are at present developing two important studies. First a campus tactile map is being produced to trace accessible routes for users with varying disabilities to contribute in the strategic planning of the campus and introduce improvements to increase the quality of local university life.

Special tools to aid this process may be in the form of "talking" models as interactive design tools. With the advent of rapid prototyping available to the profession, drawings with textures and information in Braille may be produced.

Although the results of the teaching experience presented here showed insights from observations of a specific situation in a design class of civil engineering and architecture students these findings may be meaningful to participatory processes in other situations.

The insights gained on the performance of design facilitation can be extended to collaborative design and the construction phase of building projects. Techniques for encouraging reflection in design are important to improve both the design and building and their inclusion in high education

curricula is essential. The construction industry is seen to profit from acting professional sensitive to needs of people with special needs, both as users of the built environment and workers on building sites. The construction industry should also profit from professional input learned through techniques for encouraging reflection in design.

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Mentorship appointment customised to suit CIDB categories

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ABSTRACT AND KEYWORDS

Purpose

The construction industry initiated a system of mentorship for small and medium size builders. The program has been running with limited success and therefore, the purpose was to investigate the reasons for the presumed lack of success and to propose suitable solutions to be implemented.

Methodology

A survey consisting of personal and telephonic interviews was conducted amongst contractors active in the construction industry in the Free State province to investigate current opinions on the effectiveness of mentorship guidance. This survey particularly aimed at the selection of mentors and the promotion of professional builders for the different Construction Industry Development Board (CIDB) financial grades 3–6 (ranging from R1 500 000 to R13 000 000).

Findings

It was clear from the survey results that the mentorship program, in the Free State province of South Africa, is ineffective as some of the role players in the mentorship program are not sufficiently qualified for doing specific mentorship work. The findings show that mentors should be classified into specific categories to fit the project needs for which they are appointed. The survey further indicated that appointed contractors were unable to gain the required managerial skills through mentorship alone. The majority of emerging contractors have never had the opportunity to make use of a mentoring programme.

Value

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The results of this study led to a proposal whereby mentors should now be grouped for appointment on specific projects where their expertise can be utilised to the best and a strict process should be implemented in appointing contractors.

Keywords: *mentorship; categories; processes; classified; establish; success*

1. INTRODUCTION

Although mentorship as an element of construction training has been in practice in the RSA for some time, given the value thereof, the exercise has not had the expected outcome in the Free State province.

The identification of both mentor and mentee for a specific mentor's programme should be done amongst people who have the capability to be trained and be mentored by different experts for the specific type of contract. This identification should be made for every contract and for all participating contractors.

Both the mentor and the mentee must see this exercise as an investment for all role players in the construction industry, e.g. clients (public or private), contractors, consultants, mentors and the industry as a whole. According to Lambert (2004), improving opportunities for adult learning as part of a larger framework, wherein continuing learning is encouraged, is a means for individuals and businesses to reduce the uncertainties caused by the fluctuation of the labour market. (Lambert, I. 2004, as cited in Van Vuuren, 2007: 2)

2. MENTORING CHALLENGES

2.1 CROSS RACE RELATIONSHIPS

A key hypothesis was that with mentees of the same race as mentors would receive more psycho-social support than those in cross-race mentorship relationships. For both Black and White relationships, though, the level of career support provided did not differ. Cross-race development relationships carry their share of complementary racial perspectives (Thomas (1993) as cited in Brown, Zablach & Bellenger, 2007).

2.2 ORGANIZATION AND CULTURAL DIFFERENCES

Mentee contractors who have experience in traditional consultative culture/business, may be resisting change to hi-tech culture/business. The focus point of a mentor is to adapt to the culture of the organization he is mentoring, where possible.

2.3 CROSS GENDER RELATIONSHIPS

Women may encounter barriers with forming and maintaining mentoring relationships, particularly in cross-gender mentoring. Firstly because males, and especially white males, still dominate upper level management in most organizations. Women may have difficulty initiating and maintaining mentoring relationships with males in leadership positions, or may be reluctant to act as mentors or may even be worried about sexual harassment issues, or who simply are not interested in cross-gender mentoring (Hansman (2003)

Whilst women are entering the construction industry on a regular basis, they have trouble in finding mentors who accept that they are serious about their careers, due to family obligations, and therefore mentors are unwilling to invest the time and energy to mentor them (Hansman 1998 and 2002 as cited in Hansman 2003).

3. WHY MENTORING

Before the democratically elected government took up office in 1994, most previously disadvantaged individuals did not compete in the construction market. Therefore, no experience was gained due to the lack of opportunities.

After 1994, individuals were given contract work but were not trained or qualified to execute the work successfully. Several contracts suffered because of the lack of expertise or managerial skills.

Research has shown that the use of, or opportunity of mentoring, to assist and train contractors is very limited in the RSA Free State province.

Contracts are given to people who do not have the means to execute work successfully. They are given jobs without having the designed CIDB ratings (qualifications). These contractors are very reluctant to employ people as mentors, and mostly rely on consultants for advice. This results in contracts that exceed time limits and budgets, without the contractor gaining the correct experience and knowledge.

A solution has to be found for this problem. Various alternatives exist, and the one that has the potential to succeed is mentoring, paid for and supplied by the client.

A mentor has his or her mentoring set goals and standards to develop the skills necessary for success. It is an intentional process that is supportive, maturing and protective, providing orchestrated or structural experiences to facilitate growth. A mentor provides constructive criticism, yet allows room for risk and failure (Brainard, Harkus & St. George, (1998) as cited in Girves, Zepeda & Gwathmey (2005).

4. BENEFITS OF MENTORING FOR THE MENTEE AND THE MENTOR

Table 1 shows the benefits of mentoring for the mentee and the mentor

Table 1: Benefits of mentoring for the mentee and the mentor

Mentee benefits	Mentor benefits
Teaches specific skills	Satisfaction of helping another person develop professionally
Develops intellectual abilities and critical thinking	Enthusiasm and the feeling of accomplishment
Engages in meaningful, substantive tasks	Ideas and feedback about one's own research project
Facilitates entry into the profession and career advancement	A network of mentees across institutions who can collaborate on projects, place students, and serve as sounding boards
Relates to how the field or profession operates	An expanded network of colleagues, especially if the mentor is part of a formal programme
Introduction to key players in the field	Recognition for service to the community
Advice, encouragement and feedback are provided	Potential for professional development
Raises expectations and future aspirations	The very act of mentoring - guiding, promoting others – may serve to effect their own transformations
Exemplifies values and an approach to professional and personal life	

Source: (Adapted from Girves, Zepeda & Gwathmey, 2005: 454)

5. BUILDING A SUCCESSFUL MENTORING PROGRAMME

5.1 DEFINING YOUR OBJECTIVES

Defining your objectives clearly before beginning a mentoring programme is important. For instance, if the primary goal is to ensure new mentees are productive from day one on the job, it is important to pair the Mentor and Mentee according to compatibility. The mentor and mentee also need to establish knowledge (not expertise) of the site and infrastructure to begin the process.

A formal approach typically requires a greater time commitment as the client is responsible for the assignment of compatible mentors and mentees, and also needs to oversee the relationship as work proceeds.

5.2 SELECTING MENTORS

“When selecting mentors for a programme, it is important to choose people who not only exhibit qualities you want others to emulate, but who also are excellent communicators and coaches. They must have the ability to provide support and guidance without micro-managing their mentees. Often, these attributes are less a function of years on the job and more a matter of well-developed people skills. In addition, you should choose professionals who have a positive attitude about their jobs. You may even want to create a team of mentors who possess different skill sets and expertise. They can work with mentees on a rotating basis, allowing participants to learn more about a variety of specialties and ensuring a more effective transfer of knowledge (McCauley, 2007: 17-19.)

Table 2 is a five-level model, based on several meta-analyses of other research, addressing what it takes to become an expert in a dedicated field of focus (Dreyfus and Dreyfus, 2005, as cited in Gray, 2008: Online)

Table 2: A five-level model of expertise

LEVEL	MAIN CHARACTERISTICS OF A MENTORING EXPERT
Expert	Has at least 10 dedicated years focusing on a field (e.g., developing distinctive mentoring programmes for different types of protégés). Experience is broad and deep. Intuitively aware of important, in the field, variables in any new situation. Able to use different paradigms and heuristics to solve problems quickly and creatively. Reflective practitioner who self-assesses what works/doesn't. Engages in “forward” reasoning to solve a problem. Able to align the right processes needed to produce multiple outcomes (develop competencies/talent and reduce turnover while supporting a diversity initiative). Develops guiding principles and rules of engagement.
Proficient	Has at least five years in the field, with some varied experience. Still “rule-bound” when solving problems. Is becoming a reflective practitioner. Can plan and implement several different types of mentoring programmes, each of which produces a desired outcome (talent development or retention, for example).
Competent	Has repeated experience doing the same thing. (e.g., can plan and implement one type of mentoring programme - such as orienting new hires, but not developing leadership competencies.
Advanced beginner	Knows “about” mentoring for specific circumstances and has limited practical know-how. Likely to implement a simplistic “do-your-own-thing” mentoring initiative instead of a more formal programme with structured components that produce intended outcomes. Doesn't feel responsible for producing outcomes.
Novice	Little or no direct practical experience or know-how. May have gathered information by reading books or articles, but has not practical understanding based on actual experience.

Source: Dreyfus and Dreyfus (2005), as cited in Gray, 2008: Online)

6. METHODOLOGY

Nine personal interviews and eight telephonic interviews were held with emerging contractors in the Free State province, who had experiences with mentors, and others without such experiences, employers and sub-contractors e.g. plumbers, electricians and suppliers. The results showed a shortfall in certain knowledge areas and clearly showed an improvement in the success rate (especially time) of contractors taking part in a mentoring programme.

7. OPINION SURVEY

Table 3 gives the results of the Opinion Survey on necessity and successfulness of the mentoring programme in the construction industry.

Table 3. Opinion survey results

Opinion survey on the necessity and successfulness of the mentoring programme in the construction industry in the RSA Free State province			
Questions	Yes	No	
1. Are you aware of the mentoring programme?	13	8	
2. Did you as emerging contractor ever make use of a mentor?	4	17	
3. Would you like to participate in the mentors programme for emerging contractors?	20	1	
4. Are you prepared to pay for the assistance of a mentor?	4	17	
If answer to question 2, if yes, have you gained knowledge of the following:	Good	Average	Poor
1. General management		3	1
2. Construction technology		3	1
3. Site activity and material management		2	2
4. Finance, accounting and administration	1	1	2
5. Human resource and stakeholder management		1	3
6. Legal issues and contracts			4
7. Was your relationship with the mentor during the contract	1	2	1
8. Sub-contractors matters		1	3
9. Safety management		2	2
10. Did the mentoring programme have any influence on your time for contracts	2	2	

Source: Own table

8. RESULTS

The research shows that the need for mentoring forms an integral part of development of the up-coming building contractors' career building. History has shown that the shift from white domination before 1994, to a multi-racial workforce, in which contractors of colour form a huge quota,

resulted in many contractors being awarded contracts for types of work for which he or she had no experience or infrastructure with which to do this work.

9. PROVIDING DIRECTION

When matching mentors and mentees identify common grounds like shared experiences such as coming from the same living environment, having the same hobbies or sports interest, and language, this can create important rapport and improve the chances for long-term success.

Johnson-Bailey & Cervero (2002) discuss mentoring as occurring on two dimensions: the internal dimension which is the relationship between the mentor and mentee, and the external aspect that encompasses the mentoring pair and the sponsoring or host organization (Johnson-Bailey & Cervero 2002, as cited in Hansman, 2003: 15).

Some contractors feel they have less power than the mentors in the relationship, and therefore, the exercise does not challenge the ideas and solutions offered by the mentors. “Sociocultural factors can challenge cross-race and cross-gender mentoring relationships, and the racial and/or gender make-up of the participants in mentoring relationships affects the overall mentoring experiences of both mentors and mentees. Race and ethnicity may also create impediments to mentoring relationships within organizations. White mentors may hold negative images concerning women or minority groups” (Hansman, 2003:15)

10. CONCLUSION

Although some contractors did have experience, a great deal of work was allotted to people entering the industry for the first time. This issue is now irreversible and the solution to this is mentoring programmes in which the client, contractor and mentor build on a relationship by which all role-players, including the national industry can benefit.

Results have shown that in the present situation, the emphasis not only falls on money wasted, but also quality, and time by non-delivery of the most needed infrastructure in time for clients, i.e. schools, hospitals, housing schemes, etc.

Limitations such as the number of people available to fulfil the shortage in mentors required, the difference in income between running your own business and mentoring other people, and the reluctance to accept cross-race guidance, remains a problem.

Although the integrated emerging development model showed great success, it is mostly aimed at the development of senior managers and owner-manager emerging contractors.

The finding of this research showed that the average age of male mentees is 40 years and over, which will result in a shortage of developed male contractors in the future.

Young female emerging contractors are well represented in industry.

11. RECOMMENDATIONS

With the implementation of a reliable, co-ordinated and audited mentorship system, managed by accredited professionals, mentorship may lead to dynamic growth of skills and knowledge in the construction industry.

A representative committee could be formed with contractors, educators, government, mentors and training authorities in the Free State province. This committee would be responsible for the allocation of appropriate mentors for the specific needs of an emerging contractor:

- Multi-discipline mentors should be identified to serve as mentors on small contracts, i.e. single story buildings.
- A team of mentors with different expertise should be allocated for larger projects.
- Mentors should be subjected to a continued professional development programme (CPD) to keep them abreast with the latest developments in the construction industry, e.g. changes to the JBCC set of documents etc.
- Cross-gender, -race, or –cultural adaptability should be considered in the appointment of mentors.
- A standardised format of reporting documents should be compiled by the mentor committee to ensure uniformity, conformance and quality in a report-back system.
- Reliable data should be developed in the industry to forecast work-force needs.

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Towards Development of Decision Making Skills in the Allocation of Scarce Resources

Gisela Kaiser and John Smallwood

Purpose of this paper

All spheres of Government have been and will continue to invest substantially in infrastructure development for some time to come. The paper explores whether limited funds are allocated to best effect, using a typical department of the City of Cape Town as model.

Design/methodology/approach

Through the understanding of how budget is allocated to infrastructure projects, realistic interventions can be proposed. As decisions are made at various levels, a variety of professional competencies are involved. As a starting point, the process of prioritising interventions by officials responsible for planning at operational level is evaluated to assess the capacity to reach repeatable conclusions. The method of data collection in this exploratory study was interrogative as records were studied, individuals interviewed, and a questionnaire survey undertaken.

Findings

The findings of the exploratory study indicate that decisions made to apply funding to infrastructure maintenance are based on aspects which are not well understood and do not yield best value. There is thus scope for improvement in achieving better value through better decision making.

Research limitations/implications

Decision making in local government occurs at various levels. The exploratory survey was aimed at a grass-roots level in a single department. To provide a comprehensive model which will apply broadly to Local Government, the research would need to cover other directorates, particularly utility services.

Practical implications

The findings indicate decision making can be improved to realise more value for funding applied at departmental level in local government.

