
Volume 5
Construction Project Management Research Compendium
Faisal M. Arain
Editor
NOVA

CONSTRUCTION PROJECT MANAGEMENT RESEARCH COMPENDIUM

VOLUME 5

CONSTRUCTION PROJECT MANAGEMENT RESEARCH COMPENDIUM

Additional books in this series can be found on Nova's website under the Series tab.

Additional e-books in this series can be found on Nova's website under the e-book tab.

CONSTRUCTION PROJECT MANAGEMENT RESEARCH COMPENDIUM

VOLUME 5

FAISAL ARAIN
EDITOR

nova publishers
New York

Library of Congress Cataloging-in-Publication Data

ISSN: 2167-5465

ISBN: 978-1-63321-877-2 (eBook)

Published by Nova Science Publishers, Inc. † New York

CONTENTS

PREFACE

Construction industry is and always has been a major player in any developing and developed country's economy. Construction sector is one of the major sources of economic growth, development and economic activities. Construction industry plays an important role in the economic uplift. The construction industry generates substantial employment and provides a growth impetus to other sectors through backward and forward linkages.

The rapid trend of globalization and technological changes have made difficult for construction organizations to survive in the competitive world. Consequently, the importance of construction project management has been increased many folds. It is difficult to face the challenges of present global business arena without being more agile, adaptive and efficient. To develop the required expertise and resource, construction project management training is the key. In order to effectively operate in such competitive environment, the construction professionals should have project management knowledge and essential skills and competencies.

The book presents knowledge on project management issues relevant to the built environment of developed and developing countries. The book contains very interesting research findings and scholarly perspectives on training young professionals in construction industry, causes of safety degradation in construction projects, knowledge management in architectural design firms, enhancing construction project sustainability, project management culture in GCC countries, project planning practices, disseminating construction project knowledge, project management competency requirements, procurement selection perimeters, and leadership styles in project management.

In the last four decades, the interest in construction project management has increased among construction industry stakeholders. There is an extensive body of knowledge in construction project management domain exists. The ever-changing nature of construction projects requires construction industry to keep exploring, researching new venues and methods to successfully complete projects considering all major aspects of project management. The social, political, economic, technological and competitive challenges require every business organization to be proactive in addressing construction project management related aspects to be competitive in the present market. Construction project management offers organizations a number of practical competitive advantages, including the ability to be both effective in the market place and efficient with the use of organizational resources, and the ability to achieve successful projects, and to manage challenges arising from the dynamic business environment. This book is a sincere and valuable contribution to

the project management community in construction industry. The book provides new insights into the construction project management domain.

Dr. Faisal Manzoor Arain
July 24, 2014

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 1

ENHANCING EMPLOYABILITY OF YOUNG PROFESSIONALS IN CONSTRUCTION INDUSTRY

Faisal Arain*
Southern Alberta Institute of Technology,
Calgary, Canada

ABSTRACT

The competence of a construction program in the core area of Construction Project Management is in imparting to its students the necessary expertise in order to practice professionally in the construction industry. The study identifies the graduate competencies for baccalaureate level construction education in Alberta, Canada. To achieve the study objectives, a questionnaire survey was carried out to collect information on industry's perspective on graduate competences. Responses from 32 construction industry professionals were analyzed.

The results suggest that the construction acumen, project management and leadership, business acumen, professionalism, and communications were considered as the most important (top five) and desirable graduate competencies. Other important competencies include building techniques, international project management, research, cost management, conflict resolution, ability to learn, contracts management, risk management, teamwork, and technological competency, procurement management. It is recommended that the breadth and depth of the core's syllabi ensures sufficient coverage of fundamental and extended topics on construction project management. Construction programs should help to equip our students better to participate in the local and global construction industries that await them.

The findings from this study would also be valuable for all academicians and researchers involved in the area of academic development in general.

Keywords: Construction, management, competencies, education

* Chair, Construction Project Management, Southern Alberta Institute of Technology, 1301-16 Ave NW, Office # NN211C, Senator Burns Building, T2M 0L4, Calgary, Canada. Contact# 403-774 4882, faisal.arain@sait.ca

INTRODUCTION

As the Canadian population grows, so does the demand for residential and commercial property. Construction is and always has been a major player in Canada's economy. The construction industry employs close to 1 million Canadian men and women and chalks up volumes of $123 billion annually (Arain, 2009). The construction industry also has been accounting for about 12 percent of Canada's GDP. The construction industry has a growing need for management professionals and effective project management, which are crucial for major building or renovation projects, especially given the growing complexity of large construction projects and construction-related law (Ling and Leow, 2008).

For these reasons, positions in construction management increasingly require a specialized degree. Construction management requires a broad skill set in a variety of areas, and construction project managers are ultimately responsible for every aspect of their projects, including planning and scheduling project activities; managing employees, contractors, equipment and materials; project design; and budgeting.

Construction project management is the study of how the principles of scientific management are applied to construction projects (Kramer, 2005). It also covers maintenance of existing buildings and management of construction companies. Various management tools and theories are used to solve problems relating to the planning and control of construction projects. The core establishes the professional basis for successful operations in development projects as well as a strong basis for advanced studies in related areas (Arain, 2007).

Construction projects are complex because they involve many human and non-human factors and variables (Arain et al., 2004). The construction process can be influenced by changing variables and unpredictable factors that could derive from different sources. These sources include the performance of the parties, resources availability, environmental conditions, involvement of other parties and contractual relations (Arain and Low, 2003). As a consequence, the projects may face problems possibly causing delay in the project completion time.

It is commonly accepted that the construction industry has for many years been criticized for not developing consistent projects that are on time, within budget and with high quality standard (Arain, 2007; Ling and Leow, 2008). Generally, failure to deliver successful projects has been considered in relation to schism between design and construction, lack of integration, lack of effective communication, uncertainty, changing environment, and increasing project complexity (Arain and Low, 2003; Arain et al., 2004; Arain, 2005a). Turner and Muller (2003) pointed out that committed people with high team spirit are essential for effective project management. Successful implementation of projects has always been a critical factor to the success of organization (Conrad and Sireli, 2005).

The rapid trend of globalization and technological changes have made difficult for construction organizations to survive in the competitive world (Babcock and Morse, 2002; Arain, 2007). Consequently, the importance of construction project management has been increased many folds. It is difficult to face the challenges of present international business arena without being more agile, adaptive and efficient. To develop the required expertise and resource, construction project management education is the key. In order to effectively operate in such competitive environment, the construction professionals should have project management knowledge and essential skills and competencies (Arain, 2007). The objective of

this study is to identify the graduate competencies for baccalaureate level construction education in Alberta, Canada.

GRADUATE COMPETENCIES FOR CONSTRUCTION EDUCATION

The construction industry is becoming increasingly global and the role of construction management professional now includes many front-end services, which increases the required skill set of new construction graduates (Choudhury, 2000; Kay 2001). Alternate contractual delivery systems, collaborative partnerships, new management initiatives, and global product markets require students to have a broader awareness of construction methods and project management issues (Kramer, 2005).

Due to the complex nature of present construction business environment, the organizations often undertake multiple projects which are varied in nature and call for more specialized expertise in project management (Arain and Low, 2005). The engineers are often assigned management responsibilities as a result of promotion to higher level or due to the nature of work. Therefore, the engineering managers must have project management skills and ability to have the holistic view of the project from initiation till closing. The engineering managers have to work in an organizational setting that demands high degree of cross-functional integration. In order to effectively operate in such environment, the engineering managers should have required skill set and project management knowledge (Babcock and Morse, 2002). Leading companies want and need graduates with solid foundations in both construction and project management, specific training in complex and challenging management problems, and sufficient workplace experience to assume leadership roles quickly. Construction Project Management program is a management-based course of study that prepares students for leadership roles in the construction industry. The program aims to provide participants with structured management and leadership techniques that will provide the basis for broader management decisions as well as on-site leadership in construction operations.

Graduates competencies of the construction project management program should be determined based on advice from leading regional industries, professional bodies, and the experience of other local and international for improving graduate's educational preparation for the construction industry (Arain, 2009). Program curriculum should be designed using a learner-centered model that provides choice, project based learning, opportunities for student interaction and active learning. Current best-practices in education, which encourage problem solving and critical thinking as key components of the learning process, should be employed.

Due to the technological advances in the IT industry around the world, the need for better project management skills is becoming more evident. Hartenian et al. (2001) pointed out that there is need that construction schools strive to improve the course offerings that incorporate the issues of complex dynamic environment. They particularly pointed out that the graduate students do not possess required knowledge of project management related skills. Arain and Tipu (2009) wrote that the issue of lack of project management skills has been realized by many technical schools and there is encouraging sign that schools are considering developing a complete project management curriculum addressing key competencies sought by the industry. Management decides and implements the ways and means to effectively and efficiently utilize human and non human resources to reach predetermined objectives (Bryde,

2003). Project managers are expected to marshal resources to complete a fixed-life project on time, on budget, and within specifications. Project managers are the direct link to the customer and must manage the interface between customer expectations and what is feasible and reasonable (Arain, 2005a). They provide direction, coordination, and integration to the project team, which is often made up of part time participants loyal to their functional departments. Project managers must ensure that appropriate trade-offs are made between the time, cost and performance requirements of the project (Arain and Low, 2003; Arain, 2007). At the same time, project managers, unlike their counterparts, generally enjoy only rudimentary technical knowledge to make such decisions. Instead, they must orchestrate the completion of the project by inducing the right people and resources, at the right time, to address the right issues and make the right decisions (Arain, 2005b). Certainly, resource optimization for successful project management is a unique and challenging task. Choudhury (2000) pointed out that the underlying reasons of the issues, such as time delays and high cost, could be lack of knowledge of the project management skills.

Table 1. Graduate competencies for construction education for enhancing employability of construction graduates

SNo.	Graduate Competencies for Construction Education
1	Project Management: *Apply principles of project management to plan, scope, schedule, cost, resource, complete and evaluate construction projects*.
2	Leadership: *Assume leadership role within teams to achieve the intended outcome.*
3	Business Acumen: *Apply knowledge of business processes, organizational structure, management principles and financial requirements to core business practices such as human resources, business operations, financial management, information systems, organizational behavior, business negotiations and law*.
4	Professionalism: *Integrate professional and ethical responsibilities that contribute to a safe and positive working environment*.
5	Construction Acumen: *Interpret plans, drawings, shop drawings and materials information documents for different types of construction projects*.
6	Contracts Management: *Prepare and negotiate contracts common to construction projects and the construction industry*.
7	Research: *Apply research and analytical skills to solve problems within construction projects*.
8	Communications: *Communicate effectively in both written and oral forms to a variety of audiences in a professional and ethical manner*.
9	Conflict Resolution: *Apply conflict resolution strategies to resolve current and emerging conflict*.
10	Cost Management: *Utilize current technologies and established practices to plan and manage construction budgets*.
11	Procurement Management: *Incorporate procurement management skills to evaluate and select bids for materials and skills needed to complete construction projects.*
12	Risk Management: *Incorporate risk management skills to evaluate and select construction projects*
13	Building Techniques: *Demonstrate a robust knowledge of building techniques and construction methods*.
14	International Project Management: *Differentiate and apply the management strategies and requirements for local versus international projects*.
15	Technological competency: *Apply recent technological knowledge to manage projects.*
16	Teamwork: *Assume various roles within teams to achieve an intended outcome in a professional and ethical manner.*
17	Ability to Learn: *Demonstrate a capacity to learn through formal and informal methods, in order to confirm and extend their knowledge and skills when addressing new or emerging challenges.*

Many researches indentified the graduate competencies for construction education that assist in increasing employability of construction graduates. The competencies include project management, leadership, business skills, professionalism, construction acumen, contracts management, research, communication skills, conflict resolution skills, cost management, procurement management, risk management, building techniques, technological skills, teamwork, ability to learn and global project management (Choudhury, 2000; Kay, 2001; Hartenian et al., 2001; Babcock and Morse, 2002; Turner and Muller, 2003; Arain et al., 2004; Conrad and Sireli, 2005; Karmer, 2005; Arain, 2007; Arain, 2009; Arain and Tipu, 2009).

The studies above discussed many graduate competencies for construction education for enhancing employability of construction graduates in the industry. The literature study assists in compiling a list of graduate competencies, as shown in Table 1.

The literature study forms the basis for the questionnaire survey to collect information on industry's perspective on graduate competences. The study is a unique research that identifies the graduate competencies for construction education for enhancing employability of construction graduates in Canadian construction industry for the first time. The study sets the foundation for future larger research study on identifying graduate competencies for construction education for enhancing employability of construction graduates in the construction industry on a larger scale.

RESEARCH METHODOLOGY

Through the above literature review, the 17 graduate competencies for construction education for enhancing employability of construction graduates in the construction industry were identified. These provided the basis for the formulation of a questionnaire.

A survey of 32 professionals from the Albertan construction industry was carried out. They included vice-presidents, directors, senior managers, project managers, construction managers and project engineers. A total of 32 questionnaires were distributed personally to the respondents, together with an explanation on the purpose of the study and assuring them of anonymity. In addition to collecting information via the questionnaires, face-to-face discussions using the questionnaires were also carried out to ensure that all questions were answered and the respondents have a chance to clarify any doubts with the research team. A 5-point Likert scale was used in the questionnaire to gauge the most important graduate competencies for construction education for enhancing employability of construction graduates in the construction industry.

BACKGROUND OF RESPONDENTS

A total of 32 professionals were asked to gauge the importance of graduate competencies using a 5-point Likert scale. They included 14 professional from contractor side, 11 from consultant side, 3 from academia, 2 from governmental organization, and 2 from professional association. Table 2 shows the details of the responses.

As shown in Table 3, of the 32 professionals interviewed, 5.25% were vice presidents, 21.87% were directors and 34.38% were senior managers. 18.75% of the interviewees were

project managers, 12.50% were construction managers, and 6.25% of the interviewees were project engineers. Professionals were involved with the construction industry for more than 10 years; therefore, they were likely to be better able to assess the employability issues and graduate competencies sought by the construction industry. As a majority of the interviewees were professionally positioned at management level or higher, a certain level of accuracy in the data collected was assured.

Table 2. Survey response rates

Respondents	Responses received	Interviewed	Percentage
Contractors	14	14	43.76%
Consultants	11	11	34.37%
Academia	3	3	9.37%
Governmental organization	2	2	6.25%
Professional Association	2	2	6.25%
Total	32	32	100%

Table 3. Professional interviewees' statistics

Respondents	Appointments	Responses received	Percentage
Professionals	Vice Presidents	2	6.25%
	Directors	7	21.87%
	Senior Managers	11	34.38%
	Project Managers	6	18.75%
	Construction Managers	4	12.50
	Project Engineers	2	6.25%
Total		32	100

ANALYSIS OF RESULTS

The data collected from the 32 questionnaires was analyzed statistically. As shown in the Table 1, the 17 graduate competencies for construction education for enhancing employability of construction graduates were identified from the literature review and feedbacks from the professionals in the construction industry. The questionnaires containing 17 graduate competencies and section for feedback (additional competencies) were provided to the professionals involved in the construction industry. The graduate competencies for construction education for enhancing employability of construction graduates were analyzed and ranked according to their responses.

As shown in Table 4, the 17 graduate competencies for construction education for enhancing employability of construction graduates in the construction industry were tabulated according to their means and standard deviations.

Furthermore, the graduate competencies for construction education for enhancing employability of construction graduates in the construction industry were categorized into the most important ones as shown in Table 5. The results suggest that the construction acumen, project management, leadership, business acumen, professionalism and communications were

considered to be the top five most important graduate competencies for construction education for the construction industry in Canada.

Table 4. Graduate competencies for construction education for enhancing employability of construction graduates

S No.	Graduate Competencies for Construction Education	Mean	Std. Dev.
1	Project Management	3.62	0.64
2	Leadership	3.62	0.58
3	Business Acumen	3.56	0.64
4	Professionalism	3.48	0.75
5	Construction Acumen	3.64	0.73
6	Contracts Management	3.14	0.59
7	Research	3.22	0.64
8	Communications	3.39	0.83
9	Conflict Resolution	3.18	0.67
10	Cost Management	3.21	0.92
11	Procurement Management	3.07	0.58
12	Risk Management	3.11	0.70
13	Building Techniques	3.32	0.77
14	International Project Management	3.25	0.65
15	Technological competency	3.07	0.73
16	Teamwork	3.11	0.70
17	Ability to Learn	3.18	0.64

Table 5. Top five graduate competencies for construction education for enhancing employability of construction graduates

S No.	Graduate Competencies for Construction Education	Mean	Std. Dev.	RANK
1	Construction Acumen	3.64	0.73	1.
2	Project Management	3.62	0.64	2.
3	Leadership	3.62	0.58	2.
4	Business Acumen	3.56	0.64	3.
5	Professionalism	3.48	0.75	4.
6	Communications	3.39	0.83	5.

DISCUSSION AND CONCLUSION

The study results showed that all graduate competencies were considered important by the respondents. It is revealed through in-depth interviews that employers expect construction graduates to possess the key competencies to be beneficial part and prosper in the construction industry. The construction acumen was ranked as the most important graduate competency for enhancing employability in the construction industry. Considering the

technical nature of the construction project management discipline, this was not unexpected. Many research studies have suggested that the construction acumen is the foremost skill that is sought by the construction industry. It was revealed through in-depth discussions with the professionals that ability to interpret plans, drawings, shop drawings and materials information documents for different types of construction projects is an integral skill that construction graduates should possess to be a beneficial part of the construction industry.

Project management and leadership were jointly considered as the second most important causes of low participation of professional women in the construction industry. The graduates of the construction project management program are expected to demonstrate sufficient knowledge of principles of project management application to plan, scope, schedule, cost, resource, complete and evaluate construction projects. Project management is all about providing efficient leadership at every level of the construction projects. Construction graduates should to able to assume leadership role within teams to achieve the intended outcome.

The results revealed that business acumen was perceived as the third most important competency for construction graduates. Business acumen would help construction graduate to participate in the construction organization beyond the implementation and management of construction projects. It was acknowledged by the professionals interviewed that construction graduates should be able to apply knowledge of business processes, organizational structure, management principles and financial requirements to core business practices such as human resources, business operations, financial management, information systems, organizational behavior, business negotiations and law.

Professionalism and communication were considered fourth and fifth most important competencies for construction graduates respectively. It is evident that the construction industry requires professionalism as an integral component to encourage a conducive and professional environment. Construction graduates are expected to have ability to integrate professional and ethical responsibilities that contribute to a safe and positive working environment. Effective communication is an important attribute of project leadership, construction graduates should be able to communicate effectively in both written and oral forms to a variety of audiences in a professional and ethical manner. Construction education should address to these required competency to produce career ready professionals for the local and global construction industry.

In the face of this changing economic environment, existing and upcoming professionals in the construction industry must be adequately trained to adapt to different markets and cater to regional demands in a more internationalized market. The skills needed to be successful in the international market such as project management skills, construction acumen, professionalism, business acumen, construction laws and regulations, communication, and cultural knowledge will become increasingly vital for construction industry professionals who wish to compete in the global arena. Present student generation in construction-related disciplines is well aware of the changing market conditions ahead and realizes that they need to reach out to developing regions to expand and build their careers.

Academic institutions now realize the need for courses in global project management, language skills development as well as working environments, laws and regulations in emerging markets. Nevertheless, additional efforts are required for further adjustments to their curricula in response to this emerging need. Incessant pace in education development to train students in construction-related disciplines for working in local and global, emerging

markets can help add a degree of flexibility to their arsenal, enabling them to have fewer restrictions, thus opening a wider venue of opportunities for them. This added flexibility can reduce the chances of construction professionals leaving the field for other professions, thus ensuring a more constant and stable supply of human resources. Overall, these combined advantages will ultimately lead to a healthier industry and promote a better image for the entire profession. It is recommended that the breadth and depth of the core's syllabi ensures sufficient coverage of fundamental and extended topics on construction project management. Construction programs should help to equip our students better to participate in the local and global construction industries that await them. The findings from this study would also be valuable for all professionals, academicians and researchers involved in the area of construction education in general.

REFERENCES

Arain, F. M. (2005a). "Potential barriers in management of refurbishment projects." *Journal of Independent Studies and Research*, 3(1), 22-31.

Arain, F.M. (2005b). "Strategic management of variation orders for institutional buildings: Leveraging on information technology." *Project Management Journal*, PMI, 36(4), 66-77.

Arain, F. M. (2007). "Critical success factors of project management practices in Pakistan construction industry." *Construction Information Quarterly*, 9(4), 179 – 185.

Arain, F.M. (2009). "Developing a unique baccalaureate degree program: *Benefits and challenges." Proc. Of the Innovations Conference*, Reno-Tahoe, Nevada, USA, 16-26.

Arain, F. M. and Low, S. P. (2003). "Measures for minimizing adverse impact of variations to institutional buildings in Singapore." *Journal of Housing, Building and Planning*, 10 (1), 97-116.

Arain, F. M. and Low, S. P. (2005). "The Potential effects of variation orders on institutional buildings." *Facilities*, Emerald, 23(11), 496-510.

Arain, F. M., Assaf, S. and Low, S. P. (2004). "Causes of discrepancies between Design and Construction." *Architectural Science Review*, 47(3), 237-249.

Arain, F. M. and Tipu, S. A. (2009). "Status of project management education in Pakistan." *Educational Research and Reviews Journal*, 4(4), 148 – 155

Babcock, D. L. and Morse, L. C. (2002). "*Managing Engineering and Technology*." Prentice Hall, UK.

Bryde, D. J. (2003). "Project management concepts, methods, and application." *International Journal of Operations and Productions Management*, 26(7), 775-793.

Choudhury, I. (2000). "Cross-cultural training of project personnel for implementation of international construction projects by US contractors." *Int. Proc. of the Associated Schools of Construction*, Purdue University, Indiana, 87-94.

Conrad, J. M. and Sireli, Y. (2005). "Learning project management skills in senior design courses." *Proc. of the ASEE/IEEE Frontiers in Education Conference*, Indianapolis, 83-91.

Hartenian, L., Schellenger, M. and Frederickson, P. (2001). "Creation and assessment of an integrated business course: One college's experience." *Journal of Education for Business*, 76(3), 149-159.

Kay, D. (2001). "A survey of the foreign language preparedness of construction students." *Int. Proc. of the Associated Schools of Construction*, Purdue University, Indiana, 59-66.

Kramer, S. W. (2005). "Project management education: Experiential learning through a European study abroad class.", *Proc. of the PMI Global Congress North America*, Toronto, Canada, 1-8.

Ling, F. Y. and Leow, L. (2008). "Enabling knowledge flow: retaining graduate women in the Singapore construction industry" *Journal of Construction in Developing Countries*, 13(2), 65-81

Turner, J. R. and Muller, R. (2003). "On the nature of the project as a temporary organization." *International Journal of Project Management*, 21(1), 1-8.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 2

IDENTIFING CAUSES OF SAFETY DEGRADATION IN CONSTRUCTION PROJECTS IN PALESTINE

Adnan Enshass[1], Rafiq M. Choudhry[2] and Mohamed Aqaad[1]
[1]Civil Engineering Department, IUG, Palestine
[2]School of Civil and Environmental Engineering,
National University of Sciences and Technology, Pakistan

ABSTRACT

Construction is one of the most hazardous industries due to its unique and dangerous nature. Safety performance has always been a persistent problem in the construction industry in both developed and developing countries. The objective of this paper is to identify and rank the significant factors affecting safety performance in the Palestinian construction industry in the Gaza Strip according to their relative importance. The survey covered eighty selected factors from the literature, which were grouped into nineteen categories. A questionnaire survey was used in order to facilitate the collection of information from construction projects; 51 contractors responded to this survey. The results indicated that personal protective equipment (PPE) group ranked in the first position among the nineteen groups. This group contains the main equipment that protects workers from accidents.

The results showed that the most important factors which affect safety performance in construction projects are: the use of gloves and face protection; the use of barricades to prevent collapse of soil during work; the use of protective head; the use protective feet; and non-excessive overtime work for worker. The findings of this paper sugest that the Palestinian government need to play an important role in safety management in the construction industry. The results indicate that there is a need for enacting specific labor legislation, issuing laws and rules to protect labor, conducting a periodically work sites inspections through competent safety engineers and subjecting the contractors to a citation or fine for unsafe conditions or hazards existing on a projects. The findings of this research will help construction practitioners and researchers in the development and improvement of safety performance in the construction industry.