Value

The findings provide evidence of the need to improve decision making skills of local government officials. With limited financial resources available, improved decision making can enhance the value achieved through application of these resources.

Keywords: infrastructure, value, measure, budget allocation, local government

1. INTRODUCTION

The City of Cape Town covers a geographical area of 2 500 km² (Demarcation Board, 2006) with a population of approximately 3 500 000 (Statistics South Africa, 2007). Cape Town is currently governed by a 210 member city council. Central to this is the Executive Mayor and Mayoral committee of 11 members. 105 electoral wards each directly elect one member of council, while the balance are elected by a system of party-list proportional representation (City of Cape Town, 2007).

The city manager is the non-political head of the administration of the metropolitan municipality. The administration is divided into 11 directorates:

- Finance;
- Community development;
- Economic and Social development and Tourism;
- Health;
- Service Delivery Integration;
- Corporate Services;
- Housing;
- Strategy and Planning;
- Safety & Security;
- Utility Services, and
- Transport, Roads and Storm water.

Each Directorate is headed by an Executive Director. Approximately 75 directors comprise the next management level, each in charge of a Department. Overall, the city employs approximately 22 000 staff members to deliver services (City of Cape Town, 2008a).

The department of Specialised Technical Services (STS) resides in the Corporate Services Directorate of the City of Cape Town. Corporate Services is responsible for providing support services to the service delivery directorates. These services include Human Resources, Personnel Services, Legal Services and Communication. Specialised Technical Services is responsible for technical issues such as management of fleet, plant and mechanical workshops, radio network, security alarms, and facilities management. The department had a capital budget of R 27.9 million and an operating budget of

R595.9 million for 2008/09 and a staff complement in excess of 900. Amongst other functions, the department is responsible for the building maintenance of some 600 corporate facilities.

2. REVIEW OF LITERATURE

2.1 Budget Process

The City Of Cape Town is governed by strict legislative budget principles, including Generally Accepted Municipal Accounting Practice (Accounting Standards Board, 2004) and has to operate within the Municipal Finance Management Act (National Treasury, 2004 and 2005) and other legislation. Budgets are developed annually based on that of the previous year plus a fixed parameter (so-called parameter based costing). High profile projects tend to be identified and funded outside of this process.

The government model of budgeting requires that penalties apply if budget is not spent in planned financial year cycles. Percentage budget spend is tracked in the monitoring system, and reported to Council. Targets for both operating and capital spending are set at between 90% and 100%. Penalties range from lower executive bonuses, losing the budget in the next year, or not being able to complete projects. Evidence of the effect is visible in the amount of office and computer equipment purchased in the 4th quarter of each financial year, as capital purchases.

2.2 Decision Making Structures

The City has a plethora of decision making processes and structures, in main created to protect the people who contribute to the city's income. The effectiveness of these structures is questionable, as the information pertaining to projects is often incomplete, inconsistent and possibly misleading, in order to have the best chance at approval.

The delegation of authority is prescribed through the Supply Chain Management (SCM) (City of Cape Town, 2008b) Policy, which does not strictly relate to reporting levels.

- Petty cash purchases : Up to a transaction value of R250;
- One quotation: A transaction value up to the value of R 2 000 ;
- A minimum of three formal written price quotations: A transaction value over R 2 000 up to R200 000;
- Competitive Bids and long term contracts required above the transaction value of R200 000.

Anyone can thus undertake the purchasing effort, though some levels of authority have to support project initiation. The SCM authority approving expenditure is the Bid Adjudication Committee (BAC).

Further, in the utility services departments, Integrated Development Plan (City of Cape Town, 2009b) alignment allows the creation of a 20 year project plan which is approved by Council. Once the list of projects is approved, a department can implement it as soon as funding is secured.

2.3 Capital Budget

The capital budget for the current financial year (2008/09) is R4 billion, or nearly 20% of the total budget of R19.8 billion (City of Cape Town, 2009a). In the current financial year, nearly 40% of funding is sourced through external loans. This percentage increases to 65% in 2010/11 (City of Cape Town, 2009c), but the overall capital budget reduces by ~26% in that year (due to completion of several flagship projects). Council funding contributes in the region of 13% over the next 3 years. Government funding aimed at sports and recreation stands at 20% in the current period, reducing to zero by 2010/11. The balance is made up of contributions below 15% fluctuating for other government grants, provincial housing and other grants, private sector funding and municipal infrastructure grant (average of 7%).

As Corporate Services is seen as a no-growth business area, the capital budget allocation remains steady from year to year. If specific projects require capital funding in facility management, transfers have to be found from other departments who are unable to spend their budgets.

2.4 Operating Budget

The operating budget for the City of the current year is R15.8 billion, a 24% increase from the previous year. The planned annual increase is showing a downward trend, bottoming out at a 4% increase for the 2010/11 financial year. The operating budget is funded mainly through property rates (24%), electricity revenue from tariff billings (22%) and grants, donations and subsidies (25%). The balance is collected through other utility service charges, levies, licences & permits, fines, rentals and interest earned. Water and Electricity which both fall under Utility Services are tariff funded while Solid Waste is partially tariff funded. The remainder of functions are rate funded. Any increase in infrastructure allocations result in rates increase, which is politically undesirable.

2.5 Other opportunities to fund projects

At the start of the second quarter of each financial year, all departments make submission to the Finance portfolio committee, to motivate for additional

funding to be allocated to specific projects, via the Medium Term Revenue and Expenditure Framework (MTREF). The departmental motivations are further considered in drafting of the budget of the next financial year. Although proposals are presented in varying degrees of detail, the volume of projects is such that directorates are assessed overall resulting in the merits of individual projects being lost in volume.

An effort at project ranking has been developed by corporate Finance which rates projects against the following categories:

- Strategic objectives served (multiple, single or none);
- Risk impact;
- Backlog addressed;
- Legislation, Occupational Health & Safety, Environmental initiatives;
- Capacity Building;
- Expansion, renewal or replacement;
- Capital cost (other funding sources);
- Operational cost (decrease or increase);
- Project status (level of commitment);
- Capacity (internal constraints, outsourcing options);
- Dependency (on projects in other departments), and
- Economic development (investment, revenue base or job creation).

In reality, the categories are subjectively rated. Further the scale of and diversity of projects does not allow like for like comparison.

What is commonly known as 'slippage' occurs during the third quarter of every year, when departments realise that they cannot spend the funds allocated to them within the financial year. Instead of returning funding to Corporate Finance, departments are responsible to find a safe haven for their funding. Some cash flush departments do not require that funding be returned, whilst others do. Whether funding is returned or not, the result of an ad-hoc drive to spend budget does not yield value-based results, as it is reliant on personal relationships and favours. High profile projects often take priority in funding efforts.

According to Whelan (2008), between 15 and 20% of local government funding is derived from national and provincial grants. The Restructuring Grant Fund was one such fund which was established to provide large urban areas with funding to reform service delivery, and ideally suited to making good backlogs in facility maintenance. Application was made and funding received for a number of projects, but not sufficient to cover the backlog. This fund has been closed for new applications, and no other sources of national grant funding have been identified as a possible mechanism.

2.6 Decision Making

Generically, the process of making a decision can be broken into a number of steps:

- Identify and define the problem;
- Identify all solutions;
- Evaluate alternatives;
- Make the decision based on information at hand, and
- Implement and evaluate decision.

In this study, the process of identifying the problem, alternatives, and making a recommendation lies with an official. In this process, various external influences can detract from obtaining the best solution. While some level of trust is required, and clearly is appropriate, the scope for hidden agendas is vast. For projects of significant impact, the final decision rests with politicians, who base their decision on their personal frame of reference as well as on the data presented to them. The opportunity to enhance value therefore lies mainly in the identification of the problem and establishing of alternatives. For example, a problem can be ignored and an alternative incorrectly identified. This can be well motivated, approved and implemented, to the detriment of society and at a cost.

As conventional decision making has not been overly successful in the past, creative solutions such as country lead monitoring and evaluation systems should be considered (Segone et al., 2008). A strategic intent for the City of Cape Town must be entrenched. The intent needs to be directed by leadership, but given the span of control, leadership at departmental level must be able to make significant inroads in determining a strategic intent and using this as a beacon to develop decision making skill in staff of the department.

The educational level required by management with decision making powers is either a diploma or higher diploma/degree. However, management staff with degrees are in short supply from director level down. Experience in municipal management is extensive at all levels given the propensity of municipal employees to remain in council employment for their entire careers. It is perceived that academic balance is lacking in the official structure.

Elected councillors have decision making powers in Council and Mayco. Although decisions are guided by officials, councillors have the final say. There is no educational requirement attached to being elected. News reports found a low level of literacy in elected councillors. Officials must compensate for this by ensuring that the information which they provide in guiding decisions is clear and concise to ensure the best chance of achieving the result which will add most value to the city.

2.7 Infrastructure factors

For the purpose of this paper, a discrete sample of projects requiring funding was selected. The projects are part of the Facility Management function covered by the Building maintenance branch. Projects cover the full spectrum of building maintenance, ranging from painting, plumbing, mechanical and electrical infrastructure, and structural work.

The Tenant managers of the buildings raise issues around maintenance; the Building maintenance section then investigates and advises on possible solutions. The Building maintenance department thus does not have direct influence on projects undertaken, though in its advisory capacity, has the opportunity to add value to the process by raising further areas of maintenance required for example.

2.8 Challenges

Building maintenance falls in Corporate Services directorate, which is seen to be a non-growth area in local government. The reality is that maintenance of municipal facilities has been severely neglected since the transformation of local government. The non-growth aspect results in annual budget shortfalls, compounding the problem as time passes.

Furthermore, within the available budget, several projects compete for priority. The mechanism to decide which projects should be undertaken is not consistent or repeatable, which this paper seeks to address.

Lack of capacity leads to lack of information. While some of the better known buildings such as the various civic centres around town tend to get more attention due to political structures being housed in these spaces, others are ignored. The full extent of the maintenance back-log is unknown. The building maintenance branch has recently moved from a reactive to a planned maintenance programme, but due to budget constraints, maintenance happens too late to be truly proactive.

2.9 Model

As demand for available resources will mostly outstrip supply, the ability to decide on best application is likely to remain a priority into the future. Measures such as management by objectives (MBO) and cost-benefit have not only been proved to be inaccurate in achieving the best development result (Segone et al, 2008), but also out of reach in terms of complexity of most municipal officials involved in decision making. Academic qualification has only in recent years been used as a determinator in the recruitment process. Of the 24 salary grades, a NQF 4 (Grade 12) is required from grade 6 upwards (secretaries, clerks, technical assistants). A NQF 5 (higher certificate) is required for grade 10 upwards (executive secretary, assistant professional officer etc.). A NQF 6

qualification can secure any grade between 12 (Professional Officer) and 24 (City Manager). NQF 7 equates to a Bachelor's degree (Nkomo, 2000).

Determining the strategic intent of an organisation and modelling its operations accordingly holds promise of providing better value in application of scarce resources.

3. RESEARCH

3.1 Methodology and sample stratum

The sample stratum for the questionnaire survey consisted of members of the Facility management team at management level down to individual building tenant managers. This comprised the Manager: Facilities Management, Head: Tenant Management, Head: Building Maintenance, 8 regional tenant managers, and a further 50 members of staff in the capacity of managing individual buildings or building maintenance depots. Fifty four questionnaires were duly completed. The analysis of the data consisted of the calculation of descriptive statistics in the form of frequencies and a measure of central tendency, namely a mean score (MS).

Interviews were conducted with 5 senior members of staff experienced in infrastructure funding in local government as well as budget processes to provide background information in interpreting the annual reports.

3.2 Findings

Table 1 presents the results of the condition of various types of infrastructure at municipal facilities in the care of Facility Management. The mean score indicates that the majority of facilities require maintenance in the next 2-5 years. The rating is notably high compared to a visual assessment of the facilities, which could be an indication of assessing only the manageable components of each facility. Of the aspects broadly applicable to all facilities, air-conditioning, waterproofing and roofing are in most need of repair. This is followed by external painting and floor coverings. Electrical, plumbing and structural aspects are shown to be in a fair state of repair.

Many facilities do not have escalators or elevators, thus the high incidence of N/A scores. Also, new construction will be an inappropriate intervention at many facilities, excluding some 58% of faculties. Green building intervention is a relatively new concept which has not been disseminated operationally. The City is grappling with balancing funding requirements of interventions with dramatic long-term impacts with the short-term service delivery requirements. It is imperative that tenant managers be sensitised to green building interventions in every aspect of their work.

Table 1: Perceived condition of infrastructure at 550 City of Cape Town facilities

Aspect	Condition (%)						Mean score
	Not Applicable / Don't know	In desperate need	Needs maint. in the next yr	Needs maint. in next 2 yrs	Needs maint. in next 5 yrs	Satisfactory	
Electrical	0.0	7.3	14.5	3.6	20.0	54.5	4.00
Plumbing	0.0	7.3	14.5	9.1	16.4	52.7	3.93
Structural	0.0	7.3	23.6	5.5	16.4	47.3	3.73
New construction required	58.2	10.9	1.8	5.5	1.8	21.8	3.52
Floor coverings	1.8	7.3	29.1	16.4	16.4	29.1	3.31
External painting	0.0	9.1	30.9	7.3	25.5	27.3	3.31
Mechanical - Lifts & Escalators	76.4	3.6	7.3	1.8	0.0	10.9	3.31
Waterproofing, roofing	1.8	20.0	25.5	7.3	18.2	27.3	3.07
Mechanical - Air-conditioners	0.0	20.0	27.3	14.5	7.3	30.9	3.02
Green building interventions	87.3	5.5	5.5	0.0	0.0	1.8	2.00
Overall	22.5	9.8	18.0	7.1	12.2	30.4	3.46

Table 2 presents the results of assessing the current budget process. The operational budget is determined by applying a growth factor to a base. The base is a historical estimate of costs incurred on a specific item. The growth factor varies within a range determined by CPIX and the individual items. In the 2008/09 budget process, the factor ranged from 6.5% (underwriting self insurance) to 9.5% (repairs and maintenance). STS has consistently overspent on general expenses over the past 3 years. This is balanced by departments under spending in the same directorate. Ideally, the base should be adjusted, but to date all attempts have been unsuccessful.

The sample group indicated a good understanding of the budget process with a mean score of 3.67, although a third of respondents are unfamiliar with parameter based budgeting, calling the overall understanding into question. The opportunity to give input to the budget, as well as the ability to motivate for additional funding were both scored low, indicating that budgets lack grass-roots support.

Table 2: Degree of understanding of current budget process

Budget process	Rank	Understanding (%)						Mean Score
		Don't know	None	Somewhat	Moderate	Good	Thorough	
Reliance on slippage	1	8.3	4.2	20.8	8.3	50.0	8.3	3.41

Understanding of budget process	2	4.2	0.0	45.8	16.7	33.3	0.0	2.87
Adequacy of parameter based budgeting	3	16.7	50.0	12.5	8.3	12.5	0.0	1.80
Opportunity to give input to budget	4	0.0	54.2	20.8	16.7	8.3	0.0	1.79
Ability to motivate for additional funding	5	0.0	54.2	29.2	4.2	12.5	0.0	1.75
Overall		5.8	32.5	25.8	10.8	23.3	1.7	2.32

The factors listed in Table 3 have been used by the Finance directorate in scoring projects when assessing funding motivations. The sample group found 4 out of 12 factors moderately to critically relevant. The increase or decrease in operational cost scored very high in relevance, indicating an understanding of value, with legislative compliance the next highest ranked.

Table 3: Perceived relevance of current factors used in budgeting

Factor	Rank	Relevance (%)						Mean Score
		Don't know	None	Somewhat	Moderate	Relevant	Critical	
Operational cost (decrease or increase)	1	0.0	4.2	0.0	0.0	37.5	58.3	4.46
Legislation, OHS, Environmental	2	4.2	0.0	4.2	0.0	62.5	29.2	4.22
Project status (level of commitment)	3	4.2	4.2	8.3	12.5	50.0	20.8	3.78
Backlog addressed	4	0.0	12.5	4.2	4.2	70.8	8.3	3.58
Risk impact	5	0.0	45.8	0.0	4.2	29.2	20.8	2.79
Capital cost (other funding sources)	6	4.2	45.8	0.0	0.0	33.3	16.7	2.74
Strategic objectives served	7	0.0	45.8	8.3	0.0	20.8	25.0	2.71
In-house capacity to undertake	8	8.3	12.5	20.8	45.8	12.5	0.0	2.64
Dependency on others' projects	9	4.2	12.5	58.3	4.2	16.7	4.2	2.39
Expansion, renewal or replacement	10	0.0	50.0	4.2	8.3	33.3	4.2	2.38
Capacity building	11	8.3	54.2	8.3	0.0	29.2	0.0	2.05
Impact on Economic development	12	12.5	54.2	8.3	4.2	16.7	4.2	1.95
Overall		3.8	28.5	10.4	6.9	34.4	16.0	2.99

Table 4 indicates the factors affecting grass-roots decisions. The decisions made at operational level influence the recommendations made to higher management authorities in projects receiving funding. It is notable that procurement processes ranked top of the scale. Implementation of supply chain policy and procedures should by now have been assimilated into the project management process. Instead, the tendency to fragment work into packages with value below R200 000 is widespread, as values above necessitate a proper tender process.

Budget constraints were ranked next, indicating an understanding that work cannot be undertaken where funding is not available. Impact on customers' high ranking indicates that customer focus is high on the priority list as it should be in a service department.

Table 4: Extent to which factors influence grass-roots decision making

Factor	Extent (%)						Mean Score
	Don't know	None	Somewhat	Moderate	Relevant	Critical	
Procurement processes	0.0	0.0	0.0	0.0	37.5	62.5	4.63
Budget constraints	0.0	0.0	16.7	4.2	20.8	58.3	4.21
Impact on customers	0.0	0.0	0.0	8.3	79.2	12.5	4.04
Project profile	12.5	0.0	16.7	4.2	66.7	0.0	3.57
Level of staff requesting intervention	4.2	4.2	16.7	8.3	66.7	0.0	3.43
Available skills/knowledge of aspect	0.0	0.0	12.5	58.3	25.0	4.2	3.21
Requests from politicians	4.2	20.8	12.5	0.0	62.5	0.0	3.09
Project location	4.2	8.3	16.7	50.0	20.8	0.0	2.87
Risk assessment	0.0	45.8	8.3	8.3	25.0	12.5	2.50
Environmental considerations	4.2	45.8	25.0	0.0	20.8	4.2	2.09
IDP focus areas	16.7	62.5	4.2	0.0	16.7	0.0	1.65
Overall	4.2	17.0	11.7	12.9	40.2	14.0	3.23

Property value has not to date been used in determination of maintenance plans. The use facilities are put to in accommodating staff has not been optimised following the amalgamation of the City Of Cape Town. Many of the properties in question are not fully developed, and much scope for improvement exists.

Clearly a single department has to comply with all applicable legislation and processes as determined by national and local government. Given prevailing resource constraints, it is unlikely that a branch such as Facility Management would have sufficient strategic capacity or human resource energy to challenge the status quo. However, where policies and processes frustrate service delivery it must be possible to challenge and discuss these at standard review intervals.

Decision making is further aimed at service delivery, and mechanisms to deliver are not necessarily in support of strategic intent as encouraged by Segone, 2008. Motivating for additional budget against competing priorities in an environment devoid of trust is unlikely to provide solid, repeatable outcomes. For a corporate support branch to succeed in attracting additional budget is

unlikely in this environment. Alternative mechanisms such as producing a business case which illustrates the savings in maintenance cost through capital replacement for example may have a better success rate.

The level of loyalty and commitment of the staff together with the value of fixed assets under the city's ownership must be harnessed to produce a better result than the findings indicate. Process requirements, audit trail requirements, compliance issues tend to absorb much productive time, leaving the staff with little space to focus on overall value enhancement. This must be addressed as part of the process to provide better decision making tools in the department.

4. CONCLUSIONS

The branch of Facility Management currently receives an annual capital and operational budget based on the previous year's budget plus a growth factor. The estimated shortfall required to bring the facilities managed into a good state of repair in the current year is approximately R65 million (capital) and R30 million (operating).

The findings of this paper indicate that corporate facilities are (at best) in need of maintenance within 5 years, and at worst in desperate need. Budget processes are such that slippage is relied on as the principle source of funding, while the majority view exists that the ability to motivate for additional funding is small. Findings of the perceived relevance of budget factors are widespread with two-thirds of the factors carrying a mean score above 2.5. This indicates that a range of competing objectives have to be satisfied through budget allocation.

Decision-making appears to be inconsistent in allocating scarce resources. With the limited funding available, evidence suggests that projects are selected fairly randomly, depending on the value of work, available methods of procurement and political influence of the requester.

5. RECOMMENDATIONS

It is recommended that the branch of Facility Management implement a structured framework to assist in decision making on budget allocation based on the findings of the literature survey and empirical survey. Furthermore, within the constraints of the legislation, the strategic intent of the branch must be entrenched to ensure realisation of value. The principles which apply to Facility Management apply to all other departments who stand to benefit in similar fashion by following strategic intent in favour of short-term compliance focus.

Although employees at a variety of management levels are committed and experienced, the City Of Cape Town stands to benefit significantly if decision

making skills were further developed. Factors which should be considered for development in decision making in infrastructure maintenance and augmentation include the size and development potential of a property, location, purpose and land use, and potential to accommodate city employees. Furthermore, employees need to be developed and guided to comply with legislation such as SCM but not at the expense of maximising value to ratepayers.

Also, the City of Cape Town should consider the fundamental review of the budget decision making process which would harness value and empower employees to make better informed decisions. All directorates would then have the opportunity to participate in applying sound decision making principles.

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Delivering Socio-Economic Benefits through Infrastructure Delivery

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ABSTRACT

Purpose of this paper

This paper proposes an approach that will ensure that infrastructure delivery can be used to achieve maximum socio-economic benefits.

Design/methodology/approach

A total of 401 Further Education and Training and students were placed in infrastructure projects by the Eastern Cape Department of Public Works to get practical training as artisans, 50 young people were trained in construction and given projects as contractors through the government Expanded Public Works Programme to increase the contractor base. Workers were employed and trained in HIV/AIDS.

Findings

The paper suggests that there is a strong correlation between job creation, skills and contractor development. It is concluded that infrastructure implementation can be used to place, train, mentor and produce previously unemployed FET and University trained graduates to professional artisans and built professionals, while addressing contractor capacity, employment creation and worker productivity through HIV/AIDS and Occupational Health campaigns on site in fulfilment of the Millennium Development Goals (MDGs) indicators.

Research limitations/implications (if applicable)

As the programme for the FET/University graduate students and contractor development is relatively new (less than three years), future research need to trace the progress of the FET and University graduates, the ability of contractors to get more work through their own means and the impact of HIV/AIDS campaigns on the families of workers.

Practical implications (if applicable)

The findings provide a basis for both developed and developing nations and the donor community not only to build and provide physical infrastructure such as schools, clinics etc, but to use the processes of developing as a tool to produce maximum socio-economic benefits in fulfilment of the MDGs.

Keywords: Infrastructure Delivery, Socio-Economic, Skills, Millennium Development Goals

1. INTRODUCTION

The purpose of this paper is to share experiences on how to achieve socio-economic aspects through the development of infrastructure to contribute towards achieving the Millennium Development Goals (MDGs). The aim is to share experiences with developing nations that are gripped by poverty and to assist donor agencies and governments that implement infrastructure in packaging their assistance to not only achieve the intended physical infrastructure, but to use the infrastructure delivery processes to achieve favourable socio-economic conditions. The world is currently confronted by poverty and unemployment. In addition, developing nations are constrained by a number of deficiencies such as underdevelopment, lack of requisite skills to implement their infrastructure and inadequate construction capacity. The Millennium Development Goals (MDGs) provides an international framework to eradicate poverty and its manifestations.

This paper explores the extent of poverty in both the developing and developed nations. It covers the challenges facing the South African construction sector, a key delivery in infrastructure and reports on the capacity of the Provincial Eastern Cape Department to deliver on infrastructure. The MDGs which provides a framework for addressing poverty and its implementation is explored. It is concluded that by training, placing students in the built environment, developing contractors and prioritizing women in training and employment, certain MDGs can be achieved. It is also concluded that by dictating a prescribed standardized reporting framework throughout the various reporting structures, the intended infrastructure objectives can be achieved.

2. CHALLENGES AFFECTING THE POOR

2.1 Poverty Challenges Facing the World

Developing areas are confronted by the scourge of poverty that is beyond the income means of most developing nations. The African Development Bank (2004) reported that close to 50% of people in Southern Africa, who reside largely in rural areas, live in poverty of less than \$1/day. Sanchez et al (2005) reported that 852 million people, mainly in the developing world, are still chronically or acutely malnourished. Most of them are in Asia, particularly India (221 million) and China (142 million). Sub-Saharan Africa has 204 million hungry and is the only region of the world where hunger is increasing. This calls on various strategies to counteract this, of which one of them is investment in infrastructure with the aim of addressing the poverty issues that manifests itself in unemployment and lack of requisite skills amongst other things.

While there are growing signs of positive news about Africa, with Perry (2009) quoting the 2006 Organization for Economic Cooperation and Development that foreign investment in Africa reached \$48billion, overtaking foreign aid for the first time. The same report mentions that Chinese engineers are at work across the continent, mining copper in Zambia, and cobalt in the Democratic Republic of Congo and tapping oil in Angola. The implementation of this infrastructure is not done by Africans, indicating both a skills constraints and the contracting ability. The skills constraints need to be addressed as part of eradicating poverty, so that it's not the Chinese or other foreign skills that come and implement infrastructure to the developing world, but the indigenous population as they may know better how they can be able to use the infrastructure implementation as a tool to address poverty.

2.2 Challenges Regarding Skills in the Construction Sector

The South African economy expanded for 20 consecutive quarters - the longest period of continuous growth for over fifty years (Manuel, 2004). This growth is a result of the general consolidation of policies that have been put in place after the first democratic elections in 1994. Although the current financial crisis has affected growth, South Africa is to a certain extent shielded from its effects by amongst others its infrastructure expenditure. According to the South African State of the Nation address, Motlanthe (2009), the South African government will increase its public investment programme whose value is R690 billion for the next three years. The national projected expenditure is dampened by the shortage of skills. According to the Business Group Secretariat (2004), the Construction sector is at its lowest level of capacity since the early 1960s. The explanations are many and varied. The Construction Industry Development Board (2004) gave the aspects of capacity erosion within the industry as:-

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- The low tech image of the industry together with deteriorating profitability which is discouraging bright young people from entering the built environment professions preferring the “lifestyle” careers in the Information Technology and financial services sector.
- The potential intake to tertiary education is restricted by the low percentage of matriculants with higher grade in mathematics and science.

There is a direct correlation between skills and jobs, Behar (2006) reported that most skill types complement unskilled labour such that a rise in skill supply would boost demand for unskilled labour. Thus the provision of work and the presence of skills can be regarded as two sides of the same coin. However, the greatest concern is the fact that a high standard of quality in major engineering and commercial work is reliant on an aging skills base, with much of the industry’s activity lying on semi-skilled workforce (CIDB 2004).

3. SHORTAGE OF SKILLS WITHIN GOVERNMENT STATE OWNED ENTERPRISES

According to the Eastern Cape Provincial Treasury (2008/9), the Eastern Cape Infrastructure budget in 2008/9, 2009/10 and 2010/11 was estimated at R5, 098 billion, R5.44 billion, and R5, 6billion respectively. In order for this to materialise it is required that there be formidable technical skills to ensure proper planning and execution of these plans. The Eastern Cape Department of Public Works (DPW), which is the major infrastructure delivery department, is operating at about 30% capacity with respect to professionals (Department of Public Works, 2005). The worst affected areas are those in the poorest district municipalities such as Alfred Nzo who are at close to 2% capacity. Various advertisements have yielded no response from the built environment professionals. On the other hand the Coega Development Corporation which has attracted over \$30 billion dollars in investment is in need of various skills (Coega, 2005) as indicated in Table 2.1.

Table 2.1 The number of skills required in the Coega Project, categorised according to the Sector Education Training Authority (SETA) groupings

SETA Type	Scope	No. Required
MERSETA / CHIETA	Mechanical (welding, fabrication, structural, rigging fitting, turning & machining)	6000
ESETA	Electrical & instrumentation	1500
CETA	Civil construction (bricklayers, shutterhands, concrete workers & steelfixers)	8400

While Coega's concern is the lack of artisan skills within the country, government's challenges are at both professional and artisan level. This compromises the ability of government to deliver on its mandate. As a way out, the government has to acquire the planning capacity elsewhere. Although there has been dwindling of skills in general, some of the skills have moved to the private sector, hence the logical need to use consultants to complement government. Watermeyer et al (2009) (quoting Terblanche (1971) and Lawless (2005) compared the distribution of engineers and technologists in South Africa in 1967 and 2005 as shown in Table 2.2 as follows:-

Table 2.2: Change in distribution of technologists and engineers in South Africa over time

Employer	Percentage distribution (%)	
	1967	2005
State owned enterprises	12	6
Government including provincial	12	4
Local government	15	10
Consultants	31	51
Industry or business	28	23
Academia	2	6

The lack of skilled personnel and the enormous task of ensuring service delivery means that infrastructure projects are largely planned and conceptualized by consultants as Table 2.2 suggests. The disadvantage of this is that the government might lose its strategic control as consultants might prioritize what is best for them. The other aspect is that consultants are not individually involved in high level planning as the socio-economic

aspects are conceptualized at a political and government level, where they are not represented.