Keywords: Accident, project, performance, safety, Palestine

INTRODUCTION

Construction sites are generally complex and sometimes unsafe because of outdoor operations, work-at heights and on-site plants and equipment operations (Choudhry and Fang 2008). They are complex because of extensive use of sophisticated plants, equipment, modern methods of construction, multidisciplinary and multitasked aspects of its project workforce. Teo et al. (2005) described construction site as one of the most dangerous workplaces because of high incidence or accidents. The construction industry is characterized by continual changes, bombardment of varying technologies, poor working conditions and need for coordination of different interdependent trades and operations (Choudhry and Fang 2008). Due to the hazardous nature of work, safety is a serious problem in the industry (Tam et al. 2004). Kartam and Bouz (1998) confirmed that construction is the most hazardous industry in Kuwait, with accidents accounting for 48%, 38% and 34% of all disabling injuries and 62%, 38% and 42% of all fatalities in 1994, 1995 and 1996, respectively. Globally, the construction industry has a poor safety record and is disproportionately dangerous compared to other industries which advocated the idea that safety is no luxury but a necessity (Fung et al. 2005). Siu et al. (2004) stated that safety attitudes predict occupational injuries, and psychological distress predicts accident rates. Much work in safety has focused on methodological rather than theoretical or conceptual issues (Zohar, 2010). Little has been done in this field in Gaza Strip-Palestine. To reduce accidents, injuries, and fatalities on construction sites, safety should be a top priority. Although the issue of site safety has historically been viewed as more of an engineering problem, several researchers in Palestine (Enshassi 2003; Hassona 2005, Enshassi et al. 2009) have increasingly acknowledged that management factors have played an important role in site safety. The objective of this paper is to identify and rank the significant factors affecting safety performance in the Palestinian construction industry in the Gaza Strip. This study is considered the first one of its nature in Palestine. The study will help construction firms to improve safety performance in their projects and increase safety awareness in the construction industry. The paper starts with brief review of related literature. Second, the research method is described. Third, the results and discussion of this research is presented. Finally, the conclusions and recommendations of this research are provided.

BRIEF REVIEW OF PREVIOUS STUDIES

Importance of Safety

The advancement in social sciences has promoted a greater awareness of the sanctity of life and the unacceptability of premature death due to accidents. Accidents at construction sites are identified as a major problem throughout the world. Safety is not a luxury, and may be considered an important function to be used against unnecessary loss of property, injury, or death (Hinze and Gambatese 2003). Construction site fatalities and injuries bring great losses to both individuals and societies. Petersen (1971) has summarized the problem in two points: people are the fundamental reason behind accidents and management is responsible for the prevention of accidents. The management failures represent the real and underlying causes of accidents (Fang et al. 2004a, b). Preventing occupational injuries and illness should

be a primary concern of all employers. Especially in developing countries, there must be an effort to raise the level of awareness among both employees and employers of the importance of health and safety at construction sites. Emphasis in both developing and developed countries should be placed on training and the utilization of comprehensive safety programs (Koehn et al. 1995).

Safety Performance

Neg et al. (2005) evaluated safety performance of construction contractors at organizational level and at project level. Toe et al. (2005) investigated how project managers may increase the safety levels of construction sites. They grouped factors that affect safety performance into four categories: policy aspect, process aspect, personnel aspect, and incentive aspect. Fang et al. (2004a, b) discussed an empirical research on construction site safety management performance.

They categorized the factors which affect safety performance into five groups: foreman related factors, work related factors, crew related factors, manager related factors, and safety training related factors. The nature of the project is supposed to have strong influence on safety performance. It includes the work environment, complexity of the design and type of owner. The aim in tide site planning and facilities is to produce a working environment that will maximize efficiency and minimize risks. Aspects of tide site that need to be addressed include access and traffic routes, material and storage handling, site offices and amenities, the construction plant, fabrication workshops, services and facilities, and the site enclosure. Previous research shows that tidy and well planned sites are more likely to provide a high level of safety performance (Heng 2007).

Owners have long recognized and honored a moral obligation to provide a safe work environment to minimize injuries. Owners can take measures to achieve better safety performance. Hinze and Gambtese (2003) concluded in their research to identify factors that significantly influence the safety performance of specialty contractors. They found that safer worker performances were realized among those firms reporting large percentages of their projects were with private owners. Hassan et al. (2007) studied the perception of building construction workers towards safety. They found that fire prevention, housekeeping, heavy equipment, health and welfare, and transportation among the factors which affect safety performance. In their research on important criteria's for contractor selection, Hatush and Skitmore (1997) establish that, health and safety performance of contractors was among the top four important criteria's.

Safety Factors

An extensive literature review has been conducted to identify the factors which affect the safety performance of construction projects. Sawacha, et al. (1999) identified the factors that influencing safety performances on construction sites, among these factors are: provision of safety booklets, provision of safety equipment, and training issues. Jannadi and Bu-Khamsin (2001) identified safety factors considered by industrial contractors in Saudi Arabia. Among these factors are: welfare facilities, sign and signals, handling of materials, electrical

equipment, and management involvement. Jannadi (2008) identified several factors affecting safety performance, some of these are: developing a plan to respond to emergency, workers training, using of safety signs, provision of safety aids, and safety policy. Fang et al. (2004 a) referred to volume of the project, cost of the project, project design, worker age, worker experience, worker education, relationship between management and workers and supervisors as factors influencing safety performance. Tam et al. (2004) stated that worker experience, worker education, safety awareness, personal protective equipment, and medical facilities as factors affecting safety performance. Ng et al., (2005) found that transportation, project nature, and emergency factors affecting safety performance.

Aksorn and Hadickusumo (2007) evaluated the critical success factors which influence safety program performance in Thai construction projects. They determined several factors that affect safety performance such as: good communication, sufficient resource allocation, management support, personal motivation, teamwork, safety equipment, and appropriate supervision. Mattila, et al. (1994) conducted a study to determine whether there is any connection between the quality of the work environment and occupational safety. The study proved that the quality of the work environment and the level of safety are directly connected in construction, and the high quality work environment will improve the housekeeping and reduce the accident frequency rates. Fung et al. (2005) investigated the safety culture in Hong Kong construction industry concerning: effective accident reporting, high line management commitment, active supervisor´s role. Tam et al. (2003) determined the elements of poor construction safety management in China. These elements are: poor safety awareness of top management, lack of training, poor safety awareness of project managers, reluctance to input resources to safety, and reckless operations.

Designer and Safety

In the development of a project, a significant role is played initially by the designer of the project and then by the constructor of the project.

Construction worker safety has often been regarded the sole responsibility of the construction contractor. Despite the obvious reasons for placing: the primary responsibility on the contractor, the safety performance on a project may well be dictated largely by decisions made by the designer (Hinze and Wiegand 1992). Through a questionnaire distributed to designers, it was found that 70% of the respondents did not address construction worker safety and health in their designs. Experience shows that the safety of construction workers cannot be guaranteed by legislation alone (Kartam et al. 2000).

Designers can play an important role in reducing the incidence of injuries and fatalities among construction workers. Designers should address construction worker safety in their designs (Hinze and Wiegand 1992). When engineers and architects are cognizant of and responsive to the safety consequences of their design decisions, safety improves. This leads to a reduction in injuries and associated costs and a decrease in redesign costs and in operating costs for special procedures and protective equipment (Hinze and Gambatese 2003).

Construction Safety in the Middle East

In Arabic region, construction safety conditions resemble those in developing countries. In the construction industry, the working environment is constantly changing, sites exist for a relatively short time and the activities and inherent risks change daily (Kartam et al. 2000; Jannadi and Bu-Khamsin 2002). It was found that higher frequencies of construction accidents occurred on projects that were over budget and those that were competitively bid (Kartam et al. 2000).

Kartam et al. (2000) summarized safety problems in Kuwait as follows: competitive tendering; lack of safety regulations; small size of most construction firms; extensive use of subcontractors; lack of relevant accident data; extensive use of foreign labor; disorganized labor; high labor turnover; low priority of safety; seasonal employment and weather effect. Kartam et al. (2000) in his research did not mention management in safety problems in Kuwait. Jannadi and Bu-Khamsin (2002) found that the most important three factors influencing safety performance are: (1) management involvement; (2) personal protective equipment; and (3) emergency/disaster planning and preparation.

One of the most prevailing problems in Middle East counties is that workers and engineers receive almost no safety training and are mostly uninformed about the company's safety programs or policies (Kartam et al. 2000). A study of the Egyptian construction industry concluded that safety programs applied by contractors operating in Egypt were less formal and the accident insurance costs were fixed irrespective of the contractor’s safety performance (Hassanein 2008).

Health and Safety in Gaza Strip is not widely recognized as inherent characteristic of construction projects. Contractors consider health and safety a legal requirement that means spending money without any profit, although a quick look at the cost of workplace injuries and the potential return on investing in accident prevention shows that a safe and healthy workplace can be a good profit. This situation resulted in the increased number of accidents. The accident rate in construction is highest when compared with other industries. Statistics have remained reasonably constant over the past six years, and the construction industry is accounting for nearly 20% of all industrial injuries (Abu Alqumboz, 2007). Statistics also showed that more than on third of fatalities among workers were death during working in construction site. Falls and excavations were the main causes for the death of constriction workers. The main causes of injuries in the Gaza Strip are classified into five categories including falls, struck by falling object, struck by moving or stable object, caught in/between, machines, and others (Hassona 2005). The absence of a unified set of safety regulations adversely affects the enforcement of safety on the job site.

METHODOLOGY

This research was conducted in Gaza Strip (including: Gaza city, north, middle and south area). It targeted contractors of various categories including buildings, roads, water supply and sewage. The targeted contractors are classified under the first, second and third categories in the various types of works in Palestinian Contracting Union (PCU). Contractors that are registered under the fourth and fifth classes were neglected due to the low practical and administrative experience of their companies in construction works.

The studied population was the contractors' companies that have a valid registration in the PCU in the following fields: buildings, roads, and water sewage. Based on PCU (2008) report, there are (220) classified companies, out of these there are (150) companies classified as 1st, 2nd, and 3rd classes.Sample size that represents the targeted population was determined from following equation (Shash and Abdul-Hadi 1993):

$$n = n' / (1 + n' / N)$$

where;

n' is the sample size from infinite population, which can be calculated from this formula ($n' = S^2/V^2$).

The definitions of all variables can be defined as the following:

n: sample size from finite population.

N: Total population (150 contractors)

V: Standard error of sample population equal 0.05 for the confidence level 95 %.

S^2: Standard error variance of population elements, $S^2 = P(1-P)$; maximum at $P = 0.5$

The sample size for the contractors' population has been calculated from the previous equations as follows

$$n' = S^2/V^2 = (0.5)^2/(0.05)^2 = 100$$

$$n = \left\lceil \frac{100}{1+\frac{100}{150}} \right\rceil = 60$$

Questionnaire survey was administered in this study as it is the most appropriate method for this kind of study (Naoum 2007). Seventy questionnaires were randomly distributed to contractors that are registered under the first, second and third categories. A total of 51 contractors responded to the questionnaires survey, yielding 73% response rate.

Eighty factors which affect the safety performance in construction were identified from extensive review of literature: Sawacha et al. (1999); Fang et al. (2004a,b); Tam et al. (2004); Ng et al. (2005); Fung et al. (2005); Teo et al. (2005); Hassan et al. (2007); Aksorn and Hadikusomo (2007); Fabiano et al. (2004); Siu et al. (2003); Mohamed (2002); Zhou et al. (2008); Campbell (2006); Kartam et al. (2000); Mattila et al. (1994); Jannadi (2008); Jannadi and Bu-Khamsin (2001); Jannadi (1995); Koehn et al. (1995); and Baig (2001).

These factors were categorized into nineteen groups based on previous literature. A pilot study was conducted, the results reviewed, and adjustments were made accordingly to produce the final questionnaire. For each factor there is a question, for measuring the degree of impact on safety performance in construction project. The degree of impact is based on a five-point Likert scale. These five points are: 5 (very high), 4 (high), 3 (moderate), 2 (low), and 1 (very low). A likert scale, probably the most common scale for obtaining respondents' opinion (Fellows and Liu 2003) was used for all questions. While the number of items used in such a scale can be arbitrary (Oppenheim 1992) the principal consideration is determining the extent to which respondents agree or disagree with a particular statement or view (Cormack

2000). Accordingly, a simple five-point scale was used. The responses to these statements were then used to calculate relative importance indices (Hassan, 2007).

$$\text{Relative Importance Index} = \frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

where W is the weighting given to each factor by the respondent, ranging from 1 to 5, (n_1 = number of respondents for very high, n_2 = number of respondents for high, n_3 = number of respondents for moderate, n_4 = number of respondents for low, n_5 = number of respondents for very low). A is the highest weight (i.e. 5 in the study) and N is the total number of samples. The relative importance index ranges from 0 to1. The relative importance index technique was used in this study to rank the identified factors according to their importance. This simple but effective technique has been widely used in construction research for measuring attitude with respect to surveyed factors. The most obvious limitation is that the RII method may capitalize on skewed data thus inflating the relative weight for a certain factor. As with any other ranking index method, the samples of ranks are not continuous and their population cannot be inferred to have the same distribution.

Internal consistency of the questionnaire is measured by a scouting sample, which consisted of thirty questionnaires through measuring the correlation coefficients between each paragraph in one field and the whole filed. The p-values were found less than 0.05 or 0.01, so the correlation coefficients of this field are significant at $\alpha = 0.01$ or $\alpha = 0.05$, which means the paragraphs of this field are consistent and valid to be measured what it was set for. Structure validity is the second statistical test that was used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of liker scale. The significance values were found less than 0.05 or 0.01, so the correlation coefficients of all the fields are significant at $\alpha = 0.01$ or $\alpha = 0.05$, which indicate that the fields are valid to be measured what it was set for to achieve the main aim of the study. Two tests were applied to the scouting sample in order to measure the consistency of the questionnaire. The first test is the Half Split Method and the second is Cronbach's Coefficient Alpha. The results of the test indicated that all the corrected correlation coefficients values are between 0.0 and 1.0 and the significant (α) is less than 0.05 indicating all the corrected correlation coefficients are significance at $\alpha = 0.05$. This indicates that the groups are reliable according to the Half Split method. The results of Cronbach's coefficient alpha were found in the range from 0.7892 and 0.915. This range is considered high; the result ensures the reliability of the questionnaire.

RESULTS AND DISCUSSION

The survey in this paper includes the rank of the 80 identified factors affecting safety performance in the construction industry which are categorized into nineteen groups. These groups are: project nature; emergency planning and preparations; signs, signals and barricades; historic, human and psychological climate; welfare facilities; administrative and management commitment; safety inspections; safety meetings; role of government and engineering societies; crane and lifting equipment; safety education and training; disposal of

hazardous materials and waste; personal protective equipment; excavation, trenching and shoring; scaffolds; fire prevention; transportation; economic investment; and medical facilities.

Groups Affecting Safety Performance

Table 1 shows that "Personal Protective Equipment (PPE)" group was ranked in the 1st position among the nineteen (19) groups with a score RII of 0.889. The importance of this group indicates the fact that PPE protects workers from the daily working accidents. The protection of head, eyes, noise, hands and feet are covered in this group factors.

This is considered the first defense line to protect workers and influence the safety performance. The obtained result is consistent with Jannadi et al. (2001) who found PPE in the 1st position, which reflected a consistency between the contractors of Palestine and Saudi Arabia. The results shown in Table 1, also show that "Signs, Signals and Barricades" group was ranked in the 2nd position respect to the remaining nineteen (19) groups of factors with score RII of 0.810.

Table 1. RII and Ranks of all Safety Performance Groups

Groups of Factors	RII	Rank
Personal Protective Equipment	0.889	1
Signs, Signals and Barricades	0.810	2
Excavation, Trenching, and Shoring	0.809	3
Crane and Lifting Equipment	0.804	4
Scaffolds	0.804	4
Role of Government and Engineering Societies	0.801	5
Safety Inspections	0.796	6
Administrative and Management Commitment	0.777	7
Fire Prevention	0.775	8
Historic, Human and Psychological Climate	0.760	9
Safety Meetings	0.754	10
Economic Investment	0.742	11
Disposal of Hazardous Materials and Waste	0.741	12
Project Nature	0.733	13
Emergency Planning and Preparations	0.733	13
Safety Education and Training	0.733	13
Transportation	0.706	14
Welfare Facilities	0.674	15
Medical Facilities	0.660	16
Total	0.759	

Personal Protective Equipment Group

Table 2 shows respondent's responses regarding the factors measuring safety performance. This group was ranked in the 1st position among all 19 groups with RII of 0.889. This result emphasizes that the personal protective equipment (PPE) is extremely important for any construction projects.

"The use of gloves and face protection" was ranked in the first position within this group and within overall groups' factors with RII of 0.894. The importance of this factor is that protecting hands and the face from any external harmful materials is critical for the safety of the labors. The presence of personal protective equipment like gloves and face protection is absolutely means the steadiness of the work without body injuries or human losses. "The use of protective head" factor ranked in the second position among PPE group with RII of 0.890 and was ranked in the 2nd position among all groups factors. This result indicates the high importance of this factor to safety performance. "The use of protective feet" factor was ranked in the 3rd position among PPE group with RII of 0.882. The results show that these three factors are too critical to measure the safety performance. The reasons is that hands, face, and feet are the key enablers for any person to do any task professionally specially labors in the construction.

The overall group of these factors was is in line with Jannadi et al. (2001) who found this factor in the 1st position with RII of 0.8, but relatively far from Sawacha et al. (1999) who found this factor in the 3rd position but with low RII of 0.68. The result obtained by Tam et al. (2004) shows this group in 13th position with RII of 0.62. Such deviation between the importances of these factors can be traced to the fact that using such personal protective equipment in construction project in the developed countries is a normal issue. Each labor wears gloves and face protection normally without any pressure but in the developing countries lack of willingness to use PPE found due to the labors culture.

Table 2. RII and Rank of Personal Protective Equipment Group

Personal Protective Equipment Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
The use of gloves and face protection	52.9	41.2	5.9	0.0	0.0	4.47	0.894	1	1
The use of protective head	56.9	33.3	7.8	2.0	0.0	4.45	0.890	2	2
The use of protective feet	58.8	27.5	9.8	3.9	0.0	4.41	0.882	3	3
Total						4.44	0.889		

Signs, Symbol, and Barricades Group

This group contains five factors and was ranked in the second position among overall groups, which emphasize the importance of this group with respect to safety performance (Table 3). From this group, it is observed that "Using of danger signs" was ranked in the first position within this group with a RII of (0.835). This factor was ranked in the 8th position among over all nineteen groups. This result revealed that "Use of danger signs" in the construction projects has critical influence on the safety performance. Such signs protect and guide labors to take care of the surrounding conditions which inturn protect labor's life. "The use of caution signs" was ranked in the second position within this group of factors with RII of (0.842). In addition, it was ranked in the 10th position among overall groups. Such signs take a yellow color, which reflect a warning safety conditions. The results indicate that the contractors were satisfied that such signs are critical to reduce accidents rate in the construction projects. "The use of instruction signs" was ranked in the third position within this group with RII (0.816) and in the 11th position among overall groups. The result shows the direct relation between the safety sign with its effect at the safety performance, when the most influence shown by the danger signs then caution signs and finally the instruction signs.

Table 3. RII and Rank of Signals, Symbol and Barricades Group

Signs, Signals and Barricades Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
The use of danger signs	37.3	45.1	15.7	2.0	0.0	4.18	0.835	1	8
The use of caution signs	37.3	39.2	21.6	2.0	0.0	4.12	0.824	2	10
The use of instruction signs	35.3	43.1	15.7	5.9	0.0	4.08	0.816	3	11
The use of barricades to close the site for pedestrians	35.3	31.4	29.4	3.9	0.0	3.98	0.796	4	15
The use of traffic signals in the site	23.5	45.1	29.4	2.0	0.0	3.90	0.780	5	19
Total						4.05	0.810		

Excavation, Trenching and Shoring Group

This group contains four factors. Table 4 shows respondent's opinion regarding the factor measuring safety performance. This group was ranked in the 3rd position among all 19 groups with RII of 0.809. "The use of barricade to prevent collapse of soil during work" was ranked in the first position respect to all groups of factors with highest RII of 0.894. Improving the

safety condition for the earth works and especially trenches is not only reflect safety performance but also show the value of human resources with respect to the contractors and construction parties overall. Using barricade will save the lives and create safe and stable working conditions. For this fact, this factor was ranked in the top position. "Soil type in terms of coherence" was ranked in the 2nd position among this group with RII of 0.824 and in the 10th position respect to overall factors. The result shows that type of soil is important factor that affected safety performance during excavation process.

Table 4. RII and Rank of Excavation, Trenching and Shorting Group

Excavation, Trenching, and Shorting Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
The use of barricade to prevent collapse of soil during work	56.9	33.3	9.8	0.0	0.0	4.47	0.894	1	1
Soil type in terms of coherence	33.3	47.1	17.6	2.0	0.0	4.12	0.824	2	10
Low level of ground-water below the excavation work	29.4	25.5	23.5	13.7	7.8	3.55	0.710	3	32
Total						4.05	0.809		

Crane and Lifting Equipment Group

This group contains two factors and was ranked in the 4th position respect to overall all groups with a relative importance index value of 0.804. The results obtained from Table 5 shows that "Selection of licensed operator having skill and efficiency" was ranked in the 1st position within this group (RII of 0.812).

This result reflects clearly that this factor has critical influence on the safety performance. The working process in cranes and lifting equipment is relatively difficult and dangerous process. The skilled labors in these tasks should know the safety conditions and requirements and capability to overcome any unexpected or uncontrolled accidents. "Enforce limited amount weights to be lifted by crane with clear stickers showing the limits" was ranked in the 2nd position (RII of 0.796).

These factors are consistent with Hassan et al. (2007) who found the factors of Crane and Lifting Equipment in the 2nd position (RII of 0.91) and matching also that of Jannadi (1995) who ranked it at 4th position (RII of 0.742).

Table 5. RII and Rank of Crane and Lifting Equipment Group

Crane and Lifting Equipment Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Selection of licensed operator having skill and efficiency	25.5	58.8	13.7	2.0	0.0	4.06	0.812	1	12
Enforce limited amount weights to be lifted by crane with clear stickers showing the limits	31.4	37.3	29.4	2.0	0.0	3.98	0.796	2	15
Total						4.02	0.804		

Scaffolds Group

Table 6 shows that this group was ranked in the 4th position among all 19 groups with RII of 0.804. This result shows that this group has high influence at safety performance on construction projects. This result is supported by Jannadi et al. (2001), Swasha et al. (1999) and Enshassi (2003). In construction projects especially high raise building, scaffolding represent a major source of accidents. Scaffolds are fixed on highly place in building projects, for example in plaster works. Within this group of factors "Design scaffolds as international specifications" and "Type of scaffolds material", both were ranked in the 1st position with RII of 0.839 and in the 7th position respect to overall factors. "Correct use of scaffolds" was ranked in the 2nd position with RII of 0.745 and with 25th respect to overall factors. This shows the importance in terms of design and manufactured material which is better than the correct use of scaffolds by labors in construction projects.

Table 6. RII and Rank of Scaffolds Group

Scaffolds Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Design scaffolds as international specifications (OSHA for example)	41.2	41.2	13.7	3.9	0.0	4.20	0.839	1	7
The type of material made of scaffolds	45.1	31.4	21.6	2.0	0.0	4.20	0.839	1	7
Correct using of scaffolds	29.4	33.3	15.7	17.6	3.9	3.73	0.745	3	25
Total						4.02	0.804		

Role of Government and Engineering Societies Group

This group of factors "Role of Government and Engineering Societies" contains three factors and was ranked in the 5th position respect to overall groups with a relative importance index of (0.801) which indicates the critical impact and importance of this factor at performance of safety in construction process.

With this group of factors as illustrated in Table 7, it is shown that "Strict implementation of safety instructions" was ranked in the 1st position (RII of 0.808). This factor was ranked in the position 12th respect to the overall factors within the remaining groups. The results indicate that it is necessary to use the strict implementation of safety instructions in the construction sites. These results are not in line with Tam et al. (2004) who found this factor in the 6th position (RII of 0.51). The reason for such deviation could be return to the contractors' culture towards the self motivation and monitoring without external monitoring. "The punishment in case of violation of laws, standards, regulations and legislations of safety" was ranked in the 2nd position (RII of 0.804) and 13th position in overall factors, this result show that the government and engineering societies should issue penalties to guarantee the implementation of safety regulations mentioned in the contract. These results are in line with Ng, et al. (2005) who found this factor within the most three factors affecting safety performance.