To mitigate against this challenge, it has to be realized that the outcomes of the measure of any objectives are determined at the planning level and reflected at the reporting level. What is not measured cannot be achieved. Mbande (2004) states that the challenge facing the Eastern Cape Government is that although policies are in place, there is no effective prescribed monitoring and reporting mechanism. This denies the policymakers the opportunity to review the information that ought to come out of projects and to revise and align their objectives and targets. As a consequence, the Eastern Cape Provincial Treasury (2004) prescribed to accounting officers and authorities throughout the provincial government that they should provide the Treasury with monthly reports in an approved format as part of measuring the fulfillment of their objectives. To ensure that consultants align their work to achieve government objectives, government has to define the end state by prescribing a standardized reporting format/template. The role of government would thus be to articulate its objectives, define the key performance indicators and prescribe the frequency and the template on how it requires the information to be outlined.

However, reliance on the use of Consultants should be temporary, DPW and government in general has to use its budget and buying power to issue bursaries to encourage students to embrace careers in the built environment and place, mentor students as part of experiential training to build not only its capacity, the province and the country, but to make its young men and women global citizens whose reach and influence extend beyond the borders of South Africa into Africa and beyond.

3.1 Capacity Constraints in the Construction Sector

According to the CIDB (2008), the South African Building and Investment sector employs about 450000 in the formal sector and 320000 people in the informal sector, which amounts to R158.6 million per year. The recognition of the ability of the construction sector to create more jobs is recognised by the President of the United States of America who promised to develop more Public Works programmes to create more jobs (Allen and Martin (2008). Milford et al (2008) noted that the South African construction industry is characterized by a few (5% of the total number of companies) reasonably large, internationally competitive companies which are currently undertaking more than 80% value of the public sector construction work in South Africa. According to the CIDB (2007), the black ownership is progressing well within Grades 2 to 6. This means that the majority of people are largely limited to sharing the 20% of construction work which calls for measures to transform the industry by developing more contractors towards higher grading. The CIDB (2007) reported that clients

were satisfied with 76 percent of the projects and an increase in client satisfaction was found with increasing project size. It can be assumed that work needs to be done especially at the low graded construction companies to improve their quality. The Industry has to develop strategies to ensure that the bottom level contractors that are largely black owned are developed to move to the top so as to be able to share the large part of the construction budget. A large effective contractor base will increase competition, thus reducing the cost of implementing infrastructure.

In the Eastern Cape, the number of projects for the Department of Education alone is 551, 267 and 247 for the 2009/10, 2010/11 and 2011/12 respectively, According to Milford et al (2008), these type of projects are done by contractors at CIDB grades 3 to 7. The CIDB Register of contractors indicates that the combined capacity of contractors at these grades is 187, leaving on average each contractor having to do about three projects on average in 2009/10. This capacity constraint has to be addressed as part of socio-economic considerations.

The Economic Commission for Africa (2004) reported that Africa's poor labour force, which is not very healthy and not well educated, is a major source of its low competitiveness. Lawless reported that HIV/AIDS has largely affected both the semi-skilled and unskilled labour force in South Africa. This calls for decisive actions to be taken to counteract the effect of HIV/AIDS and general education by the Construction Industry to systemically complement the national education and health strategies.

4. WORLD RESPONSE TO POVERTY: THE MILLENIUM DEVELOPMENT GOALS (MDG)

The global fight against poverty was enhanced by the 189 countries who adopted the Millennium Development Goals (MDGs) (United Nations 2000). This means that the strategies that were used by developing countries as a framework for poverty reduction such as the Poverty Reduction Strategy Papers (PRSPs) had to be adjusted to the (MDGs). Stewart and Wang (2003) described PRSPs which form the basis for all multilateral lending to the poorest developing countries as policy documents produced by borrower countries outlining the economic, social and structural programmes to reduce poverty, which they claim explicitly incorporate participation into the International Monetary Fund/World Bank (IMF/WB) lending framework for poor countries.

The African Bank (2004) in its policy noted that PRSPs provide an opportunity to implement the new poverty policy, as they represent an effective mechanism for channelling domestic and international resources for poverty reduction in a coordinated manner. The United Nations Development Programme (UNDP) (2008) noted that in Ethiopia, as in nearly 70 other countries, the PRSP is becoming the operational framework to translate the global MDG targets into national action. The review of the

Eastern Cape Provincial Development Strategy (PGDP) (2003) indicates that there are at least seven common MDG indicators with resolution 55/2 of the United Nations Millennium Declaration, adopted by the United Nations Assembly during of the 8th plenary session on the 8 September 2008. It can be concluded that the Eastern Cape Provincial Government PGDP is in line with the MDGs which form the accepted national and international core framework for strategies to reduce poverty. Thus, every policy development, implementation should be aligned to achieving the MDGs.

Given the MDGs intention to fight poverty, many donor nations are linking their funding of infrastructure to the achievement of socio-economic goals. Nahusenay, a World Bank Senior Transport Specialist quoted by Pringle (2009) noted that bilateral donors have lost interest in investing in road infrastructure in Africa, as they are not seeing the benefits of such investments because not enough employment was being created and that such investments were not helping to improve rural access and alleviating poverty. It can be concluded that it is critical for infrastructure provision to demonstrate that it meets the objectives of the MDGs.

5. METHODOLOGY ADOPTED IN THE PAPER

The following methodology was used in conducting the research:-

- The Eastern Cape Department of Public Works (DPW) placed 401 students that passed the national qualification authority standard N2 in bricklaying, Carpentry, Painting, Electrical Engineering, Mechanical Engineering from Further Education and Training (FET) colleges with its own teams over a period of two to three years to develop them to full time artisans. The aim was to train, mentor and take them to the government skills testing centre in Olifantsfontein. A total of 19 University graduates who had been previously awarded bursaries were also placed in different offices to undergo undergraduate training as Professionals in the Built Environment. On the other hand Coega Development Corporation placed a total of 58 FET students who had passed N2 and were distributed over 60 projects and about 20 University students distributed amongst the 9 consortiums from the Architectural, Civil, Building and Quantity Surveying with the aim of getting experiential training. The consultants were appointed for designing, tendering and construction of 200 schools. The Coega placement was done as a strategy of achieving maximum socio-economic benefits out of the projects. This was done at a tender stage where the CIDB (2007a) Specification for social and economic deliverables in construction works contracts was prescribed.
- On the other hand, Coega was responsible for developing 50 contractors as part of Expanded Public Works Programme (EPWP).

The students got in the programme through advertisements as per the DPW guidelines DPW (2004). No involvement in infrastructure or contracting was required from the students. After short-listing and writing of the tests, the students were trained for two months in technical, administration, financial and the regulatory environment using the Construction Sector approved syllabus. They were then each awarded contracts initially of about R1.5m in Phase 1 and then between R2m and R10m work in phase 2 depending on their phase 1 performance. During construction, monthly meetings were held between each contractor with a panel from Coega Development Corporation, Mentors, Consultants and Training Providers. The Consultants would present their reports based on technical, scope, time and ability to take and execute instructions and quality to the meeting. The mentor would also present their separate report based on finance, quality, and administrative ability. The Training Service Providers would present their report based on contractor translation of the training syllabus to work. The contractor would be given the chance to respond and do his/her assessment. An agreed scorecard where each participant with the exception of the contractor would score was developed and amended from time to time. The four scorecard categories are summarized as follows:-

- Administration that outlined the general business and site administration, adhering to the Regulatory environment such as Occupation Health and Safety Act (OHS), taxes, etc.
- Financial management that included understanding and implementing measures to ensure that expenditure is within the timeframes, less reliance on overdraft, understanding and knowledge of profit areas and actions taken to on site to improve/optimize the financial situation.
- Technical management which included quality, interpretation of drawings, managing the foreman and general project management on site.
- Progress on site which included the contractor's ability to take instructions, continuous improvement compared to the previous assessment and time spent on site.

The panel graded each contractor according to poor, fair, good and excellent. The panel agreed that a candidate would score say $\frac{3}{4}$ (3 being scored as poor, fair, good, excellent in three categories out of 4 categories, then the candidate is poor, good, fair, excellent). Any scores in between would be extrapolated and the panel would agree on the nearest score.

- A standard reporting template that was issued in terms of Eastern Cape Treasury Notice 38 of 2004 was adhered to in the monthly monitoring of the projects. Monitoring included two site meetings per month and a monitoring meeting on a monthly basis. The Consultants report as per the template on progress regarding budget/expenditure, Time, Quality and socio-economic aspects including employment regarding both the gender/youth, training on HIV/AIDS and Occupational Health issues, progress on EPWP contractors, and placement of FET College and University students on a monthly basis. The prescribed templates were such that both the Consultants and Contractors had their own reports with the Contractors submitting names of people employed and trained including wage rate per day, age, gender and disabled. The Consultants reported on numbers employed, trained and placed students in addition to Time, cost and quality. These reports were monitored, evaluated and acted upon by the panel.

6. RESULTS OF THE METHODOLOGY ADOPTED IN THE PAPER

a. Placement of FET College Students and Professionals

After a period of about three years, the results of DPW placed students are shown in Table 5.1 as follows:-

Category	Type of Trade in which learners were placed	DPW Region that Trainees were Placed on					Total
		OR Tambo	Amatole	Chris Hani	Alfred Nzo	Cacadu	
Placed Learners		294	81	11	18	18	422
Learners per Trade	Bricklayers	96	43	11	9	2	161
	Carpenters	71	17		5	9	102
	Plumbers	41	12	0	4	2	59
	Electricians	27	9	0	0	1	37
	Mechanical	0	0	0	0	4	4
	Painters	59	0	0	0	0	59
Resigned/Abandoned		35	18	0	0	0	53
Deceased		2	1	0	0	0	3
Employed		1		0	0	0	1
Passed Trade Test	Bricklayers	4	5	0	0	0	9
	Carpenters	7	7	0	0	0	14

	Plumbers	0	0	0	0	0	0
	Electricians	7	0	0	0	0	7
	Mechanical	0	0 0	0	0	0	0
	Painters	0	0	0	0	0	0
	Total Passed	18	12	0	0	0	30
	% passed	6%	15%	0%	0%	0%	7%

The unequal distribution of these students between DPW regions can be attributed to the fact that the programme was initiated by the OR Tambo region and Amatole region was the second. The large number of bricklayers (38%), followed by carpenters (28%) is derived from the fact that Eastern Cape is a rural Province. The people who chose these trades do so on the understanding that they will not only depend on formal jobs, but will also be able to be contracted by individual families to build their houses.

The plumbing (14%) and electrical (9%) enrollment can be explained by the fact that these services are beginning to be widely needed by both the urban and rural communities. The South African government has since the advent of democracy ensured that rural communities have access to water and electricity. It is then on the understanding that this infrastructure will need to be serviced and repaired, hence it is anticipated that there will be a growing demand of these services. It is not surprising to note that the Cacadu region has committed mechanical and electrical students due to its industrial nature.

The 13 percent rate of absconded/resigned students can be attributed to the lack of proper supervision by DPW, lack of powers by the regional staff as the disciplinary issues are handled at Head Office which is not as fast as it would be required regarding disciplinary issues. The lack of mentoring skills by DPW supervision staff also contribute to the disillusionment of the students.

The high failure rate of these students can be attributed to the fact that the students have been placed in projects for two years instead of the three planned, lack of systemic mentoring, non-alignment between what is taught at the college and lack of equipment and requisite skills at such colleges amongst others. While the lecturers are trying, these colleges are rural; as such they struggle to attract many senior experienced lecturers. Some of these students arrive at the DPW depot, unable to identify equipment they are supposed to use. The lack of mentoring skills at the DPW due to the fact that the experienced artisans that are responsible for the students have never been trained as mentors and there is misalignment between what is expected at Olifantsfontein and what is thought at FET Colleges also contribute to the failure rates. At closer look at the qualification of those who have passed indicate that they have on average passed grade 4 at least, meaning that the qualification for work purposes need to be raised from N3.

The major concern is that despite the fact that these students passed some six months to a year ago, only one is employed points to systemic issues within the South African economy. In the light of the pronounced lack of skills in the economy, 29 artisans should have been employed by now. An urgent marketing drive is needed to ensure that this happens.

The placed University students indicate that 19 are from the Quantity Surveying background. This is attributed to the fact that the programme was started by a Quantity Surveyor. None of these students have registered yet. This is attributed to the lack of training and shortage of training tools such as the software.

The students at Coega have just been placed over the past six months, thus no analysis of their progress will take place.

b. Contractor Development

The results of contractor analysis taken in July 2008 and December 2008 are outlined in Tables 5.1 and 5.2 as follows:-

Table 5.1 Contractor Analysis in July 2008

Cluster	Poor	Fair	Good	Excellent	Total
Cluster 1	3	3	11	2	19
Cluster 2	2	1	10	2	15
Cluster 3	2	2	9	3	16
Total	7	6	30	7	50
% Total	14%	12%	60%	14%	100%

Table 5.2: Contractor Analysis in December 2008

Cluster	Poor	Fair	Good	Excellent	Total
Cluster 1	2	5	7	5	19
Cluster 2	2	1	9	4	16
Cluster 3	1	1	11	4	17
Total	5	7	27	13	52
% Total	10%	13%	52%	25%	100%

The grading of the learners resulted in them competing with each other leading to innovation. For instance, one of the learner contractors motivated by the desire to increase productivity and achieve excellent results used to buy bread for the employees every Monday after there has been a payment on a Friday in order to lure his workers back to work on a Monday, otherwise they normally would commence on Tuesday. It soon

became clear that the foreman was playing a critical role in the business. This led the contractor spending more time looking for the right foreman, sometimes giving offers to foremen from large construction firms. One contractor terminated the services of about three foremen in a space of four months, until she was satisfied about the performance. This assertion of her authority and ownership of activities on site became the norm on every site. This explains the increase in the number of excellent contractors from 14 percent in July to 26 percent in December 2008 as in Tables 5.1 and 5.2.

There was a good correlation between a good foreman and the progress/quality of work. There was also a correlation between the Consultant and the performance of the contractor. Consultants that were not spending more time on site in guiding the learner contractor had their contractors scoring lower than those that were spending more time assisting the learner contractor. As some of these areas are remote, there was a noticeable tendency for some consultants not spending more time on site in these areas. It is easier for contractors closer to Consultant and mentor's offices to continually visit the consultants and mentors, than those who are in remote areas. This call for extra efforts to be put and a consultant scorecard be developed that will be graded by contractors.

The challenges confronting the contractors included a high rate of accidents, about eight in one month which claimed one life. This created problems not only at the site, but the contractor also left a family that relied on him for survival with a bank overdraft. Three contractors were hospitalized for longer periods which also compromised the work on site. As a response to this, a life insurance, a medical aid scheme and an advanced driving course was organized which also lead to the reduction of contractor insurance premiums. Since then, there has been no hospitalization.

i. Socio Economic Aspects as part of Standardized Reporting on Infrastructure

The results of the 60 schools that Coega has implemented are outlined in Table 5.3 as are as follows:-

Table 5.3: Employment in Coega schools which included 46 schools that are distributed among the 50 learners

Category	No of employees
Training = HIV/AIDS and OHS	1033
FET/University Interns placed	54
People Employed	1502
Women employed	375
Youth Employed	738
Disabled People	23

Out of a total of 60 schools, a school employs on average about 25 workers. The employment of women, youth and disabled, although they are outstripped by men need to be encouraged. The monthly monitoring meetings provided a platform to advocate for their inclusion and to question the traditional stereotypes. The HIV/AIDS training also provided another front to tackle this scourge. In deep rural areas, the contractors encouraged foremen especially those that are affected by HIV/AIDS to open the day by preaching to the workers about HIV/AIDS. The HIV/AIDS training given on site workshops included teaching workers how to use condoms. However, the message given on site needed to be the same as the clinic, thus a two hour visit by the nurses to the site was encouraged and pursued.

The statistics in Table 5.3 is possible as all the projects used a standard reporting template which covered Budget expenditure, cash flows, time, quality and demographic information such as people employed according to youth, women and disabled as well as people trained. On the other hand the contractor template had information that had the names of people, their age, gender and wages paid. This also covered project related information and was enforced by the tender approach which stipulated that if the report is not submitted there would be no payment. It is in this context that the enforcement of reporting ensures that everyone focuses on reporting on the outcomes of the objectives.

7. CONCLUSIONS AND RECOMMENDATIONS

The poverty that the global community is grappling with manifests itself in many ways such as the lack of requisite skills. The MDGs provide a framework by which all nations could address poverty. While there are positive news relating to the fact that investment exceeded foreign aid in Africa, the infrastructure investment is still implemented by foreign workers. The lack of skilled personnel in South Africa within and outside of government is a barrier to the ambitious plans by the government that has declared its intentions to invest in infrastructure. This also affects the planning and implementation of government programmes which necessitates that Consultants be involved as they have the resources and capacity in planning and implementation. The challenge with the Consultants is that they do not have the political insight and as such their assistance might not help in achieving the intended objectives. To counter this it is concluded that the authorities dictate the reporting templates that defines the end state. It is also concluded that the use of Consultants should be seen as a temporary measure while the government is developing its own requisite skills.

The challenges that confront organs of state requires them to use their resources, buying power to develop the requisite skills in the short, medium

and long term to ensure that they meet their objectives, while addressing the poverty issues. The MDGs provide a framework for the global community to address poverty. The Eastern Cape PGDP is aligned to the MDGs, and it can thus be concluded that its fight against poverty is part of the global effort.

It is concluded that the process of developing infrastructure should not only be the physical product, but students such as those that are artisans and those from Universities should be placed in infrastructure projects under experienced and trained mentors until they qualify as professionals. The development of contractors together with skills development, and the employment of the targeted groups, the training of the workforce in HIV/AIDS can be done simultaneously in one project. It is concluded that this approach can address the challenges confronting the infrastructure provision while addressing the issues of poverty in contribution to the Millennium Development Goals.

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Challenges of a Graduate Project Management Student

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ABSTRACT

Purpose

This paper addresses the difficulty for part time graduate students to do research that will have impact on the industry.

Hypothesis

The education based structure of the graduate education may be the problem and not the graduate students in producing research results that will have impact on the industry.

Methodology

This paper will use the theoretical comparison of the price based environment and the traditional graduate education for part time students. The hypothesis will then be tested using the University of Botswana (UB) faculty, transforming an education based course to a research based course, and training the UB faculty.

Findings

In the space of one year, the UB faculty increased their research capability by 200% based on written papers, research tests, and industry research coordination.

Value/Originality

This concept can result in the transformation of African graduate programs into research programs that will have impact on the industry. With minimal funding, and using existing resources, they can duplicate results of much better funded and experienced research schools that may also be caught in the silo approach of education based programs.

Keywords: Research based graduate program, research based approach

1. INTRODUCTION

In 2008, the University of Botswana (UB) Project Management (PM) section hosted a Fulbright Scholar (FS) from the Performance Based Studies Research Group (PBSRG) at Arizona State University, to improve its Masters of Project Management (MPM) graduate program (Mselle *et al.*, 2009). The FS made the following observations:

- The MPM graduate program was an academic/education based graduate program where students came to get a masters degree in PM;
- The majority of the graduate students came to be educated on how they could be a better PM based on existing practices;
- The students had difficulty with theoretical and logic based concepts.
- The graduate students seemed to be in a reactive mode. They were looking for detailed information that would be tested to pass the course, and
- Students had a difficult time aligning their jobs to the education.

The theoretical concepts which were causing the students the most difficulty were 'counter-intuitive' deductive logic and theoretical concepts which disagreed with their current practices:

- Management, control, directing and influencing were inefficient practices (J Kashiwagi *et al.*, 2008, Deming, 1982);
- Risk was caused by the buyer and not the vendor (Mselle *et al.*, 2009);
- Human nature is predictable based on genetics and previous practices (Kashiwagi, 2009; Herrnstein and Murray, 1994);
- Management activity was a manifestation of inefficiency and a lack of trained technical personnel, and
- Decision making was a source of risk (Mselle *et al.*, 2009).

Many students had difficulty transferring the use of theoretical concepts from other areas of studies. This was shown by their performance in the class (Kashiwagi and Kashiwagi, 2009). Sixty percent of the students either did worse on a multiple exam question exam the second time, did not

raise their grades significantly on the same exam, and did not score well on deductive logical issues. A statistical analysis of the student ratings on the class supported the hypothesis that the students had a difficult time adapting to a research based philosophy. The FS in discussion with some of the UB project management section faculty, and in seeing the difference between the research based graduate program at PBSRG, identified the potential following issues:

- Graduate students after completing their MPM coursework, had a difficult time completing their thesis work (four generations of students through the MPM program, and only four graduates);
- Graduate students were motivated to get a masters degree, but not necessarily to improve the organizations where they worked. Graduate students seemed to separate their education from their work;
- Students had difficulty measuring value and performance in their work;
- Graduate students were more comfortable learning existing practices and industry viewpoints than in changing the status quo, and
- Very few graduate students felt empowered to use their graduate education to change the environment they worked in.

The general approach of the construction and project management graduate program structure:

- Is to be more technical instead of theoretical;
- Teach existing practices from organizations such as the Project Management Institute (PMI) and International Project Management Association (IPMA);
- Use syllabuses based on textbooks;
- Concentrates on the 'what' instead of the theoretical 'why', and
- Is isolated from industry practices.

2. HYPOTHESIS

In the direction to improve the MPM program, the FS and a few of the UB PM section faculty hypothesized that the problem with part time graduate students having difficulty doing creative research and impacting their current job practices and the industry may be the current education based graduate education structure and not the student's inability.

3. PURPOSE OF PAPER

The purpose of this paper is to show that there is a possibility that the reason why graduate students are having problems with completing their thesis work at the UB is that the structure of the program and not the actions of the graduate students. This concept was introduced and

validated Edward Deming (1982), who stressed that blaming the worker for poor performance instead of the system, was usually a management error.

4. METHODOLOGY

The authors will use the Construction Industry Structure model (CIS), and the differential between the characteristics between the low bid environment and the best value environment, the event model, the difference between a research based graduate program, and an education based graduate program, the new risk model, the concept of silos, transactions and supply chain optimization.

5. CONSTRUCTION INDUSTRY STRUCTURE (CIS) MODEL

The CIS model (Figure 5.1) divides the industry into four quadrants based on performance and competition. Table 5.1 shows the differences between the two quadrants (Kashiwagi, 2003; Goodridge, 2006).

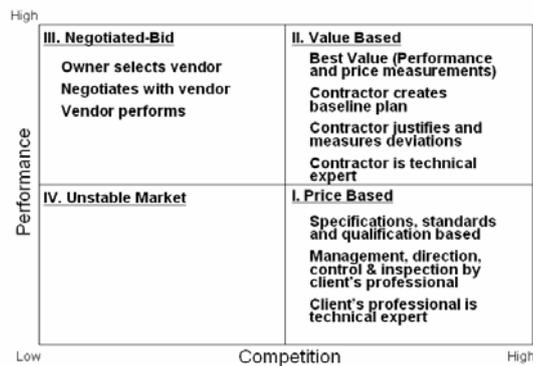


Figure 5.1 CIS model.

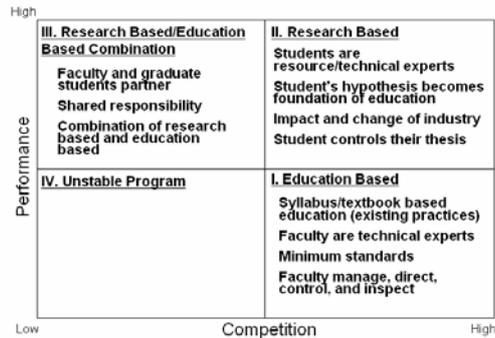


Figure 5.2 Graduate program structure (GPS) model.

The authors are proposing to use the CIS model, and the difference of characteristics between the two environments, to create a graduate research program structure model (Figure 5.2). The axis labels remain the same, competition and performance. The main players change from the client and contractor, to the graduate program staff and graduate students. Table 5.2 shows the differences in characteristics between the two environments.

6. EVENT MODEL

Figure 6.3 is the event model. The event has initial conditions and final conditions. The event model conclusions include (Kashiwagi, 2002):

- An accurate perception of the initial conditions leads to an accurate prediction of the outcome;
- The initial conditions/laws governing change dictate the final conditions.
- All conditions are predictable if governed by laws;
- The more information that is perceived on the initial conditions, the greater the predictability of the outcome;
- No event has had two outcomes with different conditions;
- The perception of randomness is caused due to a lack of information, and
- Risk is caused by an expectation of an outcome based on the inaccurate information of the initial conditions.

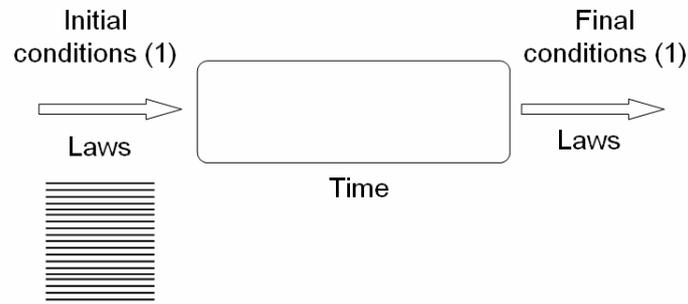


Figure 6.3 The event.

The event model will be applied to the graduate student's event of acquiring their MPM degree. Deductive logic identifies that a student should identify the following as soon as they enter the program:

- Their objective for getting the graduate education, and;
- Who they are (strong points, weak points, problems with their job, and performance requirements), what their position is in the supply chain, and what improvement they would like to make to their supply chain.

Table 6.1 Price based vs. best value environment comparison.

Environment Characteristics Requirements	Price Based Environment	Best Value Environment
	Minimum	Best Value
Preplanning	minimal due to bidding scheme, done at last instant, accepting the lowest prices	baseline plan required; total preplanning because contractor is responsible for any time and cost deviations
Accuracy of Plan	inaccurate with change orders and poor performance	very accurate with few deviations
Efficiency	very low with more management, control, and direction required	very high with minimal management, direction and control
Transfer of Risk and Control	none, as client's representative is the decision maker, and the controller	risk and control is transferred to the contractor who creates the baseline plan and measures and justifies all deviations
Accountability	no accountability because the client is the decision maker and not accountable for any deviations	contractor is accountable for any deviations, and must prove when the deviation is caused by someone else
Visionary	contractor is reactive and adversarial because the minimum is treated as a maximum to	contractor is visionary, preplans to minimize deviations
Direction of Quality	downward due to minimum standards and expectations	upward due to competition between high performers
Key Player	owner's representative	high performing contractor
Technical Expertise	becomes less important because of confusion, lack of accountability, and minimum standards	becomes more important due to high performance requirement
Confusion	greater due to greater number of players	less due to accountability, dominant documentation, preplanning, and measurement of deviation
Expectations	owners have more expectations	everyone knows exactly what they are going to get before the contract is signed
Risk	high due to expectations	low based on ability to predict based on past performance, high level of expertise, and accurate prediction of future event
More Effort	requires more rules, more technical details, and more transactions	requires few rules, less communication, fewer transactions

Table 6.2 Education Based vs. Research Based Environment Comparison.

Environment Characteristics Requirements	Education Based	Research Based
	Minimum	Dominant Impact
Preplanning	graduate students are reactive and regurgitate material in exams; only consider thesis work as they finish all course work	graduate student must identify who they are, what they are doing, why it is happening to them, and what are they changing in their environment in the beginning of the program
Accuracy of Plan	graduate students have no plan until they finish course work	graduate students identify hypothesis, methodology early in program, and then measure deviation to their plan until they finish
Efficiency	very inefficient for students as they are forced to take all the courses and their homework does not apply to their thesis	every homework assignment should be related to their thesis work if possible
Transfer of Risk and Control	faculty instructors dictate the rules, the course material, the gradings throughout the education; there is no transfer of risk and control	risk and control is transferred to the students who creates the scope of their thesis/baseline plan and measures and justifies all deviations
Accountability	the only accountability students have is to regurgitate what the instructors communicate	graduate students are accountable to take material being taught and apply to their thesis; if the course is not assisting them, the course should be modified
Visionary	students are reactive, not creative, and have short range vision	students are forced to be visionary, identify initial state and final state, and know how they will get there
Direction of Quality	minimal	increased value and quality to program and industry with each student
Key Player	faculty	student
Technical Expertise	forces instructors to memorize technical details from textbook, to know what is current industry practices, to repeat same information over and over	forces both instructor and student to be more visionary; forces the students to know what they are doing; skill levels will increase
Confusion on Strategic Objective of Students	maximized. The students are forced into short range/tactical events with every course	student has strategic objective of entire graduate education; uses each course to add to the strategic plan
Expectations	instructors expect students to finish graduate classes and then write creative thesis work	students create their own plan; plan is aligned with a change in their processes/structure; and they quickly determine their methodology
Risk	high due to expectations	low based on baseline plan that is tailored for the individual's situation and talents
More Effort	requires more rules, more technical details, and more transactions	requires few rules, less communication, fewer transactions

The courses they take will then assist them to understand how they can bring about the change. It may also cause deviations to their baseline plan,

but they will always have a vision of what they must do to be a success. If their hypothesis is not correct, they will be able to document what not to do in the future, and they will have a good understanding of why it failed.

The opposite philosophy of the above approach is the education based approach. This has the following assumptions:

- The students need to be educated;
- The faculty's knowledge is the key to the program, and
- The students after learning the knowledge of existing systems will be able to do creative work to change the system.

Figure 6.4 shows a research based graduate student event. It identifies the start as the most critical in the program. It results in the following:

- The student must take control and be accountable of their program;
- The student must identify the contribution they will make to the program and the industry and how they will measure the impact;
- The student will become more proactive;
- The up front analysis forces the student to align their knowledge and position with the value and change they can make to their environment;
- Each class must add value to their program, and
- Each faculty member must try to assist the graduate student achieve their objective by adding to their knowledge base.

This approach is proactive and therefore more efficient, brings more value to the student, the industry, and the program, integrates the purposes of the classes for the graduate student, and transforms the faculty member into a mentorship role. It also allows the faculty member to concentrate more on deductive logic, theoretical principles, research instead of education/training, visionary and impactful efforts rather than existing PM practices, and topics that are of interest to the industry.