Table 7. RII and Rank of Role of Government and Engineering Societies group

Role of Government and Engineering Societies	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Strict implementation of safety instructions	33.3	43.1	17.6	5.9	0.0	4.04	0.808	1	12
The punishment in case of violation of laws, standards, regulations and legislations of safety	37.3	35.3	19.6	7.8	0.0	4.02	0.804	2	13
Issuance of laws, standards and regulations for safety	23.5	54.9	15.7	5.9	0.0	3.96	0.792	3	17
Total						4.01	0.801		

Safety Inspections Group

This group was ranked in the 6th position with respect to overall group with a total RII of (0.796). Relatively, influence of this factor is high respect to other groups and this result matched the result for Al-Amoudi (1997). As shown in Table 8, "Safety inspections by the top management" was ranked in the 1st position (RII of 0.816) and in the 11th position respect

to overall factors. These results reveal that the project manager has an important role to adopt the inspection process in the construction project that in turn improves the safety performance. "Safety inspection by government (Ministry of workers and municipalities)" was ranked in the 2nd position (RII of 0.796) within this group and in the (15th) position respect to overall factors. These results indicate the importance of the governmental regulations towards improving and achieving safety performance in the construction industry. "Safety inspections by insurance companies" was ranked in the 3rd position (RII of 0.776) within safety inspections group and with 20th position respect to overall factors. The result shows that insurance companies do not have important role in the inspection of projects because it is difficult to obtain the rights from insurance companies due to absence of the judiciary in the Gaza strip. The overall results within this group are relatively close to each other (RII between: 0.816-0.776). This can be returned to the fact that in general, the inspection action as a controlling and monitoring tool is crucial to achieve the organization's objectives.

Table 8. RII and Rank of Safety Inspections Group

Safety Inspections Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Safety inspections by the top management	29.4	54.9	11.8	2.0	2.0	4.08	0.816	1	11
Safety inspections by government (Ministry of Works and Municipalities)	31.4	43.1	17.6	7.8	0.0	3.98	0.796	2	15
Safety inspections by insurance companies	27.5	43.1	19.6	9.8	0.0	3.88	0.776	3	20
Total						3.98	0.796		

Administrative and Management Commitment Group

This group contains six factors and was ranked in the 7th position with respect to other 19 groups with RII of 0.777. Table 9 shows the administrative and management commitment factor, which are affecting safety performance on construction projects. Within this group, "Safety awareness of project managers" was ranked in the first position (RII of 0.847) and was ranked in the 6th position among all factors. The project manger has direct responsibilities for the safety performance condition in the site; the project manger has to implement the safety clauses mentioned in contract; and the project manger has ethical responsibilities to advise labors about the safety consideration during the working hours."Safety awareness of company's top management" was also ranked in a top position (2nd position) with RII of 0.816. This factor was ranked in the 1st position with Tam et al. (2004) and with RII of 0.93.

These results show that the top management commitment influence the safety policy within organization.

Table 9. RII and Rank of Administrative and Management Commitment Group

Administrative and Management Commitment Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Safety awareness of project managers	39.2	45.1	15.7	0.0	0.0	4.24	0.847	1	6
Safety awareness of company's top management	25.5	56.9	17.6	0.0	0.0	4.08	0.816	2	11
Management's attitude towards worker's welfare	17.6	49.0	29.4	3.9	0.0	3.80	0.761	3	22
Existance of a clear company safety policy	17.6	52.9	21.6	5.9	2.0	3.78	0.757	4	23
Issuing and implementation of in-house safety rules, safety program or manuals including emergency plan and procedures	17.6	51.0	23.5	7.8	0.0	3.78	0.757	5	23
Conducting regular safety policy review	9.8	47.1	39.2	3.9	0.0	3.63	0.725	6	30
Total						3.89	0.777		

Fire Prevention Group

This group was ranked in the 8th position among all 19 groups with RII of 0.775. According to Table 10, "Availability of adequate fire extinguishers in the site" was ranked in the 1st position among this group with RII of 0.800 and 14th among all groups' factors. This result shows that the contractors who care about the existence of fire extinguishers will imply a good indicator of the safety performance conditions in the project and in turn indicating improved safety performance. "Good storage of flammable liquids and combustible materials" was ranked in the 2nd position in this group with RII of 0.780 and was ranked in the 19th of overall groups.

"Periodical maintenance of fire extinguishers on the site" was ranked in the last position (3rd) within this group with RII of 0.745 and in the position of 25th overall factors in all groups. These results are close to Tam et al. (2004) who found this factor with RII of 0.73. The results obtained overall for this group by Hassan et al. (2007) were ranked in the 11th position with RII of 0.805 while result obtained by Jannadi et al. (2001) shows lower RII of 0.734. The existences of the fire prevention in the construction site represent a critical factor in case of fire problems.

Table 11. RII and Rank of Fire Prevention Group

Fire Prevention Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Availability of adequate fire extinguishers on the site	21.6	62.7	9.8	5.9	0.0	4.00	0.800	1	14
Good storage of flammable liquids and combustible materials	25.5	45.1	23.5	2.9	0.0	3.90	0.780	2	19
Periodical maintenance of fire extinguishers on the site	19.6	45.1	25.5	7.8	2.0	3.73	0.745	3	25
Total						3.88	0.775		

Historic, Human and Psychological Climate Group

From Table 11, this group contains fourteen factors and was ranked in the 9th position among all other 19 groups with RII (0.760). Within this group, "Non-excessive overtime work for worker "was ranked in the first position with RII of (0.878) and ranked in the 4th position within overall groups of factors. This result indicates that excessive efforts of the working labors will influence the safety performance. Additional working hours over the labors capacity will create problems and may lead to negative impact on safety performance of the workforce. "Worker experience" was ranked in the 2nd position within this group with RII of (0.863) and was ranked in the 5th position respect to overall groups. The rank of this factor indicates the importance of this factor from the contractor's perspectives. The results indicate that workers who have a good experience in the field of work (such as building, roads and water sewage) will be familiar which means that he/she will consider his/her previous experience for the best interest of safety circumstances. These results are consistent with Tam, et al. (2004) who found this factor in the 6th position with RII of (0.84). The results are also in line with Teo et al. (2005) and Sawacha et al. (1999). "Decrease work pressure on workers" was ranked in the 3rd position within this group with RII of (0.839) and was ranked in the 7th position respect to overall groups. This result shows that workload on the labor capacity are influencing safety performance on the project. This factor can provide guidance for the main contractors to manage the projects activities in a suitable way for their staff (labors) capability aiming to protect them from any unexpected accident or negative impact to their productivity.

The overall results within this group shows that the historical factors (experiences, safety awareness and accident experience) have higher influence at the safety performance than the

humanity factors (relations and commutations). Managers are advised to consider the humanitarian aspects with their labors.

Table 11. RII and Rank of Historic, Human and Psychological Climate Group

Historic, Human and Psychological Climate	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Non-excessive overtime work on worker	56.9	29.4	9.8	3.9	0.0	4.39	0.878	1	4
Worker experience	45.1	43.1	9.8	2.0	0.0	4.31	0.863	2	5
Decrease work pressure on workers	41.2	39.2	17.6	2.0	0.0	4.20	0.839	3	7
Worker safety awareness, knowledge and involvement	21.6	58.8	15.7	3.9	0.0	3.98	0.796	4	15
Worker accident's experience	27.5	49.0	15.7	5.9	2.0	3.94	0.788	5	17
Worker age	15.7	56.9	21.9	5.9	0.0	3.82	0.765	6	21
Worker safety training received	17.6	51.0	25.0	3.9	2.0	3.78	0.757	7	23
Worker education	11.8	58.8	19.6	7.8	2.0	3.71	0.741	8	26
Relation between the supervisor and workers on the site	21.6	33.3	39.2	5.9	0.0	3.71	0.741	9	26
Worker culture background	9.8	52.9	23.5	9.8	3.9	3.55	0.710	10	32
Interrelation between workers in the site	11.8	39.2	41.2	7.8	0.0	3.55	0.710	11	32
A worker's ability to communicate with others	17.6	29.4	39.2	11.8	2.0	3.49	0.698	12	35
Relation between the management and workers	15.7	31.4	37.3	15.7	0.0	3.47	0.694	13	36
Worker marital status	7.8	35.3	41.2	7.8	7.8	3.27	0.655	14	42
Total						3.80	0.760		

Safety Meetings Group

This group of factors "safety meetings" contains three factors and was ranked in the 10th position respect to overall nineteen groups with RII of (0.754). Table 12 shows the factors within this group. "Conducting safety meeting at the site by the site engineer" was ranked in the 1st position within this group with RII of (0.847) and in the 6th position respect to all

factors over the nineteen groups. The results indicate that the site engineer has a crucial responsibility to improve the degree of awareness in the safety performance for the labor in construction. The periodical meeting with labors will empower the importance of safety concept and benefit for the labors that in turn develop their culture in this direction. These results are in line with (Kartam et al, 2000) who found the essential benefit of the weekly meetings for the safety performance improvement.

"Conducting safety meeting before each activity begins" was ranked in the second position with RII of (0.710), but this factor was ranked in the position 32nd respect to all factors within all groups. These results show that it was not be fruitful to hold meeting before each activity. This will lead to uncontrollable delay and may lead to disturbance of the managerial works within the site. "Attendance of safety meetings by top management" was ranked in the 3rd position within this group with RII of (0.706) but with a week position within overall group's factors (in the position 34th). The overall picture reflects that, the meeting done by site engineer is the most proper way and conducted not during work.

Table 12. Safety Meetings Factors Affecting Safety Performance

Safety Meetings Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Conducting safety meeting on the site by the site engineer	2.0	7.8	54.9	29.4	5.9	4.24	0.847	1	6
Conducting safety meeting before each activity begins	7.8	49.0	33.3	9.8	0.0	3.55	0.710	2	32
Attendance of safety meetings by top management	23.5	25.5	31.4	19.6	0.0	3.53	0.706	3	33
Total						3.77	0.754		

Economic Investment Group

This group as shown in Table 13 was ranked in the 11th position respect to over all groups with a relative important index of 0.742. Within this group, "Agreement with insurance companies" was ranked in the 1st position with RII of 0.780 and with 19th respect to overall factors. This result shows that insurance companies do not do their job exactly in the absence of judiciary and the law in Gaza Strip. “Financial motivation to application of safety" was ranked in the 2nd position with RII of 0.745 and with 25th respect to overall factors. This result shows that this factor was allocated in middle rank for all factors. Contractors pay less attention to improve safety conditions rather get motivated to crash activities for speeding up

the progress. The overall results obtained for these factors are in line with Jannadi et al. (2001) and Tam et al. (2004) who shows a moderate influence of these factors towards the safety performance.

Table 13. RII and Rank of Economic Investment Group

Economic Investment Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Agreement with insurance companies	29.4	39.2	25.5	3.9	2.0	3.90	0.780	1	19
Financial motivation to application of safety	15.7	52.9	17.6	9.8	3.9	3.73	0.745	2	25
Allocating specific budget for safety requirements	9.8	51.0	29.4	5.9	3.9	3.57	0.714	3	31
Total						3.70	0.742		

Disposal of Hazardous Materials and Waste Group

This group contains three factors and was ranked in the position 12th respect to overall all groups with a relative important index of 0.741. Relatively, this group has a moderate influence with respect to the safety performance in the construction industry in the Gaza Strip. Jannadi (1995) found this group in the position 14th (RII of 0.61). The moderate influence of this group at the overall groups could be returned to the nature of the work within this group. Such hazardous materials that can be removed from construction site are relatively small in the Gaza Strip, so the contractors' responses towards these factors were not strong enough.

As illustrated in Table 14, "Develop risk a management plan" was ranked in the 1st position with RII of 0.776. This result is very close to Jannadi (1995) results who found the RII of this factor as 0.76. The results show also that, the "Quick transfer of construction waste out site" is not reflecting a strong safety performance level. This means that the respondents (contractors) are not satisfied that the faster transport of the construction waste material is a strong indicator to the safety performance.

Table 14. RII and Rank of Disposals of Hazardous Materials and Waste Group

Disposal of Hazardous Materials and Waste Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Develop a risk management plan	19.6	52.9	23.5	3.9	0.0	3.88	0.776	1	20
Quick transfer of construction waste out the site	19.6	49.0	25.5	3.9	2.0	3.80	0.761	2	22
Develop a waste management plan	13.7	33.3	37.3	13.7	2.0	3.43	0.686	3	37
Total						3.71	0.741		

Table 15. RII and Rank of Project Nature's Group

Project Nature Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Lighting the site during night working hours	47.1	33.3	9.8	7.8	2.0	4.16	0.831	1	9
Arrangement and organization of the site (Tide site)	27.5	41.2	25.5	5.9	0.0	3.90	0.780	2	19
Volume of the project	15.7	54.9	25.5	3.9	0.0	3.82	0.765	3	21
Type of the owner (Owner identify)	25.5	37.3	23.5	5.9	7.8	3.67	0.733	4	28
Cost of the project	13.7	37.3	35.3	13.7	0.0	3.51	0.702	5	34
Application of new technology in construction projects	23.5	27.5	25.5	23.5	0.0	3.51	0.702	6	34
Planning and scheduling of the project	13.7	31.4	39.2	13.7	2.0	3.41	0.682	7	38
Clear and easy design of the project	15.7	27.5	35.3	19.6	2.0	3.35	0.671	8	40
Total						3.67	0.733		

Project Nature Group

Table 15 shows the respondents opinion regarding the factors which affected the safety performance in construction projects according to RII from high to low. This group contains eight factors and was ranked in the position 13th with respect to overall groups with a total RII (0.733). This result was closed with Fang et al. (2004a) who found that this group is not satisfied with the importance of safety performance affecting on construction projects in China. Relatively, the influence of these factors is not high with respect to other groups. Within this group, "Lighting the site during night working hours" was ranked in the 1st position among project nature group with RII of (0.831). This result indicates that the contractors were satisfied that the lighting condition during the night is critical to safety conditions. It was noted that the majority of contractors in Gaza Strip extend the working hours to the night periods to complete the project within its planned duration and overcome any a non-controllable conducting like closure or lake of raw materials. This factor was ranked in the 9th position with respect to overall factors among all groups.

"Arrangement and organization of the site (Tide site)" was rank in the second position within this group with RII (0.780) and having the 19th position to overall groups. Results of this factor matches with that of (Sawacha etal. 1999) who found that this factor is in a high important position with respect to the safety performance. "Volume of the project" was ranked in the 3rd position with RII (0.765) within the project nature group and was ranked in the 21st position witn respect to overall groups. This indicates that contractors were satisfied that the types of projects influenced the safety performance conditions in the construction industry.

Emergency Planning and Preparations Group

As shown in Table 16, this group contains two factors and was ranked with in 13th position respect to nineteen groups.

Table 16. RII and Rank of Emergency Planning and Preparations Group

Emergency Planning and Preparations Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Develop a plan to respond to emergencies	35.3	37.3	13.7	11.8	2.0	3.92	0.784	1	18
Train workers to respond to emergencies through exercises	17.6	33.3	25.5	19.6	3.9	3.41	0.682	2	38
Total						6.67	0.733		

The results show that the factor of, "Develop a plan to respond to emergencies" was ranked in the first position among project nature group with RII (0.784), and ranked in the 18th position among all groups. This factor was ranked in the 1st position by Jannadi (1995), in addition, Ng et al. (2005) found this factor in the 2nd position with R.II of (0.81). These results are in line to our results that reflect the importance of the planning for emergencies for the success of safety performance for construction projects.

"Train workers to respond to emergencies through exercises" was ranked in the second position within this group and with RII of (0.682) and in the 38th position with respect to overall groups. These results indicate that the contractors were not committed to improve the awareness level of their labor about safety conditions. This raises a lot of concern regarding safety improvements in the construction industry.

Safety Educating and Training Group

This group contains five factors and was ranked in the 13th position respects to overall all groups with a relative important index of 0.733. Relatively, this group of factors is not in the critical position to affect safety performance in the construction industry in the Gaza Strip in respect to other groups. Table 17 summarizes the factors related to Safety educating and training factors affecting safety performance. With this group "Guidance and training of workers about safety" was ranked in the 1st position with RII of 0.796. These results are in compatible with other researchers like Sawacha et al. (1999) who found the RII of this factor as 0.51, and to that of Ng et al. (2005) who found the factor with a low RII of 0.354. The continuous training and awareness campaigns will be useful to develop the labors skills and learning culture about the safety performance.

Table 17. RII and Rank of Safety Educating and Training Group

Safety Education and Training Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Guidance and training of workers about safety	15.7	66.7	17.6	0.0	0.0	3.98	0.796	1	15
Safety poster	15.7	52.9	25.5	5.9	0.0	3.78	0.757	2	23
Training for first aid for all workers	15.7	52.9	23.5	7.8	0.0	3.76	0.753	3	24
Brochures and publications on safety	3.9	49.0	33.3	9.8	3.9	3.39	0.678	4	39
Safety seminars held by the management of the project	5.9	41.2	39.2	13.7	0.0	3.39	0.678	5	39
Total						3.66	0.733		

"Safety poster" was ranked in the 2nd position within this group and with RII of 0.757 ranked in the position 23rd respect to overall factors within all groups. This indicates that this factor has moderate effect on safety performance. To empower and strength such factor it may require showing these posters before the beginning of the projects and precisely in the mobilization stage while the flow of work is relatively slow. "Training for first aid for all workers" has also a moderate effect on safety performance. This factor was ranked in the 3nd position (RII of 0.753). The results will alarm the decision makers to ask the contractors or the sub contractors to provide clear understanding of the safety conditions, problems and solutions in construction projects.

Transportation Group

As shown in Table 18, this group was ranked in the 14th position among all 19 groups with RII of 0.706. "Periodical maintenance for vehicles and machinery (Trucks, Loaders and, Shovel)" was ranked in the 1st position with RII of 0.741 and in the position 26th respect to overall factors. This result shows that the contractors in Gaza strip don't take care for the periodical maintenance of their vehicles and machines. The results obtained from Teo et al. (2005) shows this factor in the 13th position with RII of 0.816, while Ng et al. (2005) found this factor in a very weak influence with RII of 0.2. "Training the drivers of vehicles and heavy machines" was ranked in the 2nd position with RII of 0.710. In addition, the factor was shown in the position 32nd respect to overall factors. This result shows that the drivers had license before start of the work and they do not need to train them on construction sites.

Table 18. RII and Rank of Transportation Group

Transportation Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Periodical maintenance for vehicles and machinery (Trucks, Loaders, Shovel)	13.7	43.1	43.1	0.0	0.0	3.71	0.741	1	26
Training the drivers of vehicles and heavy machines	19.6	33.3	33.3	9.8	3.9	3.55	0.710	2	32
Wearing seat belts during driving vehicles and machinery	7.8	41.2	33.3	11.8	5.9	3.33	0.667	3	41
Total						3.53	0.706		

Welfare Facilities

From Table 19, this group contains five factors and was ranked in the 15th position respect to other 19 groups and with RII of 0.674. The results show that the contractors are satisfied that "Provision of adequate facilities for first aid treatment" is a critical and important factor that is affecting safety performance in the construction projects. This factor was ranked in the 1st position within this group of factors with RII of 0.804 and in the 13th position among overall groups. The results reveal that the first aid is the first line defense in case of anybody accident at the site. So the provision of adequate facility for first aid is critical for safety performance. "Provision of food and drinking water" ranked in the second position within this group with RII of 0.729 and ranked in the 29th position respect to overall groups. Further results indicate that the respondents are not satisfied that the "Provision adequate toilets" will affect the safety performance. The respondents ranked this factor in the 3rd position within this group but with a weak RII of 0.655. In addition, the factor was ranked in the 42nd position respect to overall factors. This result confirms that the contractors consider the output product regardless of humanitarian aspect (basic necessities) with labour. These results will be useful to be highlighted for the decision makers and stakeholders within the construction industry to exert more efforts to enhance the labors conditions during working hours. The results are relatively matching to that of Jannadi (1995) who found this group also in the position 16th and with a low RII of 0.56.

Table 19. RII and Rank of Welfare Facilities Group

Welfare Facilities Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Provision of adequate facilities for first aid treatment	31.5	47.1	13.7	7.8	0.0	4.02	0.804	1	13
Provision of food and drinking water	15.7	45.1	29.4	7.9	2.0	3.65	0.729	2	29
Provision of adequate toilets	11.8	33.3	31.4	17.6	5.9	3.27	0.655	3	42
Provision of an ambulance in the site	13.7	25.5	35.3	13.7	11.8	3.16	0.631	4	44
Provision of special places for smoking	9.8	15.7	31.4	25.5	17.5	2.75	0.549	5	46
Total						3.37	0.674		

Medical Facilities Group

"Medical Facilities" group is ranked in the 16th position respect to overall all groups with a relative importance index value of 0.660. As shown in Table 20, "Availability of medical aids at the site" was ranked in the 1st position with RII of 0.737. This result reveals that this

factor affecteds safety performance. Finding shows that "Periodical medical examination of workers " was ranked in the 2nd position with RII of 0.635, which indicate low affect on the safety performance. Medical examination is an important process and it must be conducted before selection of any worker to avoid the unhealthy labors which means low level of efficiency and effectiveness.

"Permanent presence of a medical specialist on the site for medical advice" was ranked in the 3rd position with RII of (0.608). The results show that this factor has low effect on safety performance. The results show that the presence of medical specialists will increase the financial requirements for the project. In general, these results demonstrate that in the process of responding of the questionnaires medical facilities was not taken into account although it is very important factor and affected on the safety performance. The medical facilities and conditions are not strongly checked within the construction projects.

Table 20. RII and Rank of Medical Facilities Group

Medical Facilities Factors	Percentage of Occurrence					Mean	RII	Rank within this Group	Rank within overall Factors
	Very High	High	Moderate	Low	Very Low				
Availability of medical aids at the site	9.8	52.7	15.7	9.8	2.0	3.69	0.737	1	27
Periodical medical examination of workers	3.9	37.3	37.3	15.7	5.9	3.18	0.635	2	43
Permanent presence of a medical specialist on site (for medical advice)	3.9	37.3	29.4	11.8	0.0	3.04	0.608	3	45
Total						3.30	0.660		

CONCLUSION

This study is aimed to identify and rank the significant factors affecting safety performance in the Palestinian construction industry in the Gaza Strip according to their relative importance. The survey covered eighty selected factors, which were grouped into nineteen categories. The respondents were 51 contractors working in the Gaza Strip. The result of this study indicate that the most five important factors that affect safety performance on construction project are: The use of gloves and face protection; the use of barricades to prevent collapse of soil during work; the use of protective head; the use protective feet; and non-excessive overtime work for worker. The results shows that worker marital status; periodical medical examination of workers; provision of an ambulance in the site; permanent presence of a medical specialist on site (for medical advice); and provision of special places for smoking were the lowest factors positively affecting safety performance in construction projects. The most important groups affecting the safety performance agreed by large

construction companies are; personal protective equipment; signs, signals and barricades; excavation, trenching, and shoring; crane and lifting equipment and scaffolds respectively.

Nonetheless, there is a need to strengthen the awareness and attitude of the top management and project managers towards the importance of safety. The managements of the company must establish and enforce safety polices for workers and develop their activities by including more monitoring of safety performance at the site and by giving more reliable feedback about the consequences that take place on site. Companies need to hold their project management accountable for accidents. The efficiency of site safety inspections by using more qualified safety engineer with specific job description need to be increased. Emphases should be laid on investigation of the indirect costs of accidents. These costs in addition of being greater than the direct costs, which are usually covered by insurance, they buried into project costs, increasing the cost of construction. The costs of accidents present a serious drain of company's profit. More attention needed to be paid to the economic investment in safety if the contractor realizes the fact that the costs of accidents are higher than the cost of safety.

The government and the engineering societies must play a major role to apply the safety rules by issuing the regulations, standards and codes and legally enforced the companies to follow them with adequate strict penalties for non-compliance. Safety performance indicators for the construction companies identified by this study are to be adopted and such indicators are to be established for other different grades with regular updating. Tender documents need to to include safety measures and the signs ought to be used during implementation. Clients are to be involved in applying the safety measures during the implementation phase of projects. This research is significant as it is to help contracting parties to understand safety performance indicators in order to minimize or eliminate accidents on construction projects.

REFERENCES

Abdel-Razek, R. (1998). Factors affecting construction quality in Egypt: Identification and relative importance. *Engineering, Construction and Architectural Management*, Vol. 5, No. 3, pp. 220 – 227.

Abu Alqumboz, M. (2007). Developing a model for integrating safety, quality and productivity in building projects in Gaza Strip. Unpublished Master Thesis. The Islamic University of Gaza, Palestine.

Al-Amoudi, W. A. (1997). Assessment of Safety Level in Performing Building Maintenance Work in Saudi Arabia , Unpublished Master thesis, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

Aksorn, T. and Hadikusumo, B.H.W. (2008). Critical success factors influencing safety program performance in Thai constriction projects. *Safety Science*, Vol. 46, pp 709-727.

Baig, M. (2001). Safety assessment of industrial construction projects in Saudi Arabia. Master Thesis, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.

Campbell F. (2006). Occupational stress in construction industry. The Chartered Institute of Building.UK.

Choudhry, R. M. and Fang, D. P. (2008). Why operatives engage in unsafe work behavior: Investigating factors on construction sites. *Safety Science*, Vol. 46, No. 4, pp. 566-584.

Cornmack, D. F. (2000). The research process in nursing, Blackwell Science, Oxford.

Enshassi, A. (2003). Factors affecting safety on projects in construction. CIB Working Commission W99, Brazil.

Enshassi A., Choudhry R., and Abu Alqumboz M., (2009) Quality and safety in the construction industry in Palestine, *Revista Ingenieria De Construccion*, Vol. 24, Issue 1, PP. 49-78.

Fabiano, B., Curr, F., and Pastorino, R., (2004). Study of the relationship between occupational injuries and firm size and type in the Italian industry, *Safety Science*, Vol. 42, pp. 587-60.

Fang. D., Huang, X., and Hinze, J. (2004a). Benchmarking studies on construction safety management in China. *Journal of Construction Engineering and Management*, Vol. 130, No. 3, pp. 424-432.

Fang. D. P., Xie, F., Huang, X. Y., and Li, H. (2004b). Factor analysis-based studies on construction workplace safety management in China. *International Journal of Project Management*, Vol. 22, No. 1, pp. 43-49.

Fellows, R. and Liu, A. (2003). Research methods for construction, Blackwell *Science*, Oxford.

Fung, Ivan W. H., Tam, C. M., Tung, Karen C. F., and Man, Ads S. K. (2005). Safety cultural divergences among management supervisory a„worker groups in Hong Kong construction industry. *International Journal of Project Management*, Vol. 23, No. 7, pp. 504-512.

Hassan, C. R., Basha, O. J., Hanafi, W. H. (2007). Perception of building construction workers towards safety, health and environment. *Journal of Engineering Science and Technology*, Vol. 2, No. 3, pp. 271-279.

Hassona A. (2005). Improving safety performance in Gaza Strip. Unpublished Master Thesis. Islamic University of Gaza. Palestine.

Hatush, Z., and" Skitmore, M. (1997). Criteria for contractor selection, *Construction Management and Economics*, Vol.15, No. 1, pp. 19-38.

Heng, S. M. (2007). Construction site safety: Legal issues of liability for various parties. Master Thesis. University of Technology, Malaysia.

Hinze, J., and Gambatese, J. (2003). Factors that influence safety performance of specialty contractors. *Journal of Construction Engineering and Management*, Vol. 129, No. 2, pp. 159-164.

Hinze, J., and Wiegand, F. (1992). Role of designers in construction worker safety. *Journal of Construction Engineering and Management*, Vol. 118, No. 4, pp. 677-684.

Improving Construction Safety Performance (1982). Report A-3, Business Roundtable, http://www.curt.org/pdf/135.pdf.

Jannadi, O. M. (2008). Risks associated with trenching works in Saudi Arabia, Journal of Building and Environment, Vol 43, pp. 776–781.

Jannadi, O. M., and Bu-Khamsin, M. S. (2001). Safety factors considered by industrial contractors in Saudi Arabia. *Journal of Building and Environment*, Vol. 37, No.(5), pp. 539–547.

Jannadi, O. M. (1995). Impact of human relations on the safety of construction workers, Journal of Project Management, Vol. 13, No. 6, pp. 383-386.

Kartam, N., and Bouz, R. (1998). Fatalities and injuries in the Kuwaiti construction industry. *Accident Analysis and Prevention*, Vol. 30, No. 6, pp. 805-814.

Kartam, N., Flood, I., and Koushki, P. (2000). Construction safety in Kuwait: Issues, procedures, problems, and recommendations. *Journal of Safety Science*, Vol. 36, No. 3, pp. 163-184.

Koehn, E., Kothari, R. K., and Pan, C.S. (1995). Safety in developing countries: Professional and bureaucratic problems. *Journal of Construction Engineering and Management*, Vol. 121, No. 3, pp. 261-265.

Mattila, M., Hyttinen, M., and Rantanen, E. (1994). Effective supervisory behavior and safety at the building site. *International Journal of Industrial Ergonomics*, Vol. 13, No. 2, pp. 85-93.

Mohamed, S. (2002). Safety climate in construction site environments, *Journal of Construction Engineering and Management*, Vol. 128, No. 5, pp375-384.

Naoum, S. G. (2007). Dissertation research and writing for construction students, Butterworth-Heinemann, Elsevier, Oxford, UK.

Ng, S. T., Cheng, K. P., and Skitmore R. M. (2005). A framework for evaluating the safety performance of construction contractors. *Building and Environment*, Vol. 40, No. 10, pp. 1347-1355.

Oppenheim, A. N. (1992). Questionnaire design, intervieweing and attitude measurement, Pinter Publisher, London.

PCU (2008) Palestinian contractors union, Gaza.

Petersen, D. (1971). Techniques of safety management. McGraw-Hill, Book Company.

Sawacha, E., Naoum, S., and Fong, D. (1999). Factors affecting safety performance on construction sites. *International Journal of Project Management*, Vol. 17, No. 5, pp. 309-315.

Shash, A., and Abdul-Hadi, N. (1993). The effect of contractor size on mark-up size decision in Saudi Arabia, *Construction Management and Economics*, Vol. 11, pp. 421-429.

Siu, O., Phillips, D., and Leung, T. (2003). Age differences in safety attitudes and safety performance in Hong Kong construction workers, *Journal of Safety Research*, Vol 34, pp.199-205.

Siu, O., Phillips, D., and Leung, T. (2004). Safety climate and safety performance among construction workers in Hong Kong: The role of psychological strains as mediators. Accident Analysis and Prevention, Vol 34, pp. 359-366.

Tam , C.M., Fung, I.W.H., Yeung ,T.C.L. and Tung, K.C.F. (2003). Relationship between construction safety signs and symbols recognition and characteristics of construction personnel, *Construction Management and Economics*, Vol 21, 745–753.

Tam, C. M., Zing, S. X., and Deng, Z. M. (2004). Identifying elements of poor construction safety management in China. Safety Science, Vol. 42, No. 7, pp. 569-586.

Teo, E. A. L., Ling, F. T. Y., and Chong, A. F. W. (2005). Framework for project managers to manage construction safety. *International Journal of Project Management*, Vol. 23, No. 4, pp. 329-341.

Zhou, Q., Fang, D., Wang, X. (2008). A method to identify strategies for the improvement of human safety behavior by considering safety climate and personal experience. *Journal of Safety Science*, Vol 46, pp.1406-1419.

Zohar, D. (2010). Thirty years of safety climate research: Reflection and future directions. *Accident Analysis and Prevention*, Vol 42, pp.1517-1522

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 3

KNOWLEDGE MANAGEMENT IN THE ARCHITECTURAL DESIGN FIRMS: PERSPECTIVE OF TURKEY AEC INDUSTRY

Yasemin Erbil*

Department of Architecture, Faculty of Design and Architecture,
Bursa Orhangazi University, Osmangazi, Bursa, Turkey

ABSTRACT

In this paper, the current knowledge management practices in Turkish architectural design firms are searched through a survey in Bursa/Turkey. This paper provides a basis for the research about knowledge management practices in architectural design firms in developing countries. The paper is organized as follows: A literature review for knowledge and knowledge management, knowledge and knowledge management in the architectural design process, methodology, survey results and finally brief conclusion. The results of the survey show that although Turkish architectural design firms have sufficient technological infrastructure they do not benefit efficiently from information technologies. The reason behind this is insufficient knowledge on information technologies. Understanding the importance of knowledge management and the desire to use such technologies is a precondition for companies adopting knowledge management applications in developing countries.

Keywords: Knowledge management, Surveys, AEC Industry, Architectural design firms, Turkey

INTRODUCTION

In this information and knowledge age, knowledge has become a valuable resource (Drucker, 1993) and knowledge is believed to be the major source of competitive advantage

* E-mail: yasemin.erbil@bou.edu.tr; Tel.: +90-224- 444 82 68. Fax: +90-224- 211 44 06

(Pan and Scarbrough 1998; Scarbrough et al., 1999). Thus, Knowledge Management (KM) is regarded as core competitive competence on which the success of organizations rely (Skyrme and Amidon, 1998).

According to Davenport and Prusak (1997), knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices and norms. According to Sun and Howard (2004), knowledge is information that is contextual, relevant and actionable. According to Brooking (1999), knowledge can be defined as information in context with understanding of how to use it. According to Polanyi (1966) and Saint-Onge (1996), there are two types of knowledge:

Explicit knowledge; also known as "hard" knowledge, explicit knowledge can be expressed in numbers and words and shared formally and systematically in the form of data, specifications, manuals (Nonaka and Takeuchi, 1995). Explicit knowledge can be captured, stored and articulated and is, thus, accessible to others (Leonard and Sensiper, 1998).

Tacit knowledge; known as "soft" knowledge that includes insights, intuitions, and hunches, tacit knowledge is difficult to express and formalize, and is, therefore, difficult to share (Leonard and Sensiper, 1998). Tacit knowledge needs to be converted into explicit knowledge in order for it to be shared and utilised by others (Nonaka and Takeuchi, 1995).

Knowledge Management has been largely supported by many scholars (Nonaka, 1994; Wiig, 1995). Some of the definitions about knowledge management are given. Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives (Davenport and Hansen, 1999). Knowledge management can be defined as the prpcessed in which knowledge is created, acquired, communicated, shared, applied, and effectively utilized (Egbu and Botterill, 2002). Knowledge management is a process of knowledge creation, validation, presentation, distribution and application (Bhatt, 2001). Knowledge management process capability as the existence of established procedures for acquiring, converting, applying and protecting knowledge (Gold et al., 2001). Knowledge management as a set of organisational principles and processes that help knowledge workers (Lee and Yang, 2000). Knowledge management as the systematic strategy of creating, conserving, and sharing knowledge to increase performance (Plunkett, 2001).

Knowledge management caters to the critical issues of transitional adaptation, survival and competence in face of increasingly discontinuous environmental change... essentially, it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and creative and innovative capacity of human being (Malhotra, 1998). Knowledge Management is a discipline that promotes an integrated approach to identifying, managing and sharing all of an organization's knowledge assets including unarticulated expertise and experience resident in individual workers. Knowledge Management involves the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfill organizational objectives (Kim, 2000).

The research presented in this paper aimed to understand the perception of the Turkish architectural design firms on the strategic role of knowledge management This research was also focused on exploring factors influencing knowledge management application in

architectural firms and research directions for the future of knowledge management application in architectural design firms in Turkey.

KNOWLEDGE MANAGEMENT IN AEC INDUSTRY

The architecture, engineering and construction (AEC) industry is project based (Bresnen et al., 2003) and knowledge intensive field. A project team is temporary and multi-disciplinary. It encompasses heterogeneous expertise from multiple fields and diverse occupational groups. Each construction project can be considered a multidiscipline organisation which may or may not continue to work together once the project is completed (Kamara et al., 2002). Construction is also an information intensive industry where stakeholders communicate a largeamount of information across various stages of the project lifecycle (Dave and Koskela, 2009). This temporary nature of construction and heavy fragmentation makes construction a complex process.

The construction industry is a fertile area for the application of knowledge Management (KM) but there has been considerable recent interest in application of knowledge management in construction industry. Researchers have recognized that knowledge may be most important competitive asset. According to Zin and Egbu (2009), in the construction industry, KM strategies are particularly important for the following reasons:

Projects are inter-related thus it is crucial that good practices within the project environment be adhered to and kept accessible to ensure smooth project transition. The unique characteristics of individual projects prevent the adoption of a standard set of practices applicable to all projects. From the KM perspective, it is these unique characteristics comprising procedures, processes and technologies that contribute the most value.

Each day on the construction site brings forth a new problem and a new solution. The management of these unique problems and their solutions form tacit knowledge confined to the minds of only those who experienced them. The persons in possession of these tacit knowledge will prove valuable to the industry as they help prevent reinvention of the wheel and repetition of similar mistakes. This knowledge also becomes the basis for innovation, overall improvement and sustaining competitive advantage (Tan et al., 2005).

The very nature of construction witnesses continual changes in job location and transfer of line workers amongst construction companies. It is for these reasons that practical experience and tacit knowledge becomes critical and hence, should be transformed as the organisation‟s knowledge assets. The management of this tacit knowledge via proper documentation and record-keeping is crucial for future employee training and cost-cutting exercises options. Traditionally, the construction industry has low productivity and poor performance despite its importance in the national economy (Egbu et al., 1999). Effective KM has a role to play in improving performance (Zin and Egbu, 2009).

ARCHITECTURAL DESIGN PROCESS AND KNOWLEDGE MANAGEMENT

Architectural design firms operate in a project-based environment (Bresnen et al., 2003), where knowledge is regarded as a vital resource (Love et al., 2003). “Project-based

organizations face substantial obstacles to be overcome in capturing knowledge and in the re-cycling of project-based learning that stem from the relatively self-contained, idiosyncratic and finite nature of project tasks" (Bresnen et al., 2003). KM can benefit a project design process in several ways: It might be possible for architects to make changes rapidly as a response to customer requests, problems in the construction field or problems related supply of materials. Storing data for using at later stages could be a lot easier. Virtual computerized prototypes can be used for examining heat performance, acoustic performance, illumination and make cost analyses in order to rapidly and cheaply determine problems that may arise during the production stage. Documentation mistakes can be reduced to minimum. Working speed can be increased. Construction mistakes can be reduced. Management and cost advantages can be gained. Architects produce a set of drawings as the output of the design process. Drawings can be presented to customers with much more efficient presentation techniques. In general architecture offices investing in KM will gain advantages for high quality products, speed, efficient cost control, rapidly and easily reaching information, customer and personnel satisfaction and using personnel efficiently. Although there are many studies emphasizing the importance of "Knowledge Management", which can be defined as processes for sharing, generalizing and using information, (Egbu et al., 1999; Bakis and Sun, 2000; Bresnen et al., 2003; DeFillippi, 2001; Gann and Salter, 2000; McCarthy et al., 2000; Winch, 1998) there are limited works that take the subject from the architectural point of view. Therefore a research has been designed to reveal knowledge management applications and factors that influence knowledge management in projects of architectural desihn firms.

METHODOLOGY

This study has set out to expose knowledge management in architectural practice by drawing upon a case study of architectural design firms in Bursa/Turkey. The main research question of this study is how KM is practiced in architectural design firms. As part of a research, a questionnaire, with three parts was designed: i) the features of the architecture company and the person interviewed and job choices, ii) knowledge management applications that are used during project architectural project preparation process, iii) factors influencing knowledge management application in architectural firms. The study is descriptive in nature.

Table 1. Composition of sample

Company size (no. of full time employees)	0-10	13
	11-50	7
Markets	National only	30
Company age (years)	0-5	15
	6-10	6
	11-20	7
	>20	2
Projects completed within the last 5 years (m2)	0-25000	13
	25000-50000	4
	50000-100000	5
	100000-250000	4
	>250000	4

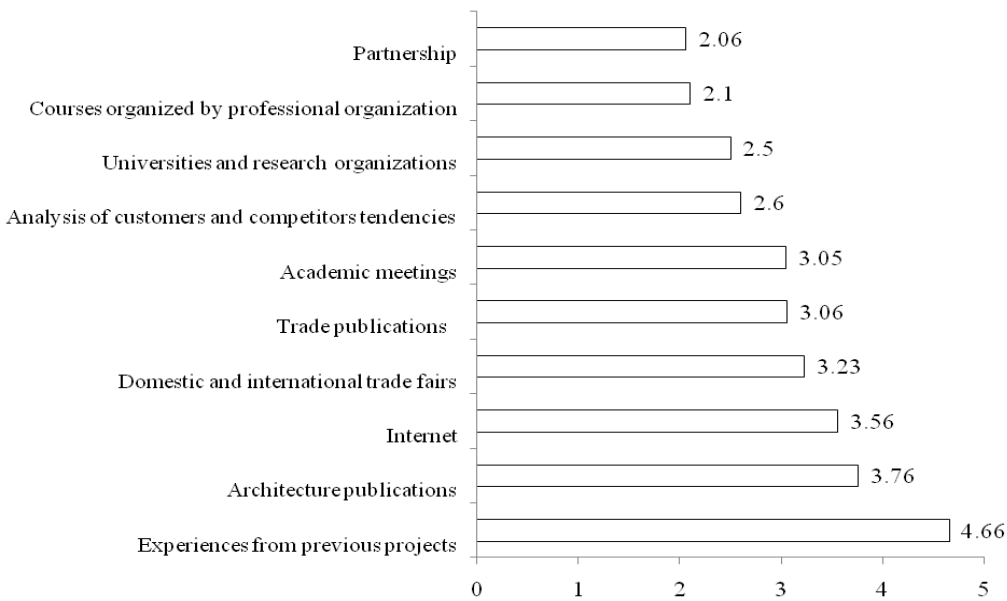
The questionnaire forms were delivered to the architects of 30 architectural design firms in Bursa, Turkey. The author used simple random sampling methods to select the firms in the study, which was the unit of data collection and analysis. Table I presents data related to company size, age, markets and projects completed within the last five years. A five-point Likert scale was used. Descriptive statistics were also reported.

RESULTS AND ANALYSIS

Results of the pilot study related with knowledge management applications that are used for gathering, sharing, storing and reusing data in architectural offices, the benefits of knowledge management and obstacles that prevent using knowledge management are given below.

Knowledge Awareness Channels

Data suggest that architects primarily capture knowledge from previous projects and experiments (Figure I). This result emphasizes the necessity of knowledge management for architectural design firms. Data may also confirm that architecture publications, internet and fairs seem to be the important information channels of architectural design firms. Table II presents data related to use of information technologies of sample. Interviewees denoted that almost all architects use of information technologies every day and number of times. It shows potential of architects to access, manage and share information using computer and communication technology effectively.



* On a scale of 1–5 where 1 is ‘not important at all’ and 5 is ‘very important’.

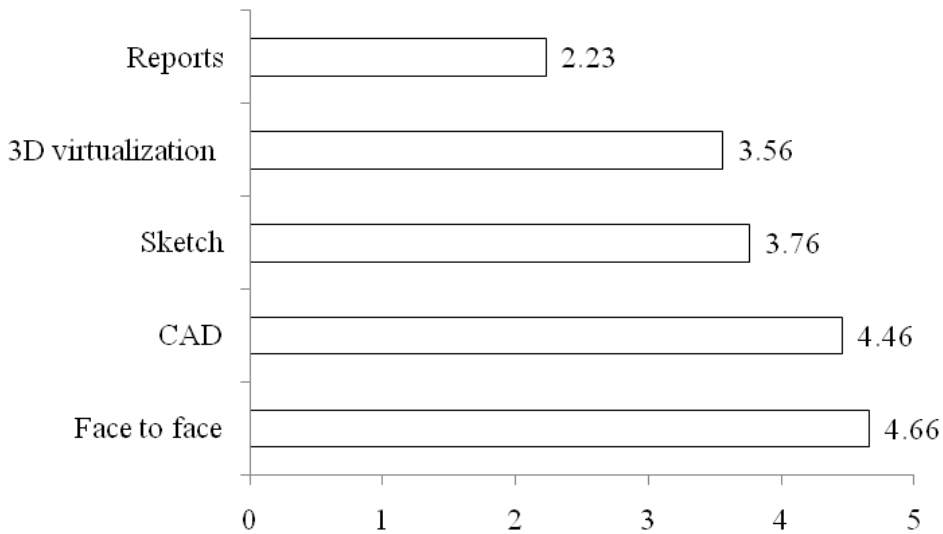
Figure I. Information channels of architectural design firms*.

Table 2. Use of information technologies of sample

Frequency	1-2 hours	3
(hours in a day)	2-3 hours	3
	> 3 hours	24
Density	one time	2
(in a day)	numbers of times	28

Knowledge Sharing Process in Firm

This study shows why face to face communication is preferred in architectural offices for sharing knowledge (Figure II). CAD programmes that became the second most used communication method in architecture offices indicate that digital environment is as important as face to face communication for architecture offices. Table II and Figure II shows that knowledge and information technologies are widely used in architecture offices in Turkey, which is a developing country.



* On a scale of 1–5 where 1 is 'not important at all' and 5 is 'very important'.

Figure II. Communication channels of architectural design firms during design process*.

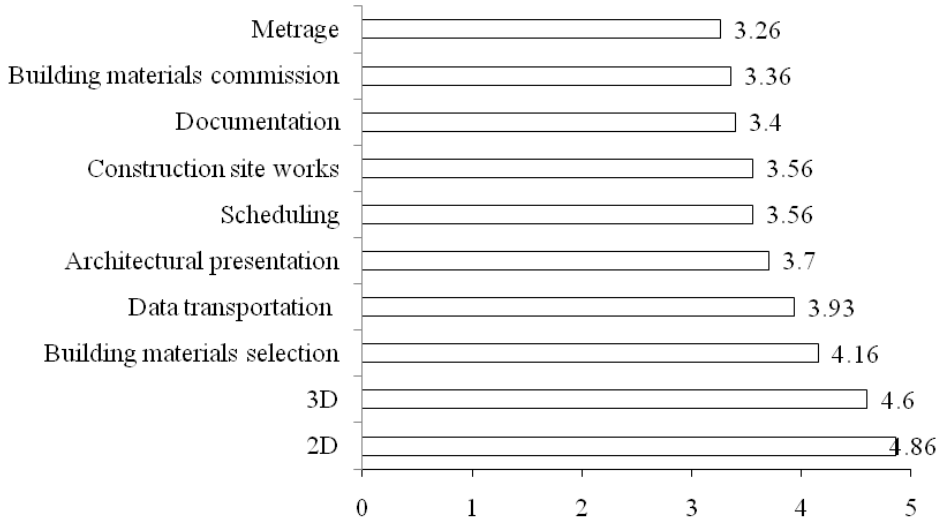
Profession Level

Architecture companies in the scope of this study are using computers in architectural project preparation because of the speed and easiness provided by computers (Figure III). However information technologies are not used at the same level in all professional activities. Therefore the survey is concluded that information technologies are not used efficiently.

The reason behind this is insufficient knowledge on information technologies in Turkey. This study also pointed out; the firm attributed the loss of knowledge to not record adequately.

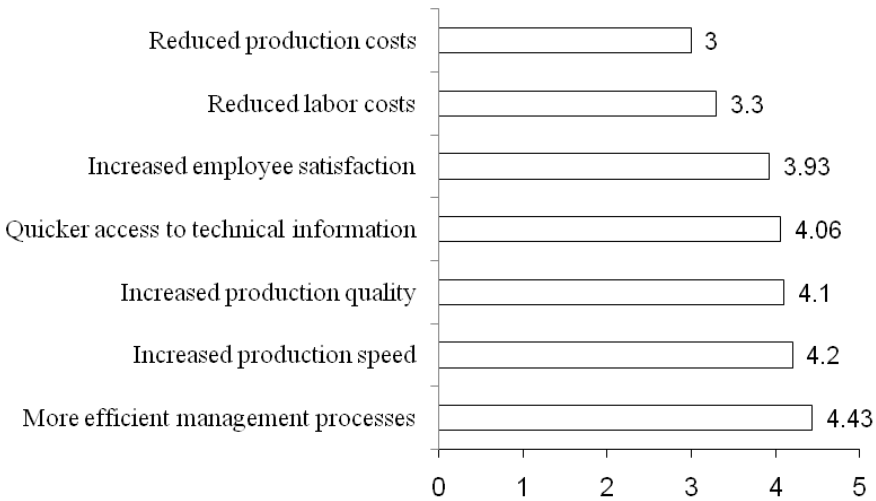
Benefits

Analysis results shows that architectural design firms which using information technology are more likely to benefit from efficient management processes. Increased production speed, increased production quality, quicker access to technical information, increased employee satisfaction, reduced labor costs, reduced production costs are other benefits from using information technology (Figure IV).



*On a scale 1-5 where 1 is 'totally disagree' and 5 is 'totally agree'.

Figure III. Proffesional applications with using information technology in firms*.