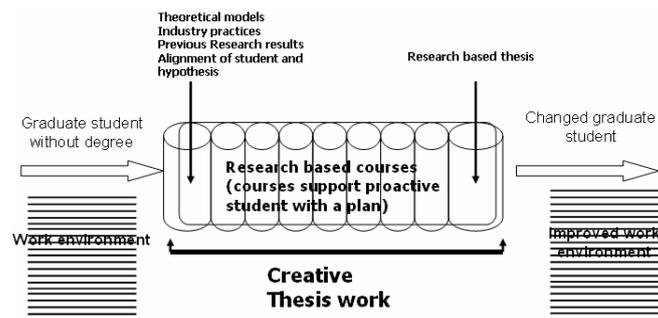


Figure 6.4 Research based graduate student event.

Figure 6.5 is the education based event model. The faculty teach the course from a textbook. Each course uses different textbooks. The courses are in silos, and do not integrate what is taught in other classes.

At the end of the program coursework, the student is required to do creative thesis work. This is very difficult because each course is:

- In a silo;
- Treats subject matter as a technical practice;
- The details of one class rarely are used in another class;
- The source of the information is a textbook;
- The education reinforces current practices, and
- The education proposes that the solution of existing problems lies in greater technical expertise which is being taught in the course.

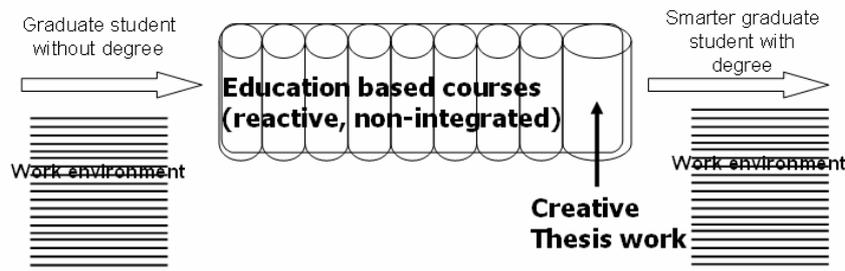


Figure 6.5 Education based graduate student event.

7. DIFFERENCES BETWEEN A RESEARCH BASED AND EDUCATION BASED MODEL

A research based model has the following advantages over an education based model (Figure 7.6):

- It is ahead of industry practice;
- It deals less with details, and more with differential;
- It is more interested in why than what;
- It has a strategic plan, which forces change;
- It is aligned to its greatest resource, the students;
- It will help the students have an impact, and
- The value is in the change of the student's practice and their knowledge of creating the change rather than the degree.

The program will create an industry interface, an industry/academic research platform, hypothesis testing that changes the environment rather than academic solutions based on survey results of the industry. These results were seen even in the short testing period of FS's visits to the UB. After teaching one course, and working with three of the five faculty in the PM section, the following results were achieved:

- Seven research tests with two more identified;

- Interface with seven different industry groups;
- Educated/trained three of the faculty in the research based approach and the PIPS/IMT technology;
- Implemented the philosophy and technology into four different classes.
- Eight graduate students were interested in implementing the approach in their thesis work, and
- The faculty have been involved in writing 21 refereed conference papers, with a goal of 25 total papers for the year, including 5 journal papers.

8. PROPOSED CHANGES TO TRANSFORM EDUCATION BASED TO RESEARCH BASED GRADUATE PROGRAM

All changes should lead to alignment of resources, less work (efficiency), greater research production, and more impact on the industry. The changes would include:

- Creating a strategic plan for the research program;
- An initial course to help students to identify potential areas of impact;
- Faculty members should be addressing the issues of students and their organizations with potential solutions/technologies;
- Students should identify thesis topics/hypothesis in the first semester.
- Thesis topics should apply to their current job environment;
- Students should be treated as resources and the focus of the program;
- Students should be writing papers on their research during their coursework and submit them to local conferences;
- Students should have the opportunity to switch any course homework assignments to assignments that apply to their proposed thesis work, and
- Faculty members should integrate with student's organization.

9. CONCLUSIONS

The current education based graduate program may be a source of problems to graduate student's inability to do creative, research based thesis work. The education based program may also be affecting the ability of the faculty to conduct research that has impact on the industry. The current system isolates the education from the graduate student's workplace, resulting in the student being motivated to get a masters degree rather than to do research work which will change the work environment. The education based graduate program has many similarities to the price based environment which motivates meeting minimum standards. The graduate students share similar characteristics with the contractors. The clients/buyers of construction have many similarities to the faculty in an education based graduate program. The transformation of the industry from the price based to the best value environment is very similar to the

transformation of the graduate program from an education based to a research based program.

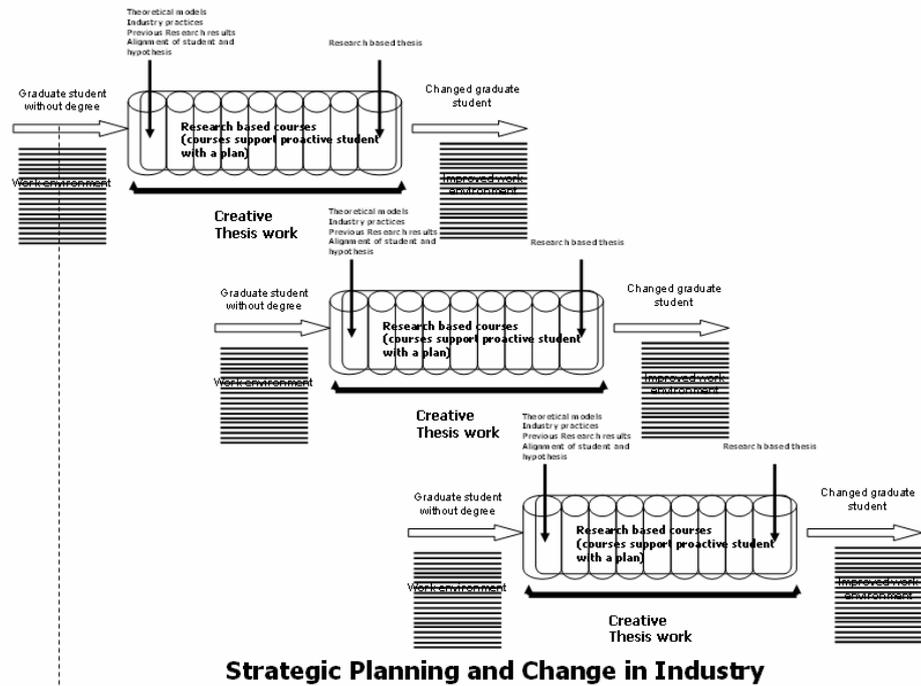


Figure 9.6 Research based graduate program.

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Nelson Powder Memorial Contribution to Research Based Graduate Education

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ABSTRACT

Purpose

This paper is a part of the effort to change the University of Botswana (UB) graduate program from an education based to a research based program. It captures the efforts of the first graduate student (GS) who participated in the program. The research based approach is for the GS to participate in a research based class, take the deductive technology to their organization, and convince the organization to support a research test on a real project, and fund the creation of an industry research platform with the university.

Methodology

Create a research based theoretical PM course, approach the GSs to implement the theory in their own organization, present the research based technology, and run tests in the organization. Also set up an industry/university research platform to run more "hypothesis testing."

Findings

The test was successful. The course was instituted, and the GS took the technology to his organization, and the best value PIPS tests were setup.

Value/Originality

This is the first case of a GS becoming the mechanism to start the research based technology in Africa, and the setting up of a funded research platform for hypothesis testing at the university.

Keywords: Delivery of design services; research based graduate program

1. INTRODUCTION

In the fall of 2008, the University of Botswana (UB) requested Dean Kashiwagi, the Director of the Performance Based Studies Research Group (PBSRG) at Arizona State University (ASU) through the United States Department of State funded Fulbright Scholar (FS) program, to come to the University of Botswana to assist in the improvement of the Masters of Project Management (MPM) graduate program (D. Kashiwagi '*et al.*', 2008).

The Fulbright Scholar (FS) quickly realized that the MPM program was an education based program. To contribute to the MPM graduate program, the research based FS recommend the following (Mselle '*et al.*', 2009; Adeyemi '*et al.*', 2009):

1. Transform the MPM 655 Assessment, Monitoring, and Evaluation class into a research based course (using Performance Information Procurement System (PIPS): six filters that help clients differentiate and select vendors and Information Measurement Theory (IMT): theoretical concepts of measurements and performance, leadership, dominant information, and efficiency.)
2. Convince Graduate Students (GS) to take PIPS/IMT to change their work environment and document the change in their thesis.
3. Convince the GS's organization that they should fund the effort and become a part of the industry/university research platform.

A research based graduate program has the following components (Figure 1.1) (Mselle '*et al.*', 2009):

1. A strategic plan and goals for developing research technology.
2. The commitment of students early in their education, to apply research developed technology in their thesis to change their work environment.
3. Courses that made the students the focus and assisted them to apply research technology to their thesis topics.

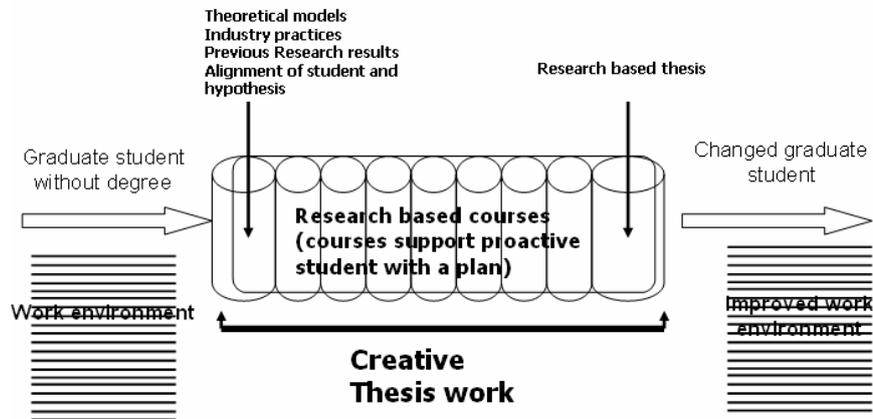


Figure 1.1 Research based graduate program.

The research test had the following resistance to overcome:

1. The existing program was an education based program (Figure 1.2).
2. The majority of the students were more comfortable with the education based program, and had a difficulty in accepting the change.
3. The faculty's experience in the new approach was minimal.
4. There was no strategic plan for the UB program (Figure 1.3).
5. The faculty were educators and not researchers.

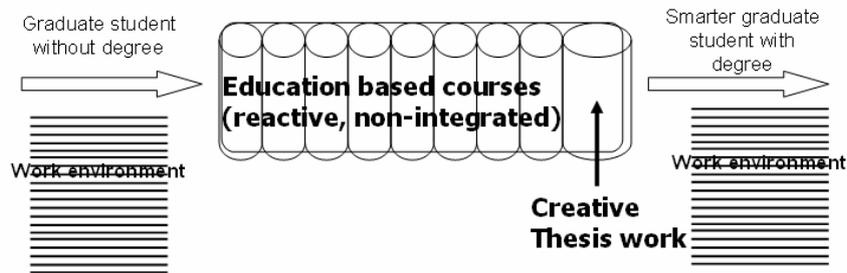


Figure 1.2 Education based graduate program.

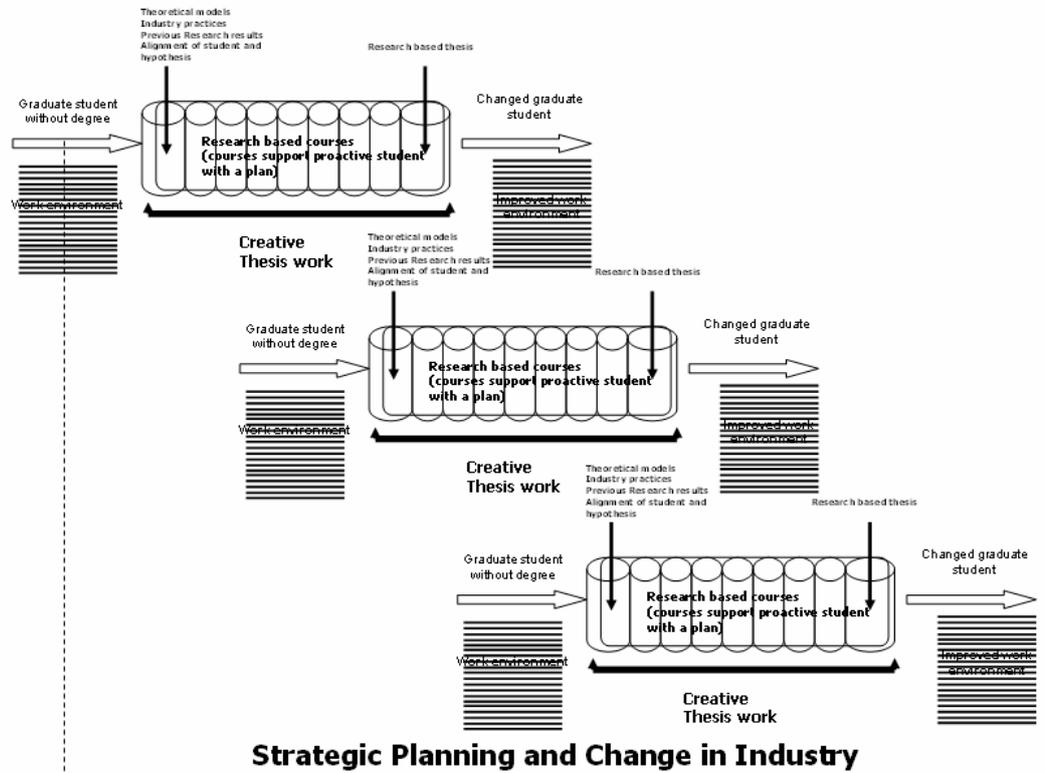


Figure 1.3 Graduate research program with strategic plan.

2. OBJECTIVE OF THIS PAPER

The objective of this paper is to document the research test to transform the MPM 655 course into a research based class, to make the GS the mechanism of the research, to train a core team of UB Project Management (PM) section faculty to support the GS, have a GS take the PIPS/IMT technology back to their organization for testing, and get the industry client to provide funding to help build an industry/UB research platform. Another objective of this paper is to identify the constraints of the UB staff and the Botswana environment in creating the industry/university research platform. The FS had been informed by both the U.S. Fulbright Program personnel and by some in the UB staff, that the aggressive research based practices that were successful in the U.S., would not be as successful in Botswana. The FS hypothesized that this was not a cultural issue but an academic program issue (Muatjetjeja *et al.*, 2009; Kashiwagi *et al.*, 2008). It is a far greater effort to change the way research is done

than to be able to impact the industry practice. Without an internal change first, it is difficult to impact the industry.

3. HYPOTHESIS

The hypothesis is that the FS would be able to change the MPM 655 course into a research based course using a GS as the primary mechanism.

4. METHODOLOGY

The FS set up the following methodology to achieve the hypothesis testing and desired outcome:

1. Find a research based core group from the UB faculty.
2. Have the core group support the MPM 655 class.
3. Have the group support presentations to student's organizations.
4. Continually encourage students to change their work environment.
5. Be successful with at least one GS as a model.
6. Train the UB core team, students, and industry partners to form a sustainable research platform with FS as a mentor.

The research platforms must be able to resist both industry and academic opposition. The FS had built a \$7.2M research group, a graduate research degree, a worldwide CIB working commission that was seamless with the research group, and a CIB journal. In the building of this worldwide center of excellence, resistance came from the university, from professors, and from the industry. The key was to have research partners who were committed to improve the PM environment. The concept of a research based graduate program is counter-intuitive, and identifies the traditional education based program as more inefficient and non-changing. By its nature, it will bring resistance from the status quo.

5. ORIGINALITY OF THE RESEARCH EFFORT AND PAPER

This research effort is original because:

1. The transformation has never been successfully accomplished in a developing country.
2. A research based course has not been successfully conducted in an education based graduate program.
3. The focus is on the GS and their alignment of their education, their organization, and the implementation of a new technology.

4. A sustainable industry/university research platform has not been built outside of PBSRG.

6. RESEARCH TEST: MPM 655 ASSESSMENT, MONITORING, and EVALUATION CLASS

The FS followed the requirements of the course description. However, the class was research based, and not education based. It was more theoretical. It used deductive logic instead of "industry practice." It transferred deductive logic from other technical areas. What made this possible was that the FS's expertise. He knew that there was performance documented effective assessment, monitoring, and evaluation processes. Due to his experience of 15 years with the research based approach, the FS knew that the following would happen:

1. The majority of the class would have difficulty with the deductive logic.
2. Some of the students would become fearful and confused.
3. Some of the students would understand the concepts, and take it back to their organizations and be successful.
4. The majority opinion of the class would be that the current job environments would not allow for this type of change being proposed.
5. The progressive students would have the opportunity to cause a change in the graduate program direction.

The FS had eight weeks during the first semester to state his case. As predicted, the staff and class were split on the research based approach due to its newness. After the last week the FS taught, the class approached the coordinator of the MPM program and stated that they felt they had not been taught the expected course material. The FS predicted the reaction and carefully documented the test class:

1. Simultaneously ran the exact same class at ASU.
2. Ran multiple choice exams, and repeated the same for the final exam.
3. Ran an industry questionnaire that identified the students' knowledge of simple concepts in PM before and after the education.
4. Gave the students access to all course presentations in video format so they could listen to the videos on their own computers at their leisure.
5. Gave them assignments which were theoretical in nature.
6. Ran the first half of the semester to see student's level of understanding, and then reviewed the critical points in the second half.
7. Identified students who had difficulty and gave special assistance.

The FS measured the performance of the class (Kashiwagi and Kashiwagi, 2009):

1. 33% did not pass with a 60% mark after the taking the final exam.
2. 7% (two students) did more poorly on the second attempt.
3. 30% failed to increase their score by at least 10% on the final exam.
4. 11% did more poorly on the industry questionnaire the second time.
5. 60% of the students fell in one of the above categories.
6. The UB class finished the second exam with a 64 average, 13 points or 20% below the PBSRG class at ASU.
7. The average score on the industry concepts was compared to industry professionals in the United States (US) who were exposed to the concepts for a conference presentation (maximum of two hours): UB 6.95 vs. US: 6.88 (UB students were educated for 42 hours.)

The FS gave the students the following to ensure that every student had a full opportunity:

1. Unlimited access to FS (office hours, email, and weekends.)
2. Videos of almost all classes and powerpoints.
3. Electronic copy of the textbook that they could print out.
4. Final exam, multiple choices, where the students had already taken the exam, and given the exact same exam.
5. Allow students to make suggestions and requests and add material.
6. The opportunity to take the PIPS/IMT technology to their organizations.

Statistical analysis of the student responses confirmed the FS's perception. The problem the students was changing their thinking, a systemic issue, and not the culture. As a result of students' complaints, the FS then gave students the opportunity for more classes. The only students who met with the FS were ones who adopted the research based philosophy. Based on the course measurements above and the interchange with the students, the FS came to the conclusion that some of the students were trapped in a reactive education based mode.

The research based approach depended on students to take it to their organizations. Six students (21.4%) took the technology back to their organizations, and three students (10.7%) are projected to lead to funded grants totaling \$30K US. Of the six students, five scored in the top six, with the top score being a teacher attempting to change careers as a project manager in health care. Based on the results, this test was more successful than any PBSRG class.

7. THE SUCCESSFUL GS

The GS, Nelson Powder, was in the top five students in the class. He scored the third highest score out of 28 students. He was the first to bring the FS and UB team to his organization to give a presentation. Two trips were required to convince his superiors to run the tests, fund the research

platform, support him as the project manager, and to allow him to use the PIPS test as his thesis. The announcement in the class of his success led to four other agencies/groups also committing to run tests.

The possibility of the tests surprised many of the students and faculty. Students who previously were complaining that the environment in Botswana would not allow change, were now worried that they had made an error in not adopting the research based concepts of change.

The research grant proposed went beyond the initial goals:

1. Make the GS an expert in the PIPS technology.
2. Bring the technology to the organization.
3. Run two tests, a design (dictated by the client) and a construction test.
4. The GS's thesis would also be the project documentation.
5. Document the difference in performance, effort, and value of the technology.
6. Make the GS, the organization and the UB core team a research team.
7. Be used for the creation of an industry research platform.

8. APPLICATION OF PIPS ON DESIGNERS

The strategic plan was to propose to the users to run PIPS on the delivery of construction. PBSRG proposes it would work well on the delivery of design services, and have started setting up tests at the state of Oklahoma and the University of Minnesota. Unsustainable attempts to apply to the delivery of design services include the State of Hawaii, State of Utah, City of Miami Beach, and the State of Missouri. Designers have notoriously not been accountable for schedule of the design and construction, and for overdesigned projects and change orders due to insufficient design. The PIPS pre-award period with the best value contractor in the construction award phase normally solves design issues, but having designers also accountable would improve the system. The GS and the organization made the decision to apply it to design as well as construction. Unlike contractors, professional designers are sometimes more difficult due to their professional environment and industry structure (Goodridge *'et al.'*, 2006.)

9. STATUS OF THE PROJECT

The test project that was selected for the tests was an executive suites design/construction project. The designer has been selected and approved, and the project is moving into the pre-award stage where the designer will create their weekly risk report that includes their schedule, risk management plan, their management of risk that they do not control and

the contract documentation and justification of all cost and time deviations. All these tasks are new to their traditional method of delivery. Risk management of both the process (time and cost) and the technical details (quality, customer satisfaction, usability) is a new approach to design work.

10. LESSONS LEARNED/CONSTRAINTS

Significant time savings could be realized by using past performance information, a scope submittal, and the interview. The design selection started in the traditional method. Two design firms ended up competing for the project. The firms were asked to turn in traditional proposals, and the proposals were rated over 20 different criteria. Three reviewers each spent three hours rating the firms. It resulted in no appreciable difference between the firms' scores. The GS realized that the traditional lengthy prequalification process may not be the most efficient methodology.

An understanding of IMT can assist the reviewers to rate the key personnel more accurately. One firm had a more experienced project manager who communicated his experience. The other firm had a younger team of a relaxed young designer and a very detailed oriented, nervous project manager. Both firms did very well in the interviews, and both were well qualified for the project. The FS rated the younger team a little higher based on IMT concepts. The lead designer was:

1. Young looking, but very calm.
2. Ability to address details and address the big picture at the same time.
3. Addressed the biggest risk as the permitting of potential multifamily dwellings in the area where the executive suites were being built. When asked how they would minimize the risk, he quickly explained that they would design the unit as one unit instead of two units. The bedrooms would be labeled 1, 2, 3, and 4, instead of unit one bedrooms 1 and 2, and unit two bedrooms 1 and 2. Then after the permit was approved, a wall would be designed in a change order between the two units in a currently marked hallway. When asked how he would explain the two kitchens for the two units, he quickly explained that one was a kitchen and the other was a bar. The entire design was oriented toward the flexibility of turning the two units into one as directed by the Bank in their design requirement. The other vendor did not address the risk of permitting at all.
4. The designer was able to address detail issues and broad overall issues without blinking an eye, telescoping in and out with ease.
5. His demeanor was one of calmness bordering on arrogance.
6. He explained that this was a relatively small job that was very simple.
7. His answers were short and to the point.

The FS explained that the characteristics of high performers based on IMT include the ability to:

1. Give answers to that were simply, short, quick and accurate.
2. Being able to telescope in and out from details to general overview issues very quickly as if they had already designed and built the facility.
3. Lay things out methodically in the right order and with the right emphasis before they performed the tasks.
4. Not get flustered.

The firm's project manager was continuously apologizing for learning the new PIPS risk system as he participated in the PIPS process. He also seemed very young, and inexperienced, but as the interview went on, the project manager's answers reflected a very accurate perception of risk and the current state of the construction industry (based on IMT and industry structure.) He was a great planner, knew which items caused risk in the delivery of design and construction. The FS explained that it is impossible for low performers or inexperienced designers/project managers to project these qualities if they weren't high performers. Both vendor personnel were extremely perceptive and visionary vendors, and both vendors did well in the interview.

Another lesson learned was that the GS felt more comfortable with the FS than with the UB support team. This is a constraint as the UB team gains in knowledge of the system. The FS recommended to the UB team that they should be far more proactive in assisting research clients. The solution to this problem is to implement the weekly risk report on the UB team as they mentored the research client.

Nelson Powder, the GS who was the key to bring the research technology to the research client died in a traffic accident after the interviews. This could have had the disastrous impact of ending the research test. However, his organization committed to continuing the tests. PBSRG also committed to match the organization's funding to set up the research platform with a matching contribution to create the "Nelson Powder Research Fund", identifying the significant contribution to graduate research and the MPM program.

11. CONCLUSIONS AND RECOMMENDATIONS

The research test shows that there is an opportunity to transform an education based graduate MPM program to a research based program using the GS as the mechanism of change. The GS should be recognized as a resource instead of a customer getting a degree. The GS should be approached in the beginning of the program to identify how they can improve themselves and their environment. Each course can then be used to fill in the pieces of the thesis and assist the GS reaches their final

expectation. The key to the research based graduate program becomes the proper alignment of the GSs in the program's strategic plan. The faculty should become facilitators and visionaries who align the GS. The graduate program needs to define their strategic plan, and the strategic goals. Each GS becomes the mechanism for the graduate program to make one more step toward the graduate program's strategic goals.

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US Embassy Botswana: Research Test of Best Value Procurement

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ABSTRACT

Purpose

Review the attempt of transforming University of Botswana (UB) faculty into research based faculty using the U.S. Embassy test as a mechanism.

Methodology

The UB faculty were trained through a mentorship of learning to teach a research based course, were taught how to interface with the industry, were mentored on running the test, and then given full control over the research test.

Findings

UB faculty has to make a radical change in philosophy and culture to become research based. Progress is substantial but more changes must be made.

Value/Originality

The research production of the UB staff has risen dramatically. This is the first time the Performance Information Procurement System (PIPS) has been tested in Africa. It is not only a new technology; the research approach is deductive and different from the inductive approach. It utilizes deductive logic, partnering with students to run industry research tests and a strategic approach where faculty actually must change their approach to their responsibilities.

Keywords: Procurement research tests; Research based academic professionals

1. INTRODUCTION

In the fall of 2008, the United States Department of State funded Fulbright Scholar Program funded a Fulbright Scholar (FS) to the University of Botswana (UB) to assist in the improvement of the Masters of Project Management (MPM) program (D. Kashiwagi *'et al.'*, 2008). The FS had expertise in “research based” graduate education (D. Kashiwagi, 2009; D. Kashiwagi *'et al.'*, 2008):

1. Created highly successful project management (PM) “research based” program with simultaneous theoretical basic research, prototype testing, and implementation of the Performance Information Procurement System (PIPS) technology (14 years, \$7.2M research funding, \$2.4B of delivered services, and 98% performance).
2. Repeated hypothesis testing.
3. Created an industry research program interface/platform.
4. Utilized a strategic plan for the research.

The FS had been testing the research based approach and PIPS for 14 years, and was ready to transfer the technology to other universities to assist them in becoming research based, running industry testing, and impacting industry practices. The authors define a “research based” approach as (Muatjetjeja *'et al.'*, 2009):

1. Their core competency is changing and impacting the industry.
2. Repeated hypothesis testing.
3. Constantly publishing results.
4. Having industry partners who participate in tests and fund research.
5. Graduate education is deductive logic, research methodology, and research test results.

The major difference between the academic based and the research based faculty, is that one is an expert in what others do, and the latter is an expert in research testing, test results and impacting the industry. The academic based UB faculty was required to make the following changes to be research based:

1. Align their expertise with their teaching and administration duties.
2. Align their graduate student's thesis with strategic research goals.
3. Have a strategic plan which includes repeated hypothesis testing, dominant measured results, and publication of their results.

4. Use deductive theory and prototype test/implementation results in their graduate education, replacing the traditional literature search data and best practices in the industry with deductive logic and test results.
5. Involve students as resources in their research, as the researchers.
6. Challenge their graduate students to pick their thesis research before they start their graduate education and constantly test, write and publish their thesis research during their program.

Research based faculty are rare in the construction management and project management area. A recent CIB W117 worldwide search of research based knowledge in the areas of project management, procurement, and optimization of current delivery processes identified just two research groups which did repeated hypothesis testing and published the results (Carey *et al.*, 2008). Stated another way, there are a lot of people who know how to state what other people say, but there are very few original sources of information that comes from valid testing.

2. PURPOSE OF THIS PAPER

The purpose of this paper is to document the attempt to change the paradigm of the University of Botswana (UB) Project Management (PM) section lecturers, from being academic based to being research based. If this is successful, faculty lectures would be conducting industry research tests, mentoring graduate students in their research, impact industry practices by solving their problems, and make the university the centre of learning and research.

3. HYPOTHESIS/DESIGN/METHODOLOGY/APPROACH

The hypothesis of this deductive research effort includes:

1. Academic based lecturers can transform to be “research based.”
2. Lecturers can setup the research based platform where they conduct research with an industry partner and test PIPS to change the method of delivery of construction and improve the performance.
3. Prove that research based faculty can impact industry practices.
4. Research based faculty can align their teaching (change teaching to research based material) and research to become industry experts.

The methodology/approach of this test is to:

1. Have the Fulbright Scholar teach a graduate class in the MPM program using the research based approach and also mentor UB lecturers.
2. Create the research based approach in the class, introducing the research based approach which is more challenging, theoretical, and more interactive.
3. Assist the faculty in exposing the research to major industry partners.

4. Challenge the students to test technology in their own organizations.
5. Prove to the UB faculty that the concept is valid and doable.
6. Setup the research testing and turn over to the UB staff.
7. Have the faculty to run tests by themselves, and monitor their results.

The strategic objectives of the research effort were to:

1. Create a research based approach to the MPM courses.
2. Develop a new risk management and project management model that would solve Botswana industry problem with delivering projects successfully.
3. Run the repeated hypothesis testing.
4. Measure the effectiveness of the UB PM faculty.