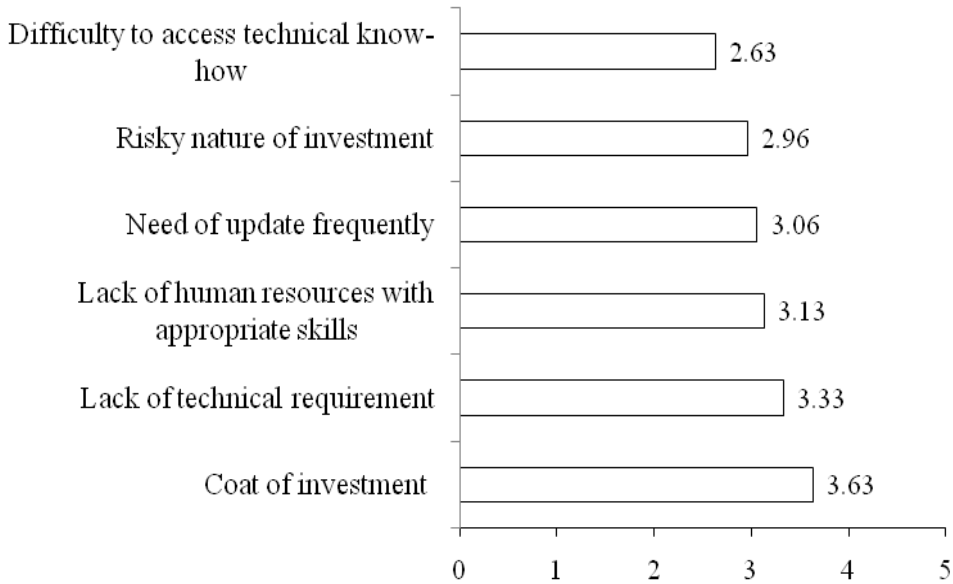


*On a scale 1-5 where 1 is 'totally disagree' and 5 is 'totally agree'

Figure IV. Benefits from using information technology in architectural design firms*.

Barriers

The cost of investments is perceived as the most important barriers to using information technology in architectural design firms (Figure V). Lack of technical requirements, lack of human resources with appropriate skills, need of update frequently, risky nature of investment, difficulty to access technical know-how are other barriers to using information technology in architectural design firms.



*****On a scale 1-5 where 1 is 'totally disagree' and 5 is 'totally agree'.

Figure V. Barriers to using information technology in architectural design firms*.

DISCUSSION AND CONCLUSION

Information technologies provide many advantages for gathering, storing, using, classifying and sharing information but is not enough on its own. In today's world, the capacity of companies to manage information became more important. Although widely used in knowledge management tools in Turkey, there is not satisfactory developments about knowledge management applications in AEC industy. KM requires separation of time, financial investment and teams of experts in this area. The findings clearly demonstrate that the cost of investments is perceived as the most important barriers to knowledge management in architectural design firms.

However, interviewees denoted that almost all architects use of information technologies every day and number of times. It shows potential of architects to access, manage and share information using computer and communication technology effectively. Although the survey is concluded that information technologies are not used efficiently.

The reason behind this is insufficient knowledge on information technologies. This finding may also suggest that to emphasize the benefits of KM in different platforms can

increase financial investment to this area. Furthermore, this finding implies that even though the first knowledge source of architecture offices in Turkey is experiences gained from projects knowledge management is not at the agenda of architecture offices. In contrast total number of permanent full-time employees in architectural design firms generally unstable due to the project size. For this reason, leaving the team to lead the person next to some of the knowledge. This situation makes it vital to improve the management of knowledge. Knowledge management applications can make explicit knowledge available to be leveraged by others in the organization. However, especially in project based organizations, sharing of tacit knowledge acquired over time and over the years is an another important subject.

This study also pointed out that technologies used in Turkish architectural design firms are sufficient in infrastructure they do not use technology efficiently. The reason behind this is insufficient knowledge on information technologies. The precondition to adopting knowledge management in developing countries is to understanding the importance of it and willing to apply it. It is believed that increased levels of usage of knowledge and information technologies by architects in Turkey will be an advantage for the development knowledge management.

REFERENCES

Bakis, N., and Sun, M. (2000). *Intelligent broker for collaborative search and retrieval of construction.* in: Gudnason, G. (ed.) *Proceedings of CIT2000, International Conference on Construction Information Technology.* Reykjavik, Iceland.

Bhatt, G.D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of Knowledge Management, 5(1),* 68-75.

Bresnen, M., Edelman, L., Newell, S., Scarbrougha, H., and Swana, H. (2003). Social practices and the management of knowledge in project environments. *International Journal of Project Managemen, 21,* 157 –166.

Brooking, A. (1999). *Corporate memory*. London: International Thomson Business Press.

Dave, B., and Koskela, L. (2009). Collaborative knowledge management-A construction case study. *Automation in Construction, 18,* 894–902.

Davenport, T, and Hansen, M. (1999). *Knowledge management at Andersen Consulting Harvard Business School Case Study*. Boston MA: Harvard Business Press.

Davenport, T, and Prusak, L. (1997). *Information ecolog: Mastering the information and knowledge environment.* New York: Oxford University Press.

DeFillippi, R.J. (2001). Project-based learning, reflective practices and learning outcomes. *Management Learning, 32 (1),* 5-10.

Drucker, P. (1993). *Post-capitalist society*. Oxford: Butterworth-Heinemann.

Egbu, C.O., and Botterill, C. (2002). Information technologies for knowledge management: their usage and effectiveness, *ITcon, 7,* 125-137.

Egbu, C.O., Sturges, J., and Bates, M. (1999). *Learning from knowledge management and trans-organizational innovations in diverse project management environments.* Proceedings of the 15th Annual Conference of the Association of Researchers in Construction Management (ARCOM), Liverpool John Moores University, 95 – 103.

Gann, D.M, and Salter, A. (2000). Innovation in project-based, service-enhanced firms: the construction of complex products and systems, *Research Policy, 29(7and8),* (955-972).

Gold, A.H., Malhotra, A., and Segars, A.H. (2001). Knowledge management: an organizational capabilities perspective. *Journal of Management Information Systems, 18(1),* 185-214.

Kamara, J.M., Augenbroe, G., Anumba, C.J., and Carrillo, P.M. (2002). Knowledge management in the architecture, engineering and construction industry. *Construction Innovation, 2,* 53–67.

Kim, S. (2000). The roles of knowledge professionals for knowledge management. *International Journal of Special Libraries, 34(1),* 1-8.

Lee, C. C., and Yang, J. (2000). Knowledge value chain, *The Journal of Management Development, 19(9),* 783-793.

Leonard, D., and Sensiper, S. (1998). The role of tacit knowledge in group innovation. *California Management Review, 40(3),* 112-32.

Love, P., Edum-Fotwe, F., and Irani, Z. (2003). Management of knowledge in project environments. *International Journal of Project Management, 21,* 155 –156.

Malhotra, Y. (1998). Deciphering the knowledge management hype. *Journal for Quality and Participation, 2(4),* 58-60.

McCarthy, T.J., Kahn, H.J., Elhag, T.M.S., Williams, A.R., Milburn, R., and Patel, M.B. (2000). *Knowledge management in the designer/constructor interface.* in Proceedings of the 8th International Conference on Computing in Civil and Building Engineering, Reston, VA: ASCE. 836-843.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5(1),* 14-37.

Nonaka, I., and Takeuchi, H. (1995). *The knowledge creating company*. New York: Oxford University Press.

Pan, S.L., and Scarbrough, H. (1998). A Socio-technical view of knowledge-sharing at buckman laboratories. *Journal of Knowledge Management, 2(1),* 55-66.

Plunkett, P.T. (2001). *Managing knowledge at work: an overview of knowledge management.* Knowledge Management Working Group of the Federal Chief Information Officers Council.

Polanyi, M. (1966). *The tacit dimension.* London: Routledge.

Saint-Onge, H. (1996). Tacit knowledge: the key to the strategic alignment of intellectual capital. *Strategy and Leadership, 24(2),* 10-16.

Scarbrough, H., Swan, J., and Preston, J. (1999). *Knowledge management: a literature review*. London: Chartered Institute of Personnel and Development.

Skyrme, D.J., and Amidon, D.M. (1998). New measures of success. *The Journal of Business Strategy, 19 (1),* 20-24.

Sun, M., and Howard, R. (2004). *Understanding I.T. in construction*. New York: Spon Press.

Tan, H.C., Carrillo, P.M., Anumba, C.J., Kamara, J.M., Udeaja, C.E., and Bouchlaghem, A.D. (2005). *Towards a methodology for live capture and reuse of project knowledge in construction.* Proceeding of International Conference on Construction and Real Estate Management, Penang Malaysia.

Winch, G.M. (1998). Zephyrs of creative desstruction: understanding the management of innovation in construction. *Building Research and Information, 26 (5),* 268-279.

Wiig, K. (1995). *Knowledge management methods*. Schema Press: Arlington, TX.

Zin, I.N.M., and Egbu, C. (2009). *A literature review on the challenges associated with implementing knowledge management strategies in construction organisations*. In: Dainty, A. (Ed) Procs 25th Annual ARCOM Conference, 7-9 September 2009, Nottingham, UK, Association of Researchers in Construction Management, 779-89.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 4

REPOSITION OF THE ROLES AMONG PROJECT PARTICIPANTS FOR IMPROVING CONSTRUCTION PROJECT SUSTAINABILITY

Vivian W. Y. Tam[1*], L. Y. Shen[2†] and C. S. Sun[3‡]
[1]School of Computing, Engineering and Mathematics,
University of Western Sydney, Australia
[2]Faculty of Construction Management and Real Estate, Chongqing University,
Shapingba Dist., Chongqing, China
[3]School of Management, Harbin Institute of Technology, China

ABSTRACT

Implementing sustainable practice in a construction project is an important component in promoting sustainable development principles. There is a weak collaboration mechanism among project participants in the current practice for implementing sustainable construction. Roles and responsibilities among various parties need to be reexamined and redefined. This paper investigates causes that affect project sustainability implementation at various stages during construction project life cycle. Solutions for improving project sustainability through close collaboration between project participants are proposed. Data used for analysis are from surveys to professionals in construction industry.

Keywords: sustainable development, construction project, life cycle, sustainability

[*] Corresponding author: Dr. Vivian W.Y. Tam is a Senior Lecturer at School of Computing, Engineering and Mathematics, University of Western Sydney, Australia. Her research interests are in the areas of environmental management in construction and sustainable development. Email: vivianwytam@gmail.com.

[†] Prof. L. Y. Shen is a Professor at the Faculty of Construction Management and Real Estate, Chongqing University, Shapingba Dist., Chongqing, China. He has been leading a number of research works in the discipline of sustainable urbanization.

[‡] Dr. C. S. Sun is an Associate Professor in the School of Management, Harbin Institute of Technology, China. Dr. Sun has been undertaking research in the areas of sustainable construction, risk management and IT application in construction and real estate.

INTRODUCTION

It is well appreciated that the rapid development of global economy concerns with many social and environmental problems in the last several decades, such as air pollution, water pollution, resources exhaustion and greenhouse effects (Tan et al., 1999; Poon et al., 2001; Shen and Tam, 2002; Tam et al., 2002; Shen et al., 2005; Tam et al., 2005b; Tam and Tam, 2006; Tam, 2008; Tam and Tam, 2008). This appreciation has highlighted the importance of sustainable development which has been widely globally promoted (Tam et al., 2005a). The Brundtland Commission presented the typical definition of sustainable development as "to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland et al., 1987). Construction industry, as a pillar industry among economic sectors, is an important component for contributing to sustainable development. The industry has been given particular attention due to it special impacts to the environment. According to the previous research studies, more than 50% energy consumed in China is generated from construction-related activities annually, which includes energy consumed by the production of construction materials, constructing houses, ventilation, lighting, heating, cooling and other aspects (Zhang, 2005). Therefore, in line with these understanding, research has been extended to examine the sustainability of construction projects. Many scholars have carried out research works in the discipline of sustainable development within the built environment, with focuses on environmental impact assessment, sustainable architectural design, and construction waste utilization. Asif et al. studied a life cycle assessment (LCA) with referring to a typical 3-bedroom semi detached house in Scotland (Asif et al., 2007), and pointed out that concrete consumes about 65% of the total embodied energy of the house while its share of environmental impacts was even more crucial. Oscar et al. conducted a review on the key milestones on the development accomplished in LCA within a building sector between 2000 and 2007 (Oscar et al., 2009). Gu et al. divided building's life span into five main stages: (1) material acquisition; (2) manufacture; (3) construction; (4) operation; and (5) demolition, in analyzing environment impacts in terms of energy consumption, resource consumption and environmental pollution (Gu et al., 2006). Gu et al. contributed to the introduction of an assessment method for building life cycle suitable for Chinese situation. Quan and Xu compared and analyzed the applications of exterior wall insulation systems, light-energy-wall heat-supply and ventilation systems, solar-energy water heating systems and summer sunshade devices as well as more than 10 technologies applied in building (Quan and Xu, 2007). Chen and Xie investigated various ways for contributing to the mission on sustainable development through selection and use of environment-friendly building materials in construction (Chen and Xie, 2004). Shen et al. demonstrated the latest approaches for managing construction waste by identifying the existing problems of managing waste handling process on construction sites (Shen et al., 2004). They examined waste handling process during construction through mapping six cases selected in the Hong Kong construction, with the assistance of a free-flow mapping presentation technique, and developed a waste management mapping model. Their research findings incorporated best practices embodied in construction and provided an alterative tool assisting in planning waste management procedures on construction sites. Several other studies examined project

sustainable performance based on a LCA method defined by International Organization for Standardization (Cha and Zhang, 2001; Zhang et al., 2005).

The sustainability of a construction project is the function of all aspects of its life cycle. However, limited research in the existing literatures has addressed the aspect of responsibilities and obligations of individual project participants in every stage of whole construction project life cycle. It is considered important to interpret individual participants' responsibilities and obligations in a proper way thus their contributions to construction project sustainability can be understood and assessed. The major aim of this paper is to examine the activities engaged with main construction project participants and understand their roles and responsibilities in the process of implementing the principles of sustainable development. Suggestions for improving the existing practice on practicing project sustainability by main project participants are also explored.

DEFINITIONS OF CONSTRUCTION PROJECT LIFE CYCLE

Whilst there are various definitions about construction project life cycle, by a typical definition adopted in the Chinese construction industry, life cycle of construction projects is generally divided into four stages (Cheng, 2005): (1) project inception and decision-making stage; (2) project design stage; (3) project construction stage; and (4) project completion and delivery stage. Each stage contains many complicated processes and construction procedures. Royal Institute of British Architects defined the standard processes of operating construction projects, including pre-design, design, preparing to build, construction, and post construction (Royal Institute of British Architects, 1973). In more details, these processes include inception stage, feasibility stage, outline proposals stage, scheme design stage, detail design stage, production information stage, bill of quantities, tender action, project planning, operations on site, completion and feedback. It can be seen that the above definition for construction project life cycle begins from preparation of new project and ends with completion, commissioning and feedback. Although definitions given by different scholars are different, they are largely similar. There are still other research works which have addressed the concept of construction project life cycle (Royal Institute of British Architects, 1973; Cheng, 2005).

From the view of sustainability, nevertheless, life cycle of construction projects will not end upon the project delivery into service and feedback. The construction project will be used for various purposes such as dwelling or used for production operations until finally demolished. A construction project has important role in contributing to sustainable development mission. In fact, the energy consumed during project operations and the effects on the environment are more significant. For example, about 35-60% annual energy consumption budget of America is used for maintaining buildings (Pulselli et al., 2007). Therefore, the implications of project life cycle in the perspective of project sustainability should be extended to include building use and final demolition stages. Therefore, this study defines construction project life cycle as five stages: (1) inception; (2) design; (3) construction; (4) use; and (5) demolition.

RESEARCH METHODOLOGY

The major objective of this study is to investigate the roles and responsibilities of various project participants in practicing sustainable construction at various stages during construction project life cycle. To undertake this investigation, the research examines the causes and factors that affect project sustainability performance. The data used for analysis are mainly from a comprehensive literature review and surveys to professionals. Interviews are invited and arranged with different project parties who involved major projects in the past. Two governmental departments, four clients, three consultants, six contractors, five sub-contractors and two suppliers are interviewed. The interviews are based on open discussions on their view and suggestions on how to effectively implement project sustainability for different stages in project life cycle. All the interviewees have had more than twenty years of working experience particularly on practicing sustainable construction principles. These discussions provide valuable comments on the adequacy of the understanding on the existing construction practice and suggestions for improving sustainable construction performance. Team-orientated approach has been adopted throughout the study by engaging comprehensive discussions within the research team.

ANALYSIS ON THE FACTORS AFFECTING PROJECT SUSTAINABILITY

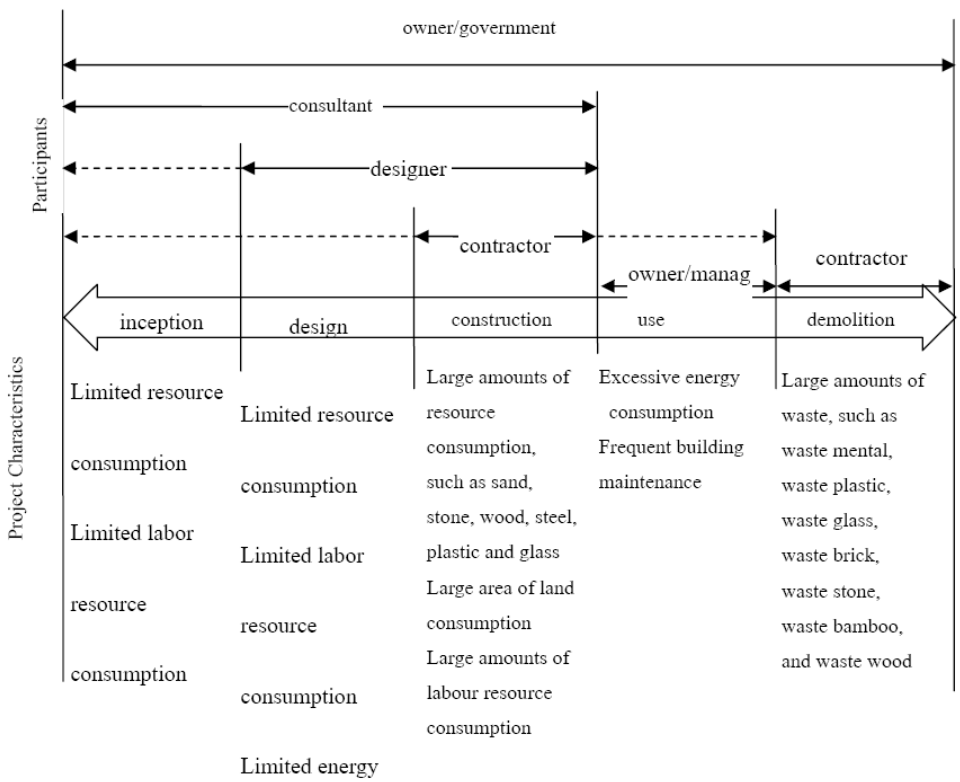


Figure 1. Project participants and characteristics across project life cycle.

By incorporating the involvements of various project participants in a construction project life cycle, Figure 1 is developed to show the correlation between individual states of project life cycle and individual participants. Major characteristics can also be highlighted in each stage from the perspective of project sustainability performance. By examining Figure 1, it can be noted that project sustainability performance is affected by all five stages in different ways. Based on the interview discussions, further analysis on the factors affecting project sustainability in these individual stages is given as above.

Factors Affecting Project Sustainability at Inception Stage

Inception stage is the first stage for projects, which is very important to have a clear planning before project starts. An early involvement of contractors can provide and ensure a successful implementation. In the traditional approach, contractors did not get involvement at inception stage. Discussions for projects at inception stage mainly between clients and designers. This cause a lot of problems at the later project stages, particular construction stage.

Factors Affecting Project Sustainability at Design Stage

At design stage, decision making on the sustainable materials or construction methods is required. The selection of construction materials is decided by design documents; however, most problems emerging at construction and use stages also originate from deign documents. Therefore, problems from design documents are the most important reasons that cause sustainable problems at construction stage.

Design related problems can affect to a large extent for sustainable performance during project operation stage. For example, users feel inconvenient, uncomfortable or inapplicable while using the buildings, because for example building is too luxury and has complicated functions and a lot of space that cannot be used.

Factors Affecting Project Sustainability at Construction Stage

At construction stage, contractors construct building products according to design drawings. Pollutants will be generated in this stage, including noise, dust, wastewater, solid waste and other problems that induce negative impacts to the environment. The main factors influencing project sustainability include the consumption on a large amount of environmental resources, the consumption on a large amount of energy, a large amount of cost spent on all types of labour resources and all kinds of mechanical equipments. Furthermore, huge amount of embodied energy will be consumed for producing and transporting building materials. Waste produced by these materials upon project demolition will be massive.

Factors contributing to these problems include management policies adopted by construction companies, technologies and equipment adopted, and construction methods. For example, as far as the selection of concrete pouring methods (pumping or using tower cranes) and the selection of pouring framework are concerned, wood framework is inexpensive but

has few turnover times. In contrast, steel framework is expensive but has many turnover times.

Constructing at night may disturb residents because of noise. Therefore, implementing construction schemes at construction stage is an important factor that can affect environmental performance to a large extent. If innovative constructing technologies and techniques of energy saving and consumption reduction methods are adopted, building waste, and air and noise pollution can be reduced.

Factors Affecting Project Sustainability at Project Operation Stage

At operation stage of building or other types of construction products, factors influencing project sustainability mainly embody two aspects. Firstly, the operation of construction projects induces energy consumption.

The amount of energy consumption can be very different when different operation systems are adopted, for example, adopting artificial lighting rather than natural light for rooms, and excessively using ventilation, cooling and heating systems can increase significantly energy consumption. Secondly, maintenance affects the quality of operations. Poor maintenance scheme will cause inefficiency of project operation and poor performance economically, socially and environmentally.

Factors Affecting Project Sustainability at Demolition Stage

At project demolitions stage, main factor influencing project sustainability performance is the treatment methods for all kinds of demolition waste. Construction demolition waste has been traditionally dealt with through dumping except metal waste (Zhang, 2006). The traditional practice of waste dumping has not only caused land pollution, but also air and water pollution. Dumping construction waste assumes a large area of land. Some construction waste causes serious harmful pollution, such as building glues, coatings and paints from building waste which are macromolecule polymers and difficult to be degraded by microbe. They contain harmful heavy metal elements. Furthermore, substantial amount of construction demolition waste is buried underground. It will cause pollution to underground water and directly harm the living of surrounding residents. This practice can even destroy soil structures and lead to ground settlement. In addition, early building demolitions often happen because of poor project designs. For example, news from Xinhua website reported that Hubin Campus District of Zhejiang University which is the third tallest building in West Lake has been demolished (Fang, 2007). The design life of this building is about 100 years; it has been demolished only after using it for 13 years. Improvements on the treatments for construction demolition waste have been made in the practice through the methods of waste reducing, recycling and reusing. However, the extensive applications of these environment-friendly methods need the provision of various conditions, particularly, economic conditions. For example, it is requested for provision of transportation, storage, sorting, breaking and sieving which require lots of funds investment. Except clean metal, wooden products and bricks after demolition can receive some return via waste recovery and utilization, other waste has very

low-added values for recovery and utilization and is of no profits for users, which present barriers to the applications of these methods.

REPOSITION OF THE ROLES OF PROJECT PARTICIPANTS FOR IMPROVING CONSTRUCTION PROJECT SUSTAINABILITY

Above analysis indicates that the factors affecting construction project sustainability present in all stages across project life cycle. Effects of these factors on project sustainability are through various operation activities undertaken by all participants of construction projects. In line with the promotion of sustainable construction practice in recent years, various methods have been introduced to help various project parties improving performance towards better sustainability. However, it is appeared that project participants practice more within their own organizations, rather than taking a co-ordinated action. In fact, as analyzed in the previous section that project sustainability is subject to many factors across life cycle. These factors are interrelated. Project sustainability can only be truly improved if these factors are integratively considered. As different project participants have different influences on the effects of these factors, the management for these factors requests for a co-ordinated response from all project participants. Therefore, project participants including clients, government, users, contractors, designers, and other project participants should provide co-ordinated efforts for reducing effects of these factors on project sustainability. The most important strategy is to promote the ideological cognition among all project participants on the importance of achieving project sustainability. All parties should be encouraged and supported to actively and initiatively put forward effective schemes for practicing the principles of project sustainability whilst individual project participants can adopt their professional knowledge and experience in contributing better sustainable performance within their own work contexts. They should make a further step in working with other parties. The following discussions present suggestions of repositioning various project participants towards better project sustainability across project life cycle:

Roles for Owners

Project owners have a key role influencing sustainability performance for construction projects. Problems contributing to poor project sustainability in project life cycle have close relation with owners. If owners consider and require for construction project works from a perspective of sustainable development. The real driving force can be gained to achieve better sustainability. Traditionally, project clients focus on the analysis on project economic performance mainly in project inception and design stages. To improve project sustainability, clients should work closely with other parties, and their roles should be repositioned as follows.