The expectations of the head of department (HOD) and head of the Faculty of Engineering and Technology (FET) was that it would take a year to find an industry partner to test. The FS was visiting the UB for only four one month visits spaced out over the academic year. The HOD, FET and coordinator of the MPM program were concerned that the traditional price based industry would not easily accept the technology, the technology would be implemented improperly and be identified as a failure, and the UB environment did not support a research based approach due to the heavy teaching workload.

4. PERFORMANCE INFORMATION PROCUREMENT SYSTEM (PIPS)

PIPS is the mechanism being used to develop the research based approach. It is a deductive model based on the Information Measurement Theory (IMT) with spectacular results (Kashiwagi, 2009.) Due to its deductive approach and testing, many academics do not think it will apply in all environments. PIPS (J. Kashiwagi, 2007; Kashiwagi, 2009; Kashiwagi 'et al.', 2006; Chong 'et al.', 2007) has three main components: selection phase, pre-award phase), the award of the contract, and the execution phase where the contractor documents time and cost deviation from a preset baseline plan. The selection phase includes using weighted factors including past performance information, a two page scope submittal, and a risk assessment value added submittal (RAVA), an interview with the key personnel, and the price (Figure 4.1). The pre-award phase is when the vendor comes in after being prioritized the best value, and agrees to baseline plan, and creates a risk management plan (RMP) and a weekly risk report (WRR) that documents the deviations from the vendor's proposal. The contract is then awarded, and the contractor turns in the WRR at the end of each week, identifying deviations and their management of the risk. After the project is finished, the vendor's services are rated, and the rating is used as 50% of their future performance rating (Figure 4.2)

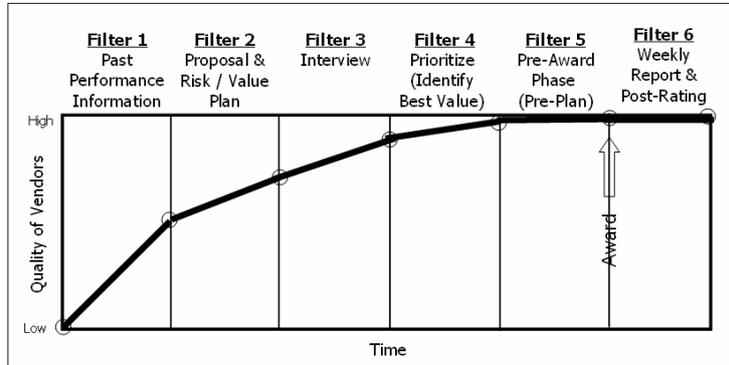


Figure 4.1 PIPS Selection Process.

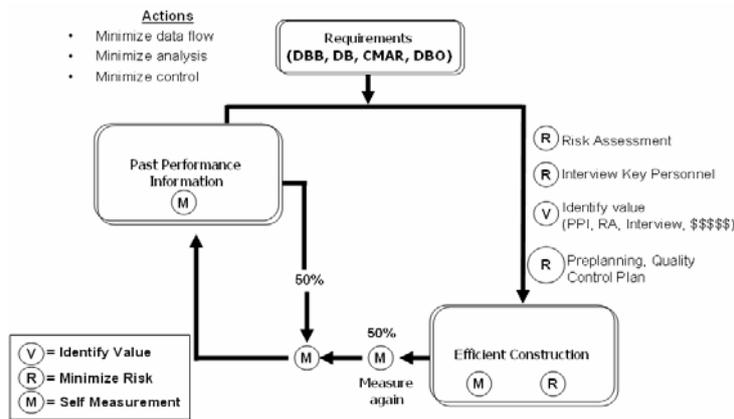


Figure 4.2 Self-Regulating Loop.

Although PIPS has been extensively tested in the US, and is now being tested in Europe on a \$1.3B Euro roadway project (PBSRG, 2009), PIPS has not been tested in underdeveloped countries. The robustness and constraints of PIPS are still being challenged. If PIPS is successful in Botswana through testing at the UB, it would become a boon to underdeveloped countries. The hypothesis is that the transfer of risk and control to the vendor forces vendor pre-planning. The measurement of deviation from the preset baseline plan by the vendor will then minimize problems without extensive client expertise and management. Underdeveloped countries have the following issues that may challenge the implementation of PIPS (Muatjetjeja *et al.*, 2009):

1. Higher levels of corruption (corruption requires a lack of dominant performance information and relationships).
2. Relationships (it is who you know, and not how you perform).
3. Movement towards more rules, standards, and management of control (control being a trademark of inefficient systems).

4. Less technical skill in vendors.
5. Price based structures in non-commodity areas such as construction.

5. UNITED STATES EMBASSY

The first organization that the FS briefed in Botswana was the U.S. Embassy. They immediately had interest in testing out PIPS. They were having the following problems with procurement:

1. The clients they were procuring services for, were working with only one vendor. The clients were having the vendors identify the scope of work, and there was no competition.
2. They were experiencing a large number of change orders.
3. The reason for the change orders was not always explainable.

The embassy manager and contracting officer identified that their current procurement practices in Botswana had some severe constraints. After an initial educational presentation, they agreed to become the UB's first research partner. This exceeded the expectations of the UB staff. The embassy picked the following projects to test the process on:

1. A landscaping project for the US Embassy.
2. A Center for Disease Control (CDC) project to find a graphics artist vendor to create posters for a project to find participants for an AIDS prevention program.

The risk of the project to the UB staff and the embassy included:

1. The UB staff had never run or seen the entire PIPS process.
2. The UB staff would be running the RAVA plan rating, the interview process, the prioritization of the best value, and the pre-award kickoff meeting, without the FS assistance.
3. This was the first experience with the process for the vendors and the clients/users.

The PIPS implementation/modification by the UB staff for the embassy in Botswana is a research project in itself. A larger project which encompassed the PIPS test is the transferring of the PIPS technology and research based methodology to the UB staff so that they are proficient enough to proliferate and do research with the industry.

6. MEASUREMENT OF PERFORMANCE OF THE UB/US EMBASSY TESTS

The measurement of success of this research project includes:

1. Number of mistakes in the process.
2. Minimization of the number of mistakes.
3. Number of projects the U.S. Embassy runs.

4. Does the U.S. Embassy continue to depend on the UB staff?
5. Embassy satisfaction with process.
6. Number of publications on the research effort.
7. Number of significant improvements made to PIPS system (as rated by the FS, creator of PIPS.)
8. Number of classes that utilize the research based concepts.
9. Increase in comfort level of UB staff, from the beginning to the point of advancement (rating from 1-10 in terms of change in understanding, and time duration from start).
10. Number of other clients that UB staff is working with.
11. Number of presentations given without the FS present.

It is important to note the success rate of PBSRG and the FS in moving the technology to other universities:

1. Glasgow Caledonian University (4 years effort, once a year visit, no research tests).
2. Florida International University (2 year effort, 2 research clients, \$150K grants, testing by PBSRG, but no testing by FIU faculty.)
3. Central Connecticut University (1 year effort, 6 visits, no research tests, 5 years later faculty is teaching the IMT/PIPS class in the curriculum.)

The movement of PIPS/IMT, and the research based education to the University of Botswana is a significant test. The effort is being funded by the US State Department Fulbright Scholar program.

7. SELECTION OF THE UB PARTICIPANTS (CORE TEAM)

The FS used the Information Measurement Theory (IMT) principle of alignment to select the UB faculty participants who would be responsible for the Embassy projects. The selection criteria included:

1. Attendance at the graduate class and volunteer to take over the research based class once the FS left.
2. Attendance at the presentations that the FS gave to prospective clients.
3. Interest shown in learning the process.
4. Time available to perform the work.

Two of the faculty, the PM section leader, and the youngest lecturer fit the above criteria.

8. DISCOVERY OF A NEW RISK MODEL

In training the UB faculty group, the lead project coordinator, requested a clearer, simpler, more dominant explanation of project risk. In discussing the issue of risk, a new risk model was created which had the following characteristics (D. Kashiwagi, 2009, Mselle *'et al.'*, 2009):

1. Risk was created by the client's inaccurate perception of the initial conditions and final conditions.
2. The inaccurate perception was caused by client decision making.
3. Client decision making was a result of not having enough information on the initial conditions and having false expectations.
4. Risk was being caused by the client's ignorance, and increased by the client hiring vendors who were not experts, but who responded to the client's delivery system and expectation.

The new risk model led to a clearer explanation of the risk management plan (RMP) and the weekly risk report (WRR) in PIPS, and is now used in all of PBSRG's projects in the United States.

9. PIPS TESTING

Over the course of six months, the U.S. Embassy has run five tests with the UB faculty:

1. Landscaping of picnic area.
2. Procurement of vendor services to create posters to supplement TV advertisements to get volunteers for AIDS preventative medication.
3. Procurement of an event organizer for the AIDS conference.
4. Procurement of services for a facilitator for AIDS conference for health care workers working with at risk AIDS population.
5. Snack bar vendor for embassy.

10. NUMBER OF ERRORS IN RUNNING PIPS TESTS AT THE U.S. EMBASSY

As the tests were run, numerous errors were recorded, and documented. The landscaping pre-award kick-off meeting was held without having the contractor fill out the RMP or WRR. The project is now completed. The results brought value to the Embassy as the best value contractor changed the scope of work to meet the intent of the client. However, the UB staff is trying to get the contractor to turn in the WRR after the fact. This error occurred because the UB team didn't fully realize the importance of the WRR and the RMP. The concept of the contractor setting the baseline plan, documenting the deviations, and weekly reporting on the status of the deviations sometimes gets lost after the client believes that the best value contractor has pre-planned and will take care of the project. A contributing factor was the contracting agent issuing the contract before the WRR and RMP were completed. Both errors were caused by not having enough information on the process.

In the selection of the facilitator for the AIDS conference, there were two competitors. One competitor did not turn in past performance information. They were allowed after the fact to turn the information in. It

should not have been allowed. If anyone does not turn in past performance information when it is required, they should be given zeros for past performance. One competitor did not come to Gaborone as requested in the RFP, but requested a telecom from South Africa. They should not have been allowed to do the interview by telecom, however, the vendor had a relationship with the client (CDC) and the procurement officer made a decision to allow the vendor to perform the interview by telecom. After the selection process was completed, the UB coordinator constructed the matrix with the selection factors. The coordinator identified that both bids were within the budget, and gave both vendors 100% credit on the price factor. However, one vendor was 20% cheaper than the other one (one vendor came from the University of Botswana, and was charging a 20% overhead charge) while the other was from the private sector. The way the price was scored, the selected best value vendor had a lower interview score and a higher price. The UB core group leader should have sent the selection matrix to PBSRG for a quick review. The last mistake was at the pre-award kick-off meeting. The “best value” facilitator came into the pre-award meeting, and immediately identified that:

1. They were very uncomfortable with the format of the conference/workshop.
2. They were doing something different, and proposed to do their proposed presentation.

During the discussion, the UB coordinator and the Embassy contracting officer had the right to terminate talks with the best value, and start discussions with the second best value. However, the UB mentor and the Embassy contracting agent did not know the PIPS rule, and instead negotiated with the vendor. They should have immediately organized a pre-award kick-off meeting with the second best value vendor.

In the procurement for the logistician for the AIDS conference, the best value vendor was the very proactive, visionary, and understood the RMP and the WRR. The FS identified that their WRR was one of the most accurate and complete reports. Because the client was unsure about the details of the conference, they did the following:

1. Made the vendor do far too much coordination.
2. Did not answer the vendor's questions in a clear and concise manner.
3. The contracting officer made the pre-award period too long.
4. The vendor was so efficient; they documented the client's confusion.
5. The vendor's weekly report was, as one of the Embassy team members stated, “I have never seen such documentation of incompetence.”

The UB staff should have been more assertive, and regulated the process more efficiently. The contracting officer should have:

1. Issued the vendor a contract earlier.
2. Forced the client to accept accountability for their actions.

11. STATUS AND FEEDBACK FROM EMBASSY PROCUREMENT GROUP

The U.S. Embassy has just requested the UB core group to start the fifth PIPS test to procure their snack bar concessionaire. This is following the conclusion of the third and fourth projects with the local CDC organization. The logistician contract was the first contract where the group received a timely WRR and RMP. This is the first group outside of PBSRG to have this accomplishment.

Table 11.1 U.S. Embassy's evaluation of PIPS

#	Criteria	Rating
1	PIPS increases the ability for Embassy to procure better value services in Botswana	10
2	Once fully learned, and once the vendors are educated, PIPS has tremendous potential to save time and provide documentation in the delivery of services	10
3	PIPS makes the vendors manage and minimize risk that they do not control	10
4	PIPS makes all participants accountable to do what is identified in the baseline plan	10
5	PIPS exposes the real issues in the delivery of services	10
6	The client and the client's delivery system is a major problem in the delivery of high performance services	8
7	As the number of tests increase, the benefits of the system become more dominant	10
8	PIPS assigns accountability and also documents user's bureaucratic action	10
9	PIPS provides a structure that helps "blind" participants pre-	10
10	PIPS allows the experts to tell the client what can be done	10
11	PIPS treats the experts as a resource, and not as an	10
12	The WRR and RMP forces preplanning and the delivery of the best value	10
13	PIPS can assist Botswana vendors and users optimize their delivery of services	10
14	PIPS is straightforward, logical, and minimizes decision	10
15	Botswana vendors are capable of learning PIPS	9
16	PIPS will increase the level of performance of Botswana contractors	9
17	UB team is capable of helping clients run PIPS	6
18	UB team understanding of PIPS when they ran the first test was complete	3
19	UB team understanding of PIPS today is complete	7
20	PIPS is a redundant, dominant structure, that minimizes risk even if only a part of the process is used	10
21	Embassy team increased in comfort with the system as they gained more experience with the system	10
22	PIPS takes repeated tests to learn the capability of the	10

The embassy staff has been very pleased with the results of the PIPS testing. They have rated the system a 9 (1-10, 10 being the highest, 10 means totally agree, 5 is don't know, 1 is totally disagree). They have

continued to run PIPS tests, and continue to work with the UB core team. The complete rating is shown in Table 11.1.

12. CONCLUSIONS AND RECOMMENDATIONS

The FS was very successful in showing the UB PM staff that a research based graduate program could be very successful. The results were:

1. 21 refereed conference papers.
2. 7 different industry research tests initiated.
3. Research based approach instituted in four different courses.
4. Two research grants totalling \$25K (U.S.)
5. The U.S. Embassy is very pleased with the research test results and would like to embed PIPS into their procurement processes.
6. Three UB faculties learned PIPS by the U.S. Embassy testing, and took the technology into their courses.
7. The UB IT department agreeing to test PIPS internally in their operations.
8. 15 graduate students from Botswana organizations interested in using research based approach and testing in their organizations.
9. A new course makeup and research based approach developed for the UB.

The research based approach has been validated on the Fulbright Scholar's test case, and should now be tested out in a full blown UB faculty test. The FS did a lot of the planning, coordination, writing, and presenting during the effort. The next stage is to determine if the UB faculty have the tools to do the research based approach.

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