(1) At inception stage, when selecting construction projects, project owners should not only appraise economic benefit, but also social benefit and environment impact, and pay attention to sustainability appraisal of construction projects.

(2) At design stage, owners should not excessively pursue luxury, style of building and top-grade outside appearance. Attention should also be given to function, economical efficiency and applicability. Owners should appraise all design schemes by adopting value engineering methods and pay attention to energy consumption and maintenance at use stage as well as building waste treatments at demolition stage. The practice of these solutions can mitigate unsustainable problems at use and demolition stages.
(3) At construction stage, owners should select contractors who have experience in green building construction and require contractors to introduce new constructing technologies and techniques for reducing the production of building waste. In addition, owners should encourage contractors and suppliers participating construction projects as early as possible so as to make use of their abundant experience in project construction, materials and equipments selection.
(4) At project operation stage, project owners should strictly abide by concerned national laws and regulations to operate projects, advocate water saving and energy saving. They should treat the drainage according to standards before drain it.
(5) At demolition stage, the main problem is treatment of building waste. Owners should pay attention to proper waste collection, sorting treatment and effective utilization methods such as reuse and recycle.

Roles for Government

Government has an important role to play in promoting sustainability of construction projects. The government should guide with policies, laws and regulations, and balance the interests among economic, social and environmental stakeholders through awards and punishment. This role is defined by laws and regulations, industrial specifications, administrative examination and approval, tax fine and other means. To realize construction projects sustainability as well as the development of the whole construction industry, specific actions can be adopted across project life cycle as follows.

(1) At inception stage, government should be involved in project early stages, particularly for public projects. Government should require that different project parties, including designers, consultants, contractors, and subcontractors must have certain sustainability knowledge. Meetings with all project participants are necessary for transferring sustainability messages at an early stage. Training and education may also be required for enriching knowledge of sustainability.
(2) At design stage, environmental design needs to be encouraged by the government. Green buildings are highly promoted around the world. Government should provide incentive for buildings using environmental designs and green building features.
(3) At construction stage, government should encourage the use of environment-friendly materials, implement green construction practice, strengthen on supervision and further improve the compliance of relative laws for noise, waste, water and air pollution.

(4) At project operation stage, government should require the compliance with various regulations and rules providing guidance on practicing sustainable construction, particularly when carrying out examination and approval of construction project.
(5) At demolition stage, government should encourage and support proper applications of building waste treatment technologies. Other waste management measures include economic awards and other means for building waste, standardize treatment process of building waste by laws and guarantee its successful implement with tax, fine and other means. Government shall update and improve regulations when and where necessary.

Roles for Designers

Design documents have great influences on the sustainable performance of construction projects during its whole life cycle. Specific actions from designers are required across project life cycle.

(1) At inception stage, early involvement of the projects and discussions with other project participants, including government, client, contractors and subcontractors should be implemented. Clear specifications and guidance for sustainable practice should be provided. As required, detailed sustainable requirements may be provided in the specification and design documents.
(2) At design stage, designers should be knowledgeable of sustainable construction principles. And these principles should be incorporated into the design process, such as the choice of proper materials, energy efficient designs, design layouts enabling safer and healthier living and working environment.
(3) At construction stage, designers should still involve with the projects for ensuring proper environmental designs are implemented and constructed. If the actual construction environment does not allow to implement the original designs, necessary modification and amendments are required and discussed between designers and contractors.
(4) At project operation stage, designers should help check whether the environmental design parameters are implemented as the original functions. Regular maintenance should also be provided for ensuring functions of the buildings are satisfied with requirements.
(5) At demolition stage, designers can provide advice on considering necessary actions for reusing and recycling environmental building features for another projects' environmental designs.

Roles for Contractors

When planning and implementing construction works, project contractors should fully consider the effect of noise and various waste on the environment and public. Various kinds of construction waste and pollutants on environment should be identified beforehand, and a plan for reducing impacts of pollutants should be developed. For example, contractors should

select energy-saving constructing technologies and techniques. Various actions are required across project life cycle.

(1) At inception stage, contractor should provide advice and comments on project for ensuring clients requirements can be met. Clients may also require contractors with necessary sustainable knowledge in the specifications or project documents.
(2) At design stage, contractors should discuss with designers for ensuring environmental building features can be implemented in the construction stage. An early planning can reduce variations which may increase project period and construction cost.
(3) At construction stage, contractors should implement green construction practice, including the use of environment-friendly materials, implementing sustainable construction methods and providing waste sorting.
(4) At project operation stage, contractors should provide advice and supports on regular maintenance for ensuring environmental requirements are satisfied. Measurement of the reduction of energy and water consumption should be provided. Contractors should offer previous experiences for continuous sustainability improvement for future projects.
(5) At demolition stage, contractors should identify any demolished materials can be reused or recycled for future projects. Contractors should appreciate the benefits from utilizing demolished materials. For example, wasted steel can sell it to recyclers for profit making, and demolished concrete waste can recycle it as recycled aggregate for pavement or sub-structural construction applications.

Roles for Suppliers

Suppliers should be knowledgeable of the characteristics of various types of materials and equipments, thus suppliers can adopt them to the construction projects in a way which can contribute to better project sustainable performance. Moreover, contractors and suppliers should provide all kinds of suggestions that are contributable to project sustainability by using their experience. Suppliers should provide advice on the way of using material and plants across project life cycle.

(1) At inception stage, suppliers should provide knowledge and information for the available sustainable materials and equipments to project parties. This can ensure adequate materials and plants for better sustainable performance can be identified and obtained for projects.
(2) At design stage, suppliers should try to fulfill designers' requirements in providing suggestions for sustainable materials and should also recommend the available resources for alternative choices for improving environmental practice at construction stage.
(3) At construction stage, suppliers should deliver the ordered sustainable materials and equipments in a timely manner for ensuring construction work can start. Some sustainable materials and equipments may require traveling from long distance. Suppliers should arrange these resources on time.

(4) At project operation stage, supplier should provide advice and direct actions on regular maintenance and inspection. Advice of suitable use of the sustainable resources should be provided to the users.
(5) At demolition stage, suppliers can try to acquire the demolished waste to reuse or recycle for other projects or to recyclers. A proper link between suppliers and recyclers should also be established. If necessary, clients or contractors should also have contractual requirements for ensuring suppliers will collect reusable and recyclable materials back at demolition stage.

Roles for Consultants

Project consultants can directly influence all kinds of decisions in the process of implementing construction projects. Thus, consultants should strengthen self cognition for better sustainability of construction project and accumulation of concerned knowledge for providing overall professional service for owners. Actions by consultants across project life cycle are identified as follows.

(1) At inception stage, consultants should be invited to involve discussions on project feasibilities from the perspectives of sustainable issues. Early planning of the project can ensure successful implementation of sustainability measures.
(2) At design stage, consultants should closely work with designers for incorporating possible sustainability measures. Sustainable building features should be implemented. Necessary research and development should also be undertaken for ensuring that advance technologies have been considered.
(3) At construction stage, consultants should regularly inspect construction activities. Consultants should ensure that sustainable materials, equipments and resources are adequately implemented. Consultants should also keep providing updated information to contractors for innovative sustainable techniques and construction methods.
(4) At project operation stage, consultants should provide advice and suggestions about regular maintenance to protect sustainable building features by employing the materials with good sustainability performance.
(5) At demolition stage, consultants can provide suggestions and recommendations on how the demolished materials can be reused and recycled to contractors and suppliers. Continuous improvement should be provided based on the past experience for improving sustainability performance.

CONCLUSION

Achieving better construction project sustainability is a complicated engineering process, which requests joint efforts among project owners, government, designers, contractors, suppliers, consultants, and other project participants. Thus factors affecting project sustainability performance are in all types of disciplines including management, technology, laws, economy and many other aspects.

This paper presented typical problems that contribute to poor project sustainability performance at each stage of construction projects. Major factors affecting project sustainability include design documents, construction schemes and building waste treatment methods and others.

The most important solution for improving project sustainability performance is effective cooperation among various project participants. Each individual project party should understand its key roles in contributing to better project sustainability performance. The paper proposed a detailed framework guidance of how different levels of project participants can provide better contributions towards the mission of implementing sustainable construction across project life cycle.

It was suggested:

(1) Owners should not only appraise economic benefit, social benefit and environment impact, but also pay attention to sustainability appraisal of construction projects at inception stage, appraising all design schemes by adopting value engineering methods at design stage, selecting contractors who have experience in green building construction at construction stage, strictly abiding by concerned national laws and regulations at project operation stage, and paying attention to proper waste management at project demolition stage.
(2) Government has important role to promote better project sustainability. For example, government may consider proficing incentives for buildings using environmental designs and green building features at design stage, encouraging the use of environment-friendly materials and practice, requiring the compliance with various regulations and rules on practicing sustainable construction
(3) Designers must be knowledgeable of sustainable construction, and be able to incorporate these principles in design process, and assist in other parties to contribute to better sustainability.
(4) Contractors have most direct activities influencing project sustainability across many stages. Corking with other project participants in close association is important for contractors to contribute to better project sustainability.
(5) Suppliers and consultant have also important roles to affect project sustainability performance. They can provide proper advice on the selection and application of materials and equipments that have better sustainability performance across project life cycle.

The analysis on repositioning for different project participants provides a detailed framework and guideline on how to effectively implement construction project sustainability. This step by step procedure can effectively instruct different project participants on their roles and responsibilities towards better construction project sustainability.

REFERENCES

Asif, M., Muneer, T., Kelly, R. (2007). Life cycle assessment: a case study of a dwelling home in Scotland. *Building and Environment. 42,* 1391-1394.

Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S. A., Chidzero, B., Fadika, L. M. (1987). *Our common future: the World commission on environment and development,* Oxford University Press.

Cha, J., Zhang, J. (2001). Application of LCA to evaluate the influence of construction project on environment. *Environmental Science Trends*. *3,* 11-15.

Chen, Y., Xie, H. (2004). Appeal for environmental-friendly building materials: promote the sustainable development. *Construction Management Moderization*. *3,* 19-22.

Cheng, H. (2005). Construction project management. *Higher Education Press*. *5,* 20-24.

Fang, Y. (2007). *Is it a successful performance of managing city for demolishing frequently high building?* From Son Fun News, Accessed on Jan, 19, 2007, from http://sonfun.com/news/2007-01-19/927577.htm.

Gu, D. J., Zhu, Y. X., Gu, L. (2006). Life cycle assesment for china building envionment impacts. *Journal of Tsinghua University (Science and Technology)*. *46(12),* 1953-1956.

Oscar, O., Castells, F., Sonnemann, G. (2009). Sustainability in the construction industry: a review of recent developments based on LCA. *Construction and Building Materials*. *23(1),* 28-39.

Poon, C. S., Yu, T. W., Ng, L. H. (2001). On-site sorting of construction and demolition waste in Hong Kong. *Resources, Conservation and Recycling 32,* 157-172.

Pulselli, R. M., Simoncini, E., Pulselli, F. M., Bastianoni, S. (2007). Energy analysis of building manufacturing, maintenance and use: em-building indices to evaluate housing sustainability. *Energy and Buildings*. *39,* 620-628.

Quan, Z., Xu, C. (2007). Discussion on the technical approach for construction energy efficiency. *Energy and Environment*. *1,* 65-66.

Royal Institute of British Architects (1973). *Architectural practice and management,* Royal Institute of British Architects

Shen, L. Y., Tam, W. Y. V. (2002). Implementing of environmental management in the Hong Kong construction industry. *International Journal of Project Management*. *20(7),* 535-543.

Shen, L. Y., Tam, W. Y. V., Tam, C. M., Drew, D. S. (2004). Mapping approach for examining waste management in construction sites. *Journal of Construction Engineering and Management*. *130(4),* 472-481.

Shen, L. Y., Wu, Y. Z., Chan, E. H. W., Hao, J. L. (2005). Application of system dynamics for assessment of sustainable performance of construction projects. *Journal of Zhejiang Univeristy Science*. *6(4),* 339-349.

Tam, C. M., Tam, W. Y. V., Chan, K. W. H., Ng, C. Y. W. (2005a). Use of prefabrication to minimize construction waste - a case study approach. *International Journal of Construction Management*. *5(1),* 91-101.

Tam, C. M., Tam, W. Y. V., Zeng, S. X. (2002). Environmental performance evaluation for construction. *Building Research and Information*. *30(5),* 349-361.

Tam, W. Y. V. (2008). On the effectiveness of implementing a waste-management-plan method in construction. *Waste Management*. *28(6),* 1072-1080.

Tam, W. Y. V., Tam, C. M. (2006). Evaluations of existing waste recycling methods: a Hong Kong study. *Building and Environment*. *41(12)*, 1649-1660.

Tam, W. Y. V., Tam, C. M. (2008). *Reuse of construction and demolition waste in housing development*, Nova Science Publishers, Inc, United States.

Tam, W. Y. V., Tam, C. M., Zeng, S. X., Chan, K. K. (2005b). Environmental performance measurement indicators in construction. *Building and Environment*. *41(2)*, 164-173.

Tan, T. K. A., Ofori, G., Briffett, C. (1999). ISO 14000: its relevance to the construction industry of Singapore and its potential as the next industry milestone. *Journal of Construction Management and Economics*. *17(4)*, 449-461.

Zhang, G. (2005). Cognition to construction sustainable development. *Anhui Architecture*. *4*, 11-12.

Zhang, M. (2006). *How to deal with the construction waste in China in order not to pollute the environment?* From HC360 Environmental Website, China, Accessed on Sept, 14, 2006, from http://info.ep.hc360.com/2006/09/20081345166-2.shtml.

Zhang, Z., Wu, X., Gong, Z. (2005). Study of theories and applicable criteria on environmental impact assessment of buildings. *Environmental Protection*. *5*, 39-42.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 5

CROSS CULTURAL CONSTRUCTION PROJECT MANAGEMENT IN THE GCC COUNTRIES: A LOCAL PERSPECTIVE ON WESTERN PROJECT PARTIES

Martin Jaeger*[*1] and Desmond Adair[2]
[1]School of Engineering, University of Tasmania, Tasmania, Australia
[2]School of Engineering, Nazarbayev University, Astana, Republic of Kazakhstan

ABSTRACT

Construction project management in the GCC (Gulf Cooperation Council) countries usually involves project parties with different cultural backgrounds. It has been shown in previous studies that cultural differences in construction project management can lead to a combination of challenges. The purpose of this study is to identify how Western project parties involved in construction projects in the GCC countries are perceived by Arab construction project managers (i.e. host perspective) and to identify specific areas of perceived influence.

Using questionnaire based in-depth interviews with 96 Arab construction project managers, qualitative and quantitative data regarding anticipated influence aspects was collected. The analysis included ranking of the cumulative frequency of influence aspects, proving a good internal consistency of the scale, and a qualitative causal analysis.

The results indicate a perceived positive influence exerted by Western project parties on the three aspects: project planning, using appropriate technology, and team spirit of the project team. At the other end of the spectrum, respondents seem to perceive a negative influence by Western project parties on traditional local values and status differences within the project team.

Increased awareness of the host perspective may lead to improved cross cultural communication between project parties from the GCC countries and project parties from

[*] Corresponding author: Ph.: +61 3 6226 2135, Fax: +61 3 6226 7247, email: Martin.Jaeger@utas.edu.au

Western cultures. The findings seem to reflect an overall positive perception of Western influence on construction project management in the GCC countries.

Keywords: Cultural awareness, project management, construction, Gulf Cooperation Council

BACKGROUND

Nicholson (2007) showed the influence of globalization on construction projects and how the global dynamic is changing the way contractors do business. Inevitably, this has consequences for managing construction projects. Construction project management of large projects involves project parties from different cultural backgrounds. This is especially true for large construction projects in the GCC countries and has a large impact on construction project management in that region.

For 2011, the GCC countries are estimated to have generated a GDP growth of 6.66%. This is more than the prospects for the so called major advanced economies (G7 countries) (1.88%) and the global economy (3.31%), but less than the prospects for China (9.59%) and India (8.37%) (IMF, 2010). This and the expectation of continuing growth in the GCC countries (Ellaboudy, 2010) contribute to the high importance of construction project management in the GCC countries. Most, if not all of the construction project managers in the GCC countries, have business interactions with professionals from different fields and from different national cultures including the Western culture.

The following summary of the current situation regarding cross-cultural studies of construction project management in the GCC countries is based on the review carried out by Ofori and Toor (2009), results published in the seven leading journals in construction management as identified by Bröchner and Björk (2008), and additional results found in databases containing construction project management resources, using combinations of the keywords (or their corresponding synonyms): Arabian Gulf, Construction Management, Culture, West. After looking at cross-cultural construction project management in general, the focus will be on cross-cultural construction project management in the GCC countries.

CROSS-CULTURAL CONSTRUCTION PROJECT MANAGEMENT

In their review of cross-cultural research in construction, Ofori and Toor (2009) found that 25 publications addressed cross-cultural issues in construction, but only a very small number of countries were considered in national level studies, and none was considered across regions. Based on the cross-cultural management of a Chinese construction project involving Chinese and American project partners, Low and Leong (2000) concluded that foreign project managers need to consider the Chinese style of management in interacting with Chinese project partners. Cross-cultural influences were found to have a direct influence on project effectiveness (Low and Shi, 2001).

Chan and Tse (2003) focused on cultural considerations in construction contracts. The research was based on questionnaire surveys among construction professionals from various backgrounds - one conducted in Hong Kong and a second questionnaire survey conducted in London and Sydney. They found that international projects are more vulnerable to disputes,

cultural differences contribute to disputes, and Westerners and Asians have a different attitude towards disputes and resolving disputes.

Chen and Partington (2004) compared and interpreted the conceptions of Chinese and UK construction project managers and found important differences in the meaning of 'relationships'.

Based on questionnaires covering human and cultural influences on project management and distributed to Samoan managers and supervisors as well as expatriates (concentrated on personnel from Australia, New Zealand and Japan), Tone (2005) analysed the impact of cross-cultural communication on construction management in Samoa. He looked into the impact of 35 specific communication barriers and the extent to which they were overcome.

Similar, but more concise, Ling and Lim (2006) revealed the following cross-cultural challenges when managing construction projects in China:

- team-spirit
- micro-management (i.e. need for detailed instructions)
- initiative
- communication with Chinese staff
- culture of distrust and bureaucracy
- claims culture
- quality culture.

Confirming the previous perspectives, Dulaimi (2007) found that the incompatibility between foreign and local cultures was a major barrier to effective knowledge sharing. This was based on four case studies, and, interviewing predominantly general and project managers of joint venture partners (from Japan, Germany and Singapore), of a major construction project in Singapore.

Toor and Ogunlana (2008) focussed on leadership skills and competencies for cross-cultural construction projects, when they analysed a mega construction project in Thailand based on questionnaires and interviews with managers from ten different nationalities. They considered construction management aspects which were formulated as leadership attributes. Their results confirmed a threefold category: universally endorsed *positive* (desired) leadership attributes, items that vary across cultures, and universally negative (undesired) attributes (Den Hartog et al., 1999).

Based on 15 case studies and interviews with real estate developers, contractors, and engineering companies, Javernick-Will and Levitt (2009) identified 15 important knowledge areas for managing international construction projects:

- approval processes
- climate and conditions
- cultural
- design standards
- industry organization
- knowledge of government procedures
- language
- laws and regulations

- logistics
- market knowledge
- labour
- operating laws
- relationships
- social norms and local preferences
- work practices.

The research revealed that for both real estate developers and engineering companies, cultural issues (such as culture, language, relationships, social norms and local preferences, work practices) ranked among the most important knowledge areas (out of 15).

These findings are confirmed by the literature review carried out by Zhang and Liang (2008) who confirmed that cultural differences contribute to disputes in international construction projects. In addition, their analysis revealed that distance between national cultures make organizational project cultures more complicated.

Regarding construction project management in the GCC countries the following was found. Rabbat and Harris (1982) analysed relevant literature and concluded that management of international construction companies operating in the Middle East must adapt to the culture if they want to minimize conflicts arising from cultural differences. In addition, they found that involving advanced technology and a lack of planning might be other important factors leading to conflicts.

Dadfar and Gustavsson (1992) carried out six case studies on construction projects in the Middle East which involved Swedish construction companies. They revealed the significance of cultural influences on performance of project management and how to manage cultural diversity.

Based on questionnaires, Loosemore and Al-Muslmani (1999) focused on UK nationals with experience of international construction projects in the GCC countries and investigated their sensitivity to Arabic culture. They focused on communication, including language, silent language, time, values, and technology and uncertainty and found a low level of sensitivity towards Arabic values, Arabs' concept of time, importance of the Arabic language and Arabs' attitude towards uncertainty.

The findings considered so far have shown that there is a variety of challenges when managing construction projects with parties from different national culture backgrounds. However, studies of national cultures in cross-cultural construction project management to date usually do not look into the *general influence* of one group on the other group. Instead, they focus on one or a limited number of influenced areas (such as leadership, knowledge management, communication, etc.).

Finally, the above summarized studies take a *guest* culture perspective. Little is known about the local *host* perspective on Western project parties, although members of the host culture represent the client organisation. Eventually, it is the perspective of the client organisations which matters most since they decide with whom to enter a business relationship.

COMPARISON OF NATIONAL CULTURES

Before focussing on the research carried out here, the reasons for differences between national cultures and, specifically, the difference between Western cultures and national cultures in the GCC countries will be shown. The comparison is based on Hofstede's cultural dimensions since they are widely used, although, not without criticism (Ofori and Toor, 2009).

Based on anthropological and societal issues, Hofstede (1980) identified four different dimensions of national cultures. The first dimension is "Power Distance" and demonstrates "the extent to which the less powerful members of institutions and organizations accept that power is distributed unequally", and the second dimension is "Uncertainty Avoidance" and shows "the extent to which people feel threatened by ambiguous situations, and have created beliefs and institutions that try to avoid these". The third dimension is "Individualism versus Collectivism" and illustrates the position of a culture between individualistic versus collectivistic perspectives of its people while the fourth dimension is called "Masculinity versus Femininity" and discusses the position of a culture between "success, money, and things" versus "caring for others and the quality of life" orientation.

Hofstede (1980) compared these dimensions for 40 and later more national cultures (Hofstede 1984) as well as for a five-dimensional classification (Hofstede and Hofstede, 2005) by using country scores which were based on a factor analytical treatment of country averages for his value measures (Hofstede 1984). Three of the national cultures of the GCC countries were included in his analysis (Hofstede 1980): Kuwait, Saudi Arabia, and United Arab Emirates. The country scores of the four dimensions for each of the three countries were found to be the same:

- The power-distance (high: less powerful members accept and expect unequal power distribution, low: unequal power distribution is less accepted and expected) is with 80 much higher than the power-distance of Western cultures (in comparison: Austria scored lowest with 11, and Malaysia highest with 104).
- Individuality (high: individualist societies, low: collectivist societies) is with 38 lower than the scores for France (71), Belgium (75), Italy (76), United States (91), United Kingdom (89), Germany (67), and other Western national cultures, except Portugal (27) and Greece (35).
- Masculinity (high: very assertive and competitive, low: modest and caring) is with 52 *not* very distinctive from Western cultures (ranging from Sweden with 5 to Austria with 79).
- The same is true for the uncertainty-avoidance (high: uncertainty causes members to feel uncomfortable, low: uncertainty is tolerated) which is with 68 *not* very distinctive from Western cultures (ranging from Denmark with 23 to Greece with 112).

These findings show that national cultures of the three GCC countries are fairly different from most Western national cultures regarding power-distance and individualism. This suggests that local project parties in the three GCC countries have a distinct perception regarding the influence of Western project parties on construction project management. Since

there are no differences between the three analysed GCC countries, it can be assumed that the perception of local project parties in the other GCC countries is similar. All countries of the GCC show many cultural and economic similarities.

OBJECTIVE AND PURPOSE

First, the objective of this study is to contribute to filling the above mentioned gap of cross-cultural research in construction (Ofori and Toor, 2009) by considering the region of the GCC countries.

Secondly, different from the previous studies summarized above, this study aims at analysing the *general* influence of Western project parties on Arab construction project managers since it is the *general* perception of "the other" which determines attitude and behaviour (Pronin 2008) and sometimes turns into ethnocentrism or stereotypes (Moghaddam et al., 1993; Srivastava, Guglielmo and Beer, 2010).

Third, this study focusses on the host perspective - Arab construction project managers in the GCC countries - since this is of special interest. It is the client perspective and the client eventually decides with which project party to enter into a business relationship.

Fourth, since an over-reliance on experience was identified among project managers of the construction industry (McCaffer and Edum-Fotwe, 2000), this study aims at providing solid insights into the local perspective on Western project parties which increases cultural awareness and reduces potential lapses.

The purpose of this study can be summarized:

- Identify the host perception
- Identify areas of influence (various aspects)
- Identify type of influence (*very positive – very negative* continuum)
- Identify importance of influence

Following Merriam-Webster's definition of "Western", it means here "of, relating to, or characteristic of a region conventionally designated West: as steeped in or stemming from the Greco-Roman traditions" (Merriam-Webster 2010).

RESEARCH METHODOLOGY

Among others, national heterogeneity, interplay of national and organizational culture, cultural complexities within an organization, and environmental factors have been identified as issues in cross-cultural research in construction (Ofori and Toor, 2009). Furthermore, the specific research segment (construction project management in the GCC countries), the broad approach (general influences), and the sensitivity of the research question, need to be recognized.

The authors based their sample size (N=96) on the achievement of theoretical saturation (Glaser and Strauss, 1967) which holds that an emerging consistency of perceptions among respondents does not lead to further significant new discoveries. Data were collected using questionnaire based interviews consisting of principal quantifiable questions and open-ended

follow-up questions. The principal questions aimed at identifying the extent of perceived influences and the follow-up questions aimed at identifying the reasons for the expressed extent. Respondents were encouraged to give examples to explain their answers further to the follow-up questions.

This framework recognizes earlier calls for greater use of qualitative analyses of cultures and the proposed blend of quantitative and qualitative methods (Ofori and Toor, 2009). It considers an identified set of possible influences combined with giving freedom to respondents to explain and justify their opinions and to study their perspective in depth. In order to account for language issues and region specific difficulties regarding research methodologies (Loosemore, 1999; Oney-Yazici et al., 2007) as well as the sensitivity of the research question, the interviews were to be conducted by interviewers of the same cultural background.

In order to develop an adequate questionnaire as a basis for personal in depth interviews, a focus group meeting with a senior project manager from one of the GCC countries with intercultural experience was arranged. Interview questions used in previous studies (Chan and Tse, 2003; Chen, 2006; Tone, 2005) were discussed, summarized and composed into the following questionnaire. In order to ensure full understanding of the questions, they were also translated into Arabic. Some questions were not purely culture related since cross-cultural research in construction should cover a wider range of topics (Ofori and Toor, 2009) and the research question here addresses the perceived *general* influence of Western project parties.

Table 1. Interview Questions

	How did Western project parties influence the following aspects of managing your projects?
Q1	Team-spirit (cooperation between project parties):
Q2	Leading the project:
Q3	Solving problems:
Q4	Communication with local project parties:
Q5	Trust between project parties:
Q6	Interpretation of contracts:
Q7	Product quality:
Q8	Solving disputes:
Q9	Integrity and ethics:
Q10	Relationships between project parties:
Q11	Dealing with project risks:
Q12	Status differences within the project organization:
Q13	Motivation of project parties:
Q14	Our traditional values:
Q15	My position as project manager:
Q16	Decision-making:
Q17	Use of appropriate technology:
Q18	Project planning:
Q19	Of the 18 aspects shown above, which are the 5 most influential on project success?

For the interviews, construction project managers who fulfilled the following requirements were randomly selected.

- at least five years professional experience as project manager;
- at least one managed project which included direct exposure to Western project parties (contractors, consultants, or other project parties);
- Arab nationality and at least 15 years residency in the GCC countries.

During the interviews, the interviewees were asked to evaluate the perceived Western influence on a Likert-type scale:

- very negative
- negative
- no influence
- positive
- very positive.

Alternative techniques, such as Fuzzy AHP or ranking techniques, have not been found effective since they would have required significantly more time from the respondents and would have added complexity to the evaluation task, hence, would have further complicated the region specific difficulties in carrying out research (Loosemore, 1999; Oney-Yazici et al., 2007). The answers to principal and follow-up questions and additional notes of interview observations were recorded. In addition, the number of years experience in project management, number of years of living abroad, number of years of working as project manager abroad, and the highest level of qualification were recorded.

RESEARCH FINDINGS

For the data analysis, the three most significant influence areas (aspects) of each influence type (*very positive* to *very negative*) – the top 3 – were selected for further qualitative analysis and discussion. The qualitative analysis is based on the reasons the interviewees gave for their perspectives. Most of the other influence areas may have been affected disproportionately highly by extra-ordinary individual experiences and therefore, may not be representative.

As can be seen from Table 2, the top 3 (top 2 for *very negative* influence) of each influence type are as follows:

Very positive influence:

- Project Planning
- Use of appropriate technology
- Team-spirit

Positive influence:

- Motivation of project parties

- Relationships between project parties
- Communication with local project parties

Neutral influence:
- Traditional values
- Status differences within the project organization
- Interpretation of contracts

Negative influence:
- Status differences within the project organization
- Trust between project parties
- Communication with local project parties

Very negative influence:
- Interpretation of contracts, solving disputes (each 2% of respondents)
- Status differences within the project organization, motivation of project parties, project planning (each 1% of respondents)

Solving disputes (Q8) and contract interpretation (Q6) were seen as *very negatively* (VNG) influenced each by 2% of the respondents. The two respondents did not want to give a reason.

Table 2. Perceived Influence per influence type and influence area

Area:	Q1		Q2		Q3		Q4		Q5		Q6	
VP	44	46%	33	34%	33	34%	16	17%	31	32%	32	33%
P	47	49%	45	47%	48	50%	50	52%	41	43%	33	34%
N	1	1%	14	15%	9	9%	12	13%	10	10%	21	22%
NG	3	3%	3	3%	6	6%	14	15%	14	15%	8	8%
VNG	0	0%	1	1%	0	0%	0	0%	0	0%	2	2%
Q19:	67	14%	36	8%	34	7%	15	3%	20	4%	14	3%
Area cont.:	Q7		Q8		Q9		Q10		Q11		Q12	
VP	43	45%	15	16%	32	33%	28	29%	29	30%	6	6%
P	39	41%	48	50%	41	43%	53	55%	47	49%	24	25%
N	10	10%	17	18%	20	21%	13	14%	13	14%	39	41%
NG	4	4%	11	11%	3	3%	2	2%	5	5%	19	20%
VNG	0	0%	2	2%	0	0%	0	0%	0	0%	1	1%
Q19:	38	8%	12	3%	22	5%	67	14%	34	7%	1	0%
Area cont.:	Q13		Q14		Q15		Q16		Q17		Q18	
VP	23	24%	11	11%	39	41%	37	39%	51	53%	53	55%
P	62	65%	25	26%	41	43%	44	46%	39	41%	30	31%
N	6	6%	47	49%	12	13%	13	14%	5	5%	10	10%
NG	4	4%	11	11%	2	2%	2	2%	1	1%	2	2%
VNG	1	1%	0	0%	0	0%	0	0%	0	0%	1	1%
Q19:	14	3%	2	0%	7	1%	45	9%	26	5%	72	15%

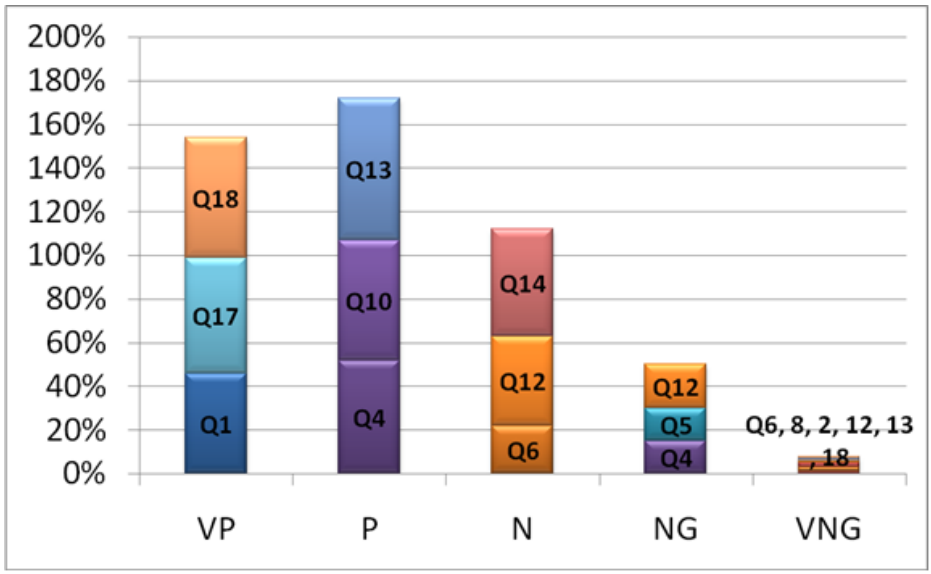


Figure 1. Top 3 influence areas per influence type.

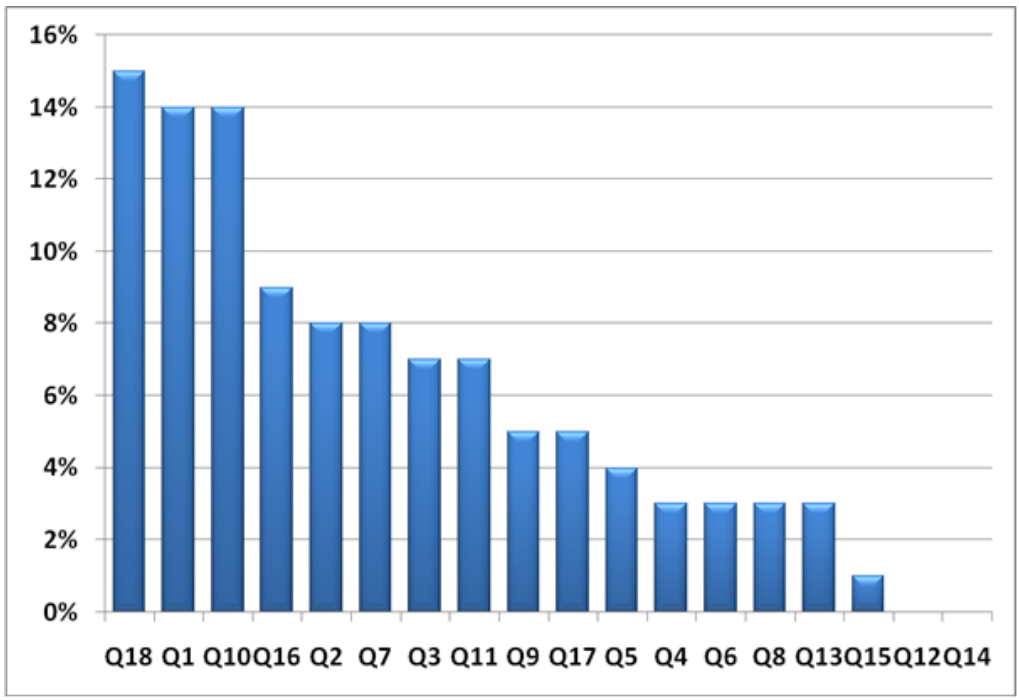


Figure 2. Belonging to the 5 most influential influence areas.

Project leadership (Q2), status differences (Q12), motivation (Q13), and project planning (Q18) were all seen *very negatively* influenced each by 1% of the respondents, but no clear reasons were given and it seemed that the question was not clearly understood. Consequently, these influence areas are excluded from further discussion.

With question 19, the interviewees were asked to list the five most influential areas for project success out of the previously categorized 18 influence areas. Since they had to interact with each of these areas while determining the perceived influence, they had a sufficient overview of the influence areas for the determination of the five most influential areas. Figure 2 illustrates the result.

It has been stated that, when using Likert-type scales, it is imperative to calculate and report Cronbach's alpha coefficient (Cronbach, 1951) for internal consistency reliability for any scales or subscales one may be using (Gliem and Gliem, 2003). Therefore, the results from the first 18 questions of Table 1 were analysed for internal consistency using in-house software developed from Freedman et al. (2007) and Venables and Smith (2010) with the results shown in Table 3.

Table 3. Internal Consistency Reliability

Statistics for Scale		*N* *18*	*Mean* *56.1146*	*Variance* *41.3202*	*SD* *6.4281*	
	Mean	*Minimum*	*Maximum*	*Range*	*Max/Min*	*Variance*
Item Means	3.1174	2.5729	3.6458	1.0729	1.4170	0.1232
Item Variances	1.4757	0.7238	2.1974	1.4736	3.0359	0.1325
Inter-Item Correlations	0.3238	0.08456	0.5956	0.5110	7.0435	0.0187
Reliability Coefficient			Alpha 0.8960			

First is given the 'Statistics for Scale' which are summary statistics for the 18 items comprising the scale. The summated scores can range from a low of 18 to a high of 90. Next presented is the 'Item Means' and 'Item Variances' which are summary statistics for the eight individual item means and variances respectively. The 'Inter-Item Correlations' are descriptive information about the correlation of each item with the sum of all remaining items. In the example in Table 3 there are 18 correlations computed: the correlation between the first item and the sum of the other seventeen items, the correlation between the second item and the sum of the other seventeen items, and so forth. The Cronbach's alpha is also reported in Table 3, which was calculated using the formula

$$\alpha = N.\bar{c}(1+(N-1).\bar{c}),$$

where N is the number of items considered and $\bar{c}$ is the mean of the inter-item correlations. Using the scale developed by George and Mallery (2003), it can be seen that the value obtained can be classed just short of excellent. It should be noted that while a high value for Cronbach's alpha indicates good internal consistency of the items in the scale, it does not mean that the scale is one-dimensional (Gliem and Gliem, 2003).

One might expect correlations between the significance of the influence areas (percentages) and other collected factors such as years of professional experience, number of years lived abroad, and project management experience abroad. However, this was not found to be the case. The product moment correlation coefficients obtained for professional experience versus each of the items of Table 3 were found to be less than 0.3, and for the number of years lived abroad they were less than 0.15, and hence both sets of results showing no correlation.

DISCUSSION

As stated earlier, the first purpose of this study was to find the host perception regarding the influence of Western project parties on project management in the GCC countries. Local Arab project managers of construction projects perceive a dominating *positive* influence which allows two principal interpretations. Either the interviewees tended for some reason beyond the scope of this study more towards a positive perception, or the influence is in fact perceived dominantly positively.

The second purpose was the identification of influence areas. Based on 18 potential influence areas, project planning, application of appropriate technology, team-spirit, motivation of project parties, relationships between project parties, communication with local project parties, status differences within the project organization and trust between project parties, were clearly identified as areas which are influenced by Western project parties.

The third purpose was the identification of the type of influence (very positive – very negative). Project Planning was seen as being *very positively* influenced by Western project parties by 55% of the respondents.

Interestingly, the respondents did not elaborate on how this influence takes place, but more than 80% of the respondents mentioned the importance of "project planning for project success". At the same time, Loosemore (1999) found that UK nationals might frustrate Arabs by spending too much time in the planning stage of a project.

The aspect of appropriate technology followed closely and was seen *very positively* influenced by 53% of the respondents. The closeness to project planning can be explained with the widely used software packages for project planning. Respondents mentioned frequently the importance of appropriate technology for a successful project. Other respondents stated that "Westerners have the latest technology" or "we require this". This confirms the generally recognized technological advancement of predominantly Western cultures (Patai, 2002, 308-313). Team spirit was seen *very positively* influenced by 46%. A reason which was most commonly articulated was, "Westerners are committed". Others mentioned the importance of team spirit for project success.

The motivation on the project team was seen *positively* influenced by Western project parties by 65% of the respondents. Asked for the reason, most respondents mentioned its importance for project success.

Others explained how Western project parties increase motivation through financial incentives such as bonuses and salary rises. A few respondents mentioned that aspects such as motivation, team spirit, work ethics, and contract agreements are very important. Relationships among the involved project parties were seen *positively* influenced by 55% of the respondents. Again, the importance of this aspect for project success was mentioned by

more than 50% of the respondents. Another frequently mentioned reason was along the line, "Westerners are helpful, objective, experienced, ensure sufficient communication". Communication with local project parties was seen *positively* influenced by 52% of the respondents.

Next to the common remark related to the importance for project success, some stated that, "Westerners are clear, precise, project oriented". However, around 15% of the respondents mentioned that there is no specific cultural way of communication when it comes to Westerners. However, it is important not to ignore that there *are* potential communication problems between Westerners and Arabs in the Arabian Gulf region (Loosemore, 1999). It is noteworthy that the fourth and fifth most frequent aspects are following closely with 49% (team spirit) and 31% (project planning) which were both among the three most frequent aspects seen as *very positively* influenced.

Traditional values, status differences and contract interpretations were seen as *uninfluenced*. The majority of respondents remarked that traditional values "have nothing to do with project management" whereas around 15% of the respondents mentioned that traditional values "should be observed". This result is very interesting since other investigations (Dadfar and Gustavsson, 1992; Low and Chi, 2001; Dulaimi, 2007) revealed a high importance of traditional norms and values for intercultural project management.

Status differences were seen *negatively* influenced by 20% of the respondents. Some remarked that "a contract should clarify status". Communication with local project parties was seen *negatively influenced* by 15% of the respondents.

The given reasons were not clear and seemed to be based on an extraordinary *negative* experience. It is noteworthy that a larger portion of respondents (52%) saw this aspect *positively* influenced by Western project parties. Trust was seen *negatively* influenced by 15% of the respondents. Again, the given reasons were not very clear and pointed towards negative experiences with Westerners related to trust. Some mentioned that "trust is there, but you need to make sure". This result could also be interpreted in light of the previously articulated Western preference for contracts. However, most respondents see a more *positive* influence on trust (*very positive*: 32%, *positive*: 43%).

The fourth purpose of this study was to identify the importance of the identified influence types. Project planning, team spirit, and relationship between project parties were most frequently considered to belong to the five most influential areas. The first two were also considered to be *very positively* influenced by Western project parties. This means Western project parties are considered to have a high influence on project success. However, appropriate technology, which was perceived as *very positively* influenced by Western project parties as well, was only perceived by 5% of the interviewees as being among the five most influential aspects for project success.

At the same time, the relationship between project parties was perceived as being among the five most influential aspects for project success by 14% of the interviewees. Furthermore, it was one of the top 3 *positively* influenced perceived influence areas. This seems to confirm the mentioned low individualism index in comparison with Western national cultures (Hofstede, 1980). Relationships among the involved project parties are more important for local construction project managers than for Western project parties and are considered essential for project success.

PRACTICAL IMPLICATIONS

The previous discussion leads to the following implications for Western project parties if they plan to be involved in construction projects in the GCC countries.

First, if Western project parties are involved in project planning, they are expected to exert an active and positive influence on the entire project management of the project. Therefore, Western project parties need to assign more human resources to project planning than they would normally do in Western countries. Alternatively, responsibilities should be discussed in greater detail before a contract is signed.

Second, the local perception that team spirit, motivation, relationships, and communication with local construction project managers are positively influenced creates high expectations by local construction project managers, especially, if they had previous experience with Western project parties which confirmed this perspective. Western project parties should assign staff to projects in the GCC countries which is known for high social competence, professional communication skills, and intercultural competence.

Third, the influence on aspects such as trust, leadership, contract interpretation, solving disputes, and status difference was seen more negatively. Involved Western project parties need to be aware that a contract in the GCC countries may be more similar to an "agreed upon possibility" than a "fixed law", personal relationships are clearly more important than written agreements, and the status differences on the project team have to be accepted - independent of personal knowledge and skills. Disputes may be solved more effectively by involving a mediator than commissioning a lawyer.

CONCLUSION

Local construction project managers perceive a dominating positive influence of Western project parties on construction project management in the GCC countries. A *very positive* influence was identified regarding project planning, application of appropriate technology and team-spirit. The influence on motivation of project parties, relationships between project parties and communication with local project parties was perceived as *positive*, whereas status differences within the project organization and trust between project parties was perceived as *negatively* influenced. Furthermore, project planning, team spirit, and relationship between project parties were most frequently considered to belong to the areas which are strongest influenced by Western project parties.

It has been derived that Western project parties need to assign more human resources to project planning and that defining responsibilities requires more coordination than for comparable projects in the West. Furthermore, the assignment of staff should be limited to staff with high social competence, professional communication skills and intercultural competence. Personal relationships with representatives of the GCC host party need to be considered more important than written agreements and personal knowledge.

Further research is recommended and should consider the tendency of interviewees in the Middle East to provide answers which are perceived as more favourable (Hamady 1960). The construct validity of the research presented here might be limited since evaluation of individual perceptions is a difficult concept which can only be captured with subjective measurement instruments. Furthermore, analysing the perception of the local project manager

and, in addition, the perception of the representative of the Western project party on the same project, could lead to more specific results. Finally, case studies, based on additional information resources such as meeting minutes and written correspondence, would allow further insight.

REFERENCES

Bouchara, A. (2002). *Höflichkeitsformen in der Interaktion zwischen Deutschen und Arabern—Ein Beitrag zur interkulturellen Kommunikation* [forms of courtesy in the interaction between Germans and Arabs – a contribution to intercultural communication]. Reihe Germanistische Linguistik, 235. Tübingen: Max Niemeyer Verlag.

Bröchner, J.B., and Björk, B. (2008). Where to submit? Journal choice by construction management authors. *Construction Management and Economics, 26* (7), 739-749.

Chan, E.H.W., and Tse, R.Y.C. (2003). Cultural considerations in international construction contracts. *Journal of Construction Engineering and Management, 129* (4), 375-381.

Chen, C. (2006). *Entry strategies for international construction markets*. Ph.D. thesis, The Pennsylvania State University, UMI Number 3202480. Ann Arbor, MI: ProQuest Information and Learning Company.

Chen, P., and Partington, D. (2004). An interpretive comparison of Chinese and Western conceptions of relationships in construction management work. *International Journal of Project Management, 22* (5), 397-406.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16* (3), 297-334.

Dadfar, H., and Gustavsson, P. (1992). Competition by effective management of cultural diversity. *International Studies of Management and Organization, 22* (4), 81-92.

Den Hartog, D.N., House, R.J., Hanges, P.J., and Ruiz-Quintanilla, S.A. (1999). Cultural specific and cross-culturally generalizable implicit leadership theories: Are attributes of charismatic/transformational leadership universally endorsed? *The Leadership Quarterly, 10* (2), 219-256.

Dulaimi, M.F. (2007). Case studies on knowledge sharing across cultural boundaries. *Engineering, Construction and Architectural Management, 14* (6), 550-567.

Ellaboudy, S. (2010). The global financial crisis: Economic impact on GCC countries and policy implications. *International Research Journal of Finance and Economics, 41*, 180-193.

Freedman, D., Pisoni, R., and Purves, R. (2007). *Statistics* (4th ed.), New York: W.W. Norton and Company.

George, D., and Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. 11.0 update (4th ed). Boston: Allyn and Bacon.

Glaser, B.G., and Strauss, A.L. (1967). *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine.

Gliem, J.A., and Gliem, R.R. (2003). Calculating, interpreting, and reporting Cronbach's Alpha reliability coefficient for Likert-type scales, *Proceedings of Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education*, 8-10 October, Columbus, OH.

Hamady, S. (1960). *Temperament and character of the Arabs*. New York: Twayne Publishers.

Hofstede, G. (1980). *Cultural consequences: International differences in work-related values*. Beverly Hills, CA: Sage Publications (retrieved 12 April 2010 from: http://www.clearlycultural.com/geert-hofstede-cultural-dimensions/power-distance-index/).

Hofstede, G. (1984). Culture's consequences: International differences in work-related values. Beverley Hills, CA: Sage.

Hofstede, G., and Hofstede, G. J. (2005). *Cultures and organizations: Software of the mind* (2nd ed.), New York: McGraw-Hill.

IMF (2010). *International Monetary Fund, World economic outlook database,* October 2010. (retrieved 29 January 2011, from http://www.imf.org/external/pubs/ft/weo/2010/02/weodata/index.aspx)

Javernick-Will, A., and Levitt, R. (2009). Acquiring local knowledge for international projects. *Proceedings of the ASCE Construction Research Congress*, April 2009, Seattle, WA.

Ling, F.Y.Y., and Lim, S.S.Y. (2006). Cross-cultural encounters when managing projects in China. In F. Dulaimi (Ed.), *Proceedings of The Joint International Conference on Construction Culture, Innovation and Management (CCIM, pp. 105-106)*, 26-29 November, Dubai, UAE.

Loosemore, M., and Al-Muslmani, H.S. (1999). Construction project management in the Persian Gulf: Inter-cultural communication. *International Journal of Project Management, 17* (2), 95-100.

Loosemore, M. (1999). International construction management research: cultural sensitivity in methodological design. *Construction Management and Economics, 17* (5), 553-561.

Low, S.P., and Shi, Y. (2001). Cultural Influences on Organizational Processes in International Projects: Two Case Studies. *Work Study, 50* (6/7), 276-285.

Low, S.P., and Leong, C.H.Y. (2000). Cross-cultural project management for international construction in China. *International Journal of Project Management, 18* (5), 307-316.

McCaffer, R., and Edum-Fotwe, F.T. (2000). Developing project management competency: Perspectives from the construction industry. *International Journal of Project Management, 18* (2), 111-124.

Merriam-Webster. (2010). An Encyclopaedia Britannica Company. Online Dictionary. (Retrieved 27 January 2011 from http://www.merriam-webster.com).

Moghaddam, F.M., Taylor, D.M., and Wright, S.C. (1993). *Social Psychology in Cross-Cultural Perspective*. New York: W.W. Freeman and Company.

Nicholson, T. (2007). Expansion of Market Spurs Firms to Adopt Coherent Global Approach. *ENR: Engineering News-Record, 259* (23), 58-61.

Ofori, G., and Toor, S. (2009). Research on cross-cultural leadership and management in construction: a review and directions for future research. *Construction Management and Economics, 27* (2), 119-133.

Oney-Yazici, E., Giritli, H., Topcu-Oraz, G., and Acar, E. (2007). Organizational culture: The case of Turkish construction industry. *Engineering, Construction and Architectural Management, 14* (6), 519-531.

Patai, R. (2002). *The Arab Mind*. New York: Hatherleigh Press.

Pronin, E. (2008). How we see ourselves and how we see others. *Science, 320* (5880), 1177-1180.

Rabbat, O., and Harris, R.B. (1982). Managing Employee Conflict in the Middle East. *Journal of the Construction Division, 108* (2), 219-225.

Srivastava, S., Guglielmo, S., and Beer, J.S. (2010). Perceiving others' personalities: examining the dimensionality assumed similarity to the self, and stability of perceiver effects. *Journal of Personality and Social Psychology, 98* (3), 520-534.

Tone, K. (2005). *Talking Past Each Other: The Impact of Cross-Cultural Communication on Construction Project Management in Samoa*. PH.D. Thesis, Queensland University of Technology, School of Urban Development, Faculty of Built Environment and Engineering.

Toor, S.R., and Ogunlana, S.O. (2008). Leadership skills and competencies for cross-cultural construction projects. *International Journal of Human Resources Development and Management, 8* (3), 192-215.

Venables, W., and Smith, D.M. (2010). *Notes on R: A Programming Environment for Data Analysis and Graphics*, R-Project, University of Adelaide.

Zhang, S., and Liang, X. (2008). Culture studies in international construction contracting: an overview. *Proceedings of the International Conference on Multi-National Construction Projects*, CIB (International Council for Research and Innovation in Building and Construction), 21-23 November, Shanghai, China.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 6

A DESCRIPTIVE ANALYSIS OF PROJECT MANAGEMENT PLANNING PRACTICES FOR RENOVATION OF HISTORICAL BUILDINGS IN URBAN CONTEXTS LOCATED IN TEXAS

Edelmiro F. Escamilla*
Texas A&M University, College Station TX, US

ABSTRACT

This paper describes the descriptive analysis results that focused on the perceptions of the relationship between Project Management Planning (PMP) practices and project success for preservation projects of historical significance located in an urban context. The planning for these projects was also emphasized because these historic buildings are recognized by the National Register of Historic Places. The project team members' perceptions of PMP practices and how these practices affect project success were the focus of this research. The findings indicate a significant disconnect between the perceptions of project success and actual performance of project delivery.

Keywords: Success criteria, project management, success and strategy, stakeholders

INTRODUCTION

This study attempts to ascertain the relationship between Project Management Planning (PMP) and project success for preservation projects of historical significance located in an urban context. One would assume that delivering the project on time and under budget are the most critical influences to ensuring project success. Yet a multitude of studies have shown an eclectic collection of solutions to the project success puzzle (Nguyen, Ogunlana, and Lan,

* Edelmiro F. Escamilla, Ph.D. Assistant Professor, Langford Bldg A, 437. Department of Construction Science, College of Architecture, Texas A&M University. College Station, TX 77843-3137. E-mail: eescamilla@arch.tamu.edu. Tel. (979)-845-4226. Fax. (979)-862-1572.

2004; Sanvido, Grobler, Parfitt, Guvenis, and Coyle, 1992; Chan and Chan, 2004, Chan, Scott, and Chan, 2004; Atkinson, 1999). The primary outcome of this study was to identify success criteria variables (budget, time, performance, and satisfaction) that significantly affect project success. A matrix of project management practices categorized as success factor variables was developed from the results of this study.

Building projects are becoming more complex and owners expect their projects to be delivered as fast as possible, while maintaining a high level of quality. This requires the project manager to pay particular attention to the criteria affecting the success of a construction project. The literature review served to identify the criteria variables budget, time, performance, and satisfaction as indicators of project success. According to several studies (Baker, Murphy, and Fisher, 1983; Atkinson, 1999), cost, time, and quality are success criteria often referred to as the "Iron Triangle." Pinto and Slevin (1988) advocated that measures for project success should also include project psychosocial outcomes that refer to the satisfaction of interpersonal relations with project team members; they also suggested the inclusion of satisfaction as a measure of success.

The planning problem is certainly complicated when the construction is being carried out on a historic building, such as Texas courthouses, that are recognized by the National Register of Historic Places (NRHP, 2010).

According to the Texas Historic Commission (THC) (THC, 2010a), the complexity of preserving such urban historically significant buildings led to House Bill 1341 legislation, which is also known as the Texas Historic Courthouse Preservation Program (THCPP) (THC, 2010b). The historical significance of these courthouses played a crucial part in undertaking this study.

These buildings serve as a testament to the historical fabric of the area where they are located. Contractors doing the work are held to the Secretary of Interior's Standards for Rehabilitation of Historic Properties as a guideline to keep the integrity of the building materials and craftsmanship (Grimmer and Weeks, 1995). Yet the significance of these important buildings had little impact on the actual delivery of these projects. The results of the actual data indicated overages in cost and time, which in turn led to performance issues and overall dissatisfaction.

Research for the current study revealed that protecting these unique historic structures involves increased risks because of the nature of preservation work. Uncertainties regarding actual project site information are common during the design and construction phase of the project. Information available to project team members may not reflect the true condition of the courthouse projects.

Based on these discoveries, the current research study focused on examining the delivery of preservation projects of Texas courthouses and how the application of PMP practices during the construction phase of the projects influenced the success of the project.

This study focuses on the following research questions.

1. What are the project team members‟ perceptions of PMP practices?
2. How do these PMP practices affect project success?

Following the literature review, a conceptual model was developed to illustrate the relationships between the indicators of project success and the PMP. This relationship is the basis for the research hypotheses. The general hypothesis includes the practical and theoretical assumptions that there is a relationship between the PMP and project success. The relationship between PMP and project success was tested in two different measures: actual project success data and perception of project success.

BACKGROUND

Numerous studies about the construction industry have investigated the performance of project management plans (PMP) (Caron, Marchet, and Perego, 1998; Borges da Silva and Cardoso, 1999; Fei, Weijian, Lihua, and Juwei, 2008). Others investigated the various factors that influence the successful delivery of a project (Belassi and Tukel, 1996; Chan, Scott, and Chan, 2004; Parfitt and Sanvido, 1993). However, there are no current investigational studies on the relationship of PMP practices and project success for historic renovations. Though there are many different approaches to project planning, research has shown there remains a misconception of how historic preservation and facility management practices affect the project planning process. Some studies (Friedman and Oppenheimer, 1997; O'Donnell, 2004) indicated that it is difficult to make refurbished buildings meet current sustainability standards, which appears to support the perception that old, inefficient, and out-of-fashion buildings need to be replaced with new construction regardless of condition or life expectancy. Other studies maintained that the debate concerning sustainable development raised the importance of the building stock as economic, social, and cultural capital that should not be wasted (Curwell and Cooper, 1998; Kohler and Hassler, 2002; Myers and Wyatt, 2004). Renovations of historic building projects are complex and owners expect their projects to be completed as fast as possible, while still maintaining a high level of quality. In some cases, owners may require that buildings continue to function during renovation. These critical constraints require project managers to pay particular attention to the criteria that affect project success.

To establish a framework for this study, a literature review was conducted on the current academic and professional research related to PMP practices for preservation of a historically significant building. This was accomplished by dividing the literature review into four major sections. The first section focuses on issues of historic preservation planning related to the target buildings of this study. The second section investigated facility management practices related to project success. The third section investigated the project management planning and development of the PMP deliverables used during the bidding and construction phases. The fourth section defined the success criteria indices (SCI) that affected the project outcomes.

Historic Preservation Planning

Historic preservation projects generate more than $1.4 billion of economic activity each year, and support almost 41,000 Texas jobs (THC, 1999). In an online article titled *The Future of the Past*, Hosey (2009) stated that a 2005 Brookings Institution report predicted that

by 2030, half of the buildings in the U.S. will have been constructed after 2000. This means half of the buildings that were built in the last few decades will equal the entire remains of the previous two centuries. This prediction demonstrates the importance of improving the project delivery process for preservation of existing historic buildings. Historical structures serve an important role to the fabric of the communities in which they are located.

Many historic structures represent the highest architectural achievements of their period when they were built. Others reveal extraordinary construction technologies and craftsmanship, while some are significant because they represent a vernacular building type. Many provide a unique perspective on important people and events in history (Swanke, 2000). Look (2004) stated that cultural resources are unique, non-renewable, and irreplaceable. Once a resource is gone, it is gone forever. Our cultural resources are most vulnerable during construction for a variety of reasons. According to Look, the risk of damage is very high for historical projects, issues including natural disasters, human attitude, and human harm. Typically with every preservation project, the project team members follow the guidelines established by the Secretary of the Interior's *Standards for Rehabilitation* (36 CFR 67) (Grimmer and Weeks, 1995). In 1999, at the urging of Governor George W. Bush, the Texas Legislature created the Texas Historic Courthouse Preservation Program through House Bill 1341 (THC, 2010b). As a result, the Texas Historical Commission was given review authority over changes or alterations proposed by the counties for the preservation of their courthouses. These buildings display some of the finest examples of 19th and early 20th century architecture in the United States. Texas was the first state to introduce legislation to protect and preserve its courthouses.

Facility Management Practices

Though this study focused on the preservation of an existing historic building, other studies show that other terms used to define preservation work have similar meaning and those are discussed in this section. For example, facility management studies in the UK referred to the upgrade, major repairs work, renovation, alterations, conversions, extensions, and modernization of existing buildings, but excluded routine maintenance and cleaning work as refurbishment (Quah, 1991). One of the major problems identified in managing refurbishment projects is that the fragmented and uncertain condition of existing buildings limits the availability of design information. Therefore, any decisions made at the early stage of design may have a major influence on the overall performance of the project delivery (Ali, Rahmat, and Hassan, 2008).

Project management practices implemented during the project construction phase. New and renovation construction projects are usually done by a newly created team of professionals. This presents the client with a number of challenges, implementing relationship management, managing contractor performance, ensuring delivery, obtaining value for money, and controlling costs. Fundamentally, project delivery systems define the roles and responsibilities of the parties involved in a project. They also establish an execution framework in terms of sequence of design, procurement, and construction (Oyetunji and Anderson, 2006).

Project Management Planning

As mentioned previously, the complexity of preservation work of historic buildings tends to be less well-planned and more difficult to control than the construction of new buildings (Egbu, 1999). Therefore, development of a PMP is essential to help control activities during a project. Contractors are well aware of their special role and are legally bound to deliver a quality project on time and within cost; their commercial survival depends on their continuing performance in the market place. Thus, it may be anticipated that contractors will use all available managerial skills, including current planning techniques, to plan and monitor their projects (Cole, 1991).

Numerous studies have focused on ways to improve the construction planning process. Dawson and Dawson (1998) attempted to define the duration and sequencing of construction activities by optimizing the scheduling problem. Chan and Kumaraswamy (2002) developed a prediction model for construction time that combines historic data and factors that affect the project duration. Some studies focused on project planning for preservation work, which was especially pertinent to the current study. These studies pointed out the complexities of dealing with existing structures, usually located in an urban context (Robson, 1999; Feilden, 2003; Mitropoulos and Howell, 2002) to prevent design rework.

Defining the Project Planning Success Criteria Indices (SCI)

The concept of project success was developed to set criteria and standards to help guide project managers in completing projects with the most favorable outcomes (Chan and Chan, 2004). These standards require project managers to pay particular attention to the criteria that affect the success of a construction project. Researchers (Baccarini, 1999; Hatush and Skitmore, 1997; Nguyen et al., 2004) have defined project success as occurring when a project meets time, cost, and quality objectives and satisfies the stakeholders. Furthermore, a project is considered an overall success if it meets the technical performance specification or mission to be performed (De Wit, 1988). A high level of satisfaction concerning the project's outcome included meeting budget, schedule, quality of workmanship, client and project manager's satisfaction, transfer of technology, friendliness of environment, and health and safety in their definition of project success (Kumaraswamy and Thorpe, 1996).

Though there has been documented consensus on the success criteria of a construction project, recent research indicated that there has been little agreement on the causal factors of project success (Pinto and Slevin, 1987; Belassi and Tukel, 1996; Chan et al., 2004). Several studies have attempted to express the varied approaches to develop the project manager's planning for success. Sayles and Chandler (1971) looked at the project manager's competence, scheduling, monitoring, and feedback. Cleland and King (1983) focused on financial support, logistics requirements, facility support, project schedule, and acquisition as the success factors. Baker et al. (1983) studied the on-site project manager, adequate funding to completion, accurate initial cost estimates, minimum start-up difficulties, and planning and control techniques. Locke (1984) focused on appointing a competent project manager, setup communications and procedures, setup control mechanisms, and progress meetings. Pinto and Slevin (1989) developed a success factor list that included monitoring and feedback, communication, and characteristics of the project team leader.

According to one study, a major reason for not having an agreement on the causal factors of project success is the widespread assumption that a universal theory of project management can be applied to all types of projects (Dvir, et al, 1998). The search for a universal theory may be inappropriate given the fundamental differences that exist across projects and innovations (Dewar and Dutton, 1986; Pinto and Slevin, 1989; Damanpour, 1991; Shenhar, 1993; Shenhar and Dvir, 1996). Therefore, the concept of project success has remained ambiguously defined both in the project management literature as well as within the psyches of project managers (Pinto and Slevin, 1988). Therefore, the current study will focus on the success criteria of budget, time, performance, and satisfaction.

RESEARCH METHODS

The study was conducted focusing on independent variables affecting the project success identified as budget, time, performance, and satisfaction. In addition, this study examines completed renovation projects of the same building type (courthouses) that were built in the same state (Texas) and were renovated during the same decade (2000-2010). This was done in two phases. Phase I included analysis of the completion reports for the 37 cases. Phase II included administering a survey to the project team members (THC reviewers, architects, and contractors) and analysis of the results.

Research Design

Phase I

Quantitative methodology in the form of analysis of 37 cases was used to investigate the relationship between estimated project data vs. actual project data by using project performance metrics (budget growth, time growth). The analysis of the cases was limited to a single setting, utilizing data from the THCPP completion reports. The analysis of the cases methodology was used to build theory and find factors that may impact the phenomenon being studied (Meredith, 1998).

Phase II

Qualitative methodology in the form of an online survey instrument that was administered to the project team members. The aim of this methodology was to investigate the impact of the project management planning practices (success criteria and success factors) on project success of Texas historic courthouse preservation projects.

Procedure

Phase I Procedure

The completion reports provided the name, address, and phone number of the project managers, owners, THC reviewers, and architects, so a telephone call was placed to update the contact information to include any information changes. In addition, the completion reports provided project status information such as; original contract, estimated schedule, substantial completion, and final pay application. The courthouses comprised the unit of

analysis for Phase II of this study. Completion reports were analyzed for each of the 37 courthouse projects and project team contact information was collected. In addition, data was collected on the performance of two success criteria variables (e.g. time and budget) (Gransberg, et al, 2003). The collected data, as well as the analysis of time and budget growth performance metrics, allowed the completed projects to be sorted and ranked from the smallest budget/time growth percentage to largest budget/time growth percentage of delivered courthouse preservation projects.

Phase II Procedure

An online questionnaire was administered to each of the project team members selected to participate in the study. This was done in order to collect data describing the current project management planning practices for those construction companies that worked on the THCPP. The prevailing reason for utilizing the online key informant questionnaire was the ease of having the project team members being able to complete the survey on their own time. Data was analyzed using descriptive statistics. The survey aim was to gain data on project team members‟ perceptions of PMP and how they relate to a successful project delivery.

Population of Interest and Sample Size

The THC received 133 master plans for preserving and maintaining historic county courthouses in Texas. Of those 133 plans, 122 were approved. According to the THC (2010a), the most recent information published listed 37 completed courthouse projects that have been rededicated prior to this study. The completed courthouse projects used for this study were required to submit a completion report to the THC as part of their closing documents. These documents were invaluable, providing much of the data needed for this study.

The potential sample size for the survey implementation stage included 75 potential project team members chosen from the 37 completed courthouse renovation projects. Of the 75 project team members, fourteen were construction project managers responsible for the renovation of the courthouses. Seventeen were architects responsible for the design and specifications of the courthouses preservation documents. Seven were THC project reviewers responsible for the inspection and adherence to the construction documents. Thirty-seven were the governing officials (Owners) representing the counties, including judges and owner representatives selected by the counties. There is a redundancy of project team members within the construction and architecture firms, as well as the THC project reviewers.

The goal of this study was to collect data from all the project team members associated with the completed renovation projects. However, this was not possible because of significant employment turnaround in the different project team groups. In addition, there were a large number of redundancies in regards to the repetition in the design and construction professionals. Thus, the total actual respondents of this study included ten owners, six THC reviewers, eight architects, and seven contractors.

Development of Survey Instrument

The experiment used a web-based survey (*www.surveymonkey.com*) in order to make it inclusive in recruiting subjects, inexpensive, controllable, and quickly analyzed (Solomon, 2001; Wyatt, 2000). The online survey instrument was developed from the project management planning list that was developed from the literature review. The web-based survey dramatically reduced the time needed for survey implementation. In addition, important elements such as questionnaire layout and design, navigation path simplicity, and coverage were followed during the survey design.

The question-building process was continually evaluated and revisions were incorporated at different stages of the survey design. The final survey questionnaire was designed to obtain information about the impact of the project management practices on project success. The design of the survey pursued two objectives, the reduction of non-response and the reduction or avoidance of measurement error (Dillman, 2000).

Composition of Questionnaire

The final questionnaire consisted of 19 questions. Table 1 lists each question in numeric order, describes which of the project management practices is being described, and summarizes the intent of each question. Questions 1 and 2 focused on identifying the respondents and the date the survey was completed. The information is confidential but serves as an agreement of consent. Each respondent was given a coded number that served as the only identifier in the matrix index. Questions 3 and 4 focused on establishing whether or not there was a project management plan in place during the project lifecycle.

Table 1. Project management plan practices included in questionnaire

Question	Success Criteria	
Number	PMP	Summary of Questions
1	Name	Consent Form
2	Date	Consent Form
3	PMP	Was there a PMP in place?
4	Success	Did the LMP contribute to the project success?
5	Budget	Did establishing the “Budget” lead to project success?
6	Time	Did establishing the project “Time” lead to project success?
7	Performance	Did establishing the project “Performance” lead to project success?
8	Satisfaction	Did establishing the project “Satisfaction” lead to project success?
9	Historical	Assessment of the building significance
10	Site Analysis	Was there a detailed site analysis done?
11	Site Layout/Staging	Was there a site layout/staging plan done and implemented?
12	Value Engineering	Was there an opportunity for value engineering?

Question	Success Criteria	
Number	PMP	Summary of Questions
13	Funding	Was there adequate funding throughout the project?
14	Scheduling	Were construction tasks clearly defined?
15	Communication/ Feedback	Was there communication and feedback readily available during the project lifecycle?
16	Decision Tracking	Were RFI and Change Order directives resolved quickly?
17	Quality Assurance	Was there a Quality Assurance in place?
18	Mock-ups/Samples	Were mock-ups and samples effective contributors in conveying design and construction intent?
19	Lessons Learned	Rank the success criteria for future projects having previous experience

The answers are based on a dichotomous set of Yes/No possible responses. For a number of questions, the answers were based on a four-point Likert scale used to measure the degree to which the project team member perceived the importance of the success criteria and project management practices.

Questions 5-8 consisted of four possible numeric responses, ranging from (4) strongly agree to (1) strongly disagree. This set of questions focused on establishing which of the four success criteria was most significant in the overall success of the courthouse renovation project. Similarly, questions 9-18 were based on a four-point Likert scale consisting of four possible numeric responses, ranging from (4) strongly agree to (1) strongly disagree. This set of questions focused on the project management practices developed from the finalized list of success criteria and the factors that impact project success developed in Phase I. Finally, question 19 was based on rank ordering the project team member's lessons learned preferences for future historic renovation work. The rank order consisted of four possible numeric levels, ranging from (1) most important to (4) least important.

FINDINGS

Descriptive Statistics

Summaries were drawn from the results depicted in the figures for each group of project team members. Each figure illustrates the perceptions of each independent project team group. Groups were asked the same questions about a diverse collection of project management practices. The survey questions focused on the project management practices used in planning for the success criteria variables.

Analysis of PMP Using Descriptive Statistics

In order to determine the perception of the owners, THC reviewers, architects, and contractors towards the PMP, responses to each of the questions associated with the PMP in the sample were collected and analyzed. From the survey questionnaire, two questions were specifically focused on the use and success of the PMP. This was done to establish the

understanding of what role the PMP had during the preservation process. Both dichotomous questions asked to give an answer of yes/no.

Question three (Q3) asked respondents to acknowledge if there was a PMP in place during the courthouse preservation project. Findings show that the observational respondents were closely divided in their answers if the PMP was in place (see Figure 1). As a result, 51.61% of the respondents believed that the PMP was not in place during the courthouse preservation projects. The invested respondents show similarities in their perceptions with the exception of the architects. Both the THC reviewers and contractors (69.23%) responded that "Yes" there was a PMP in place. Similar to the owners‟ responses, the architects‟ responses showed agreement that "No" PMP was in place during the courthouse preservation project. A possible explanation for the owners and architects responding "No" is their involvement in the construction process. Both were engaged in the design and served to evaluate the process but were not active in determining the methods used to plan the construction phases.

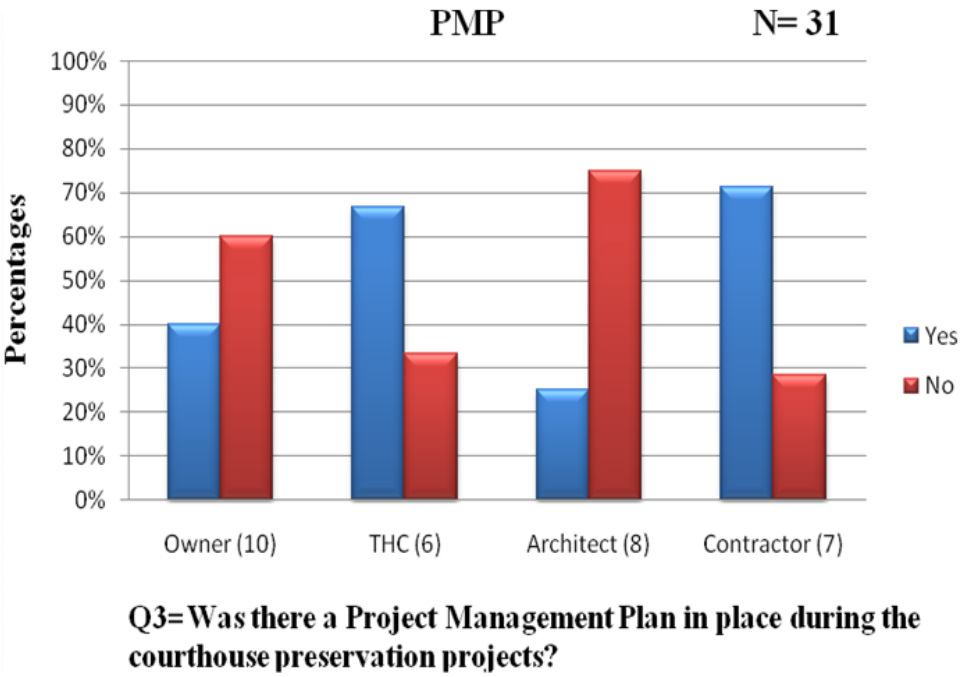


Figure 1. Results for PMP Question 3.

Question four (Q4) asked respondents to acknowledge if the PMP was a significant contributor to the courthouse preservation project success. This was the first question in the survey to introduce the topic of project success. The responses mirrored those of the previous question. The data reflected that if the respondent perceived that the PMP was in place during the construction phase, then it had a significant impact on the success of the project delivery (see Figure 2).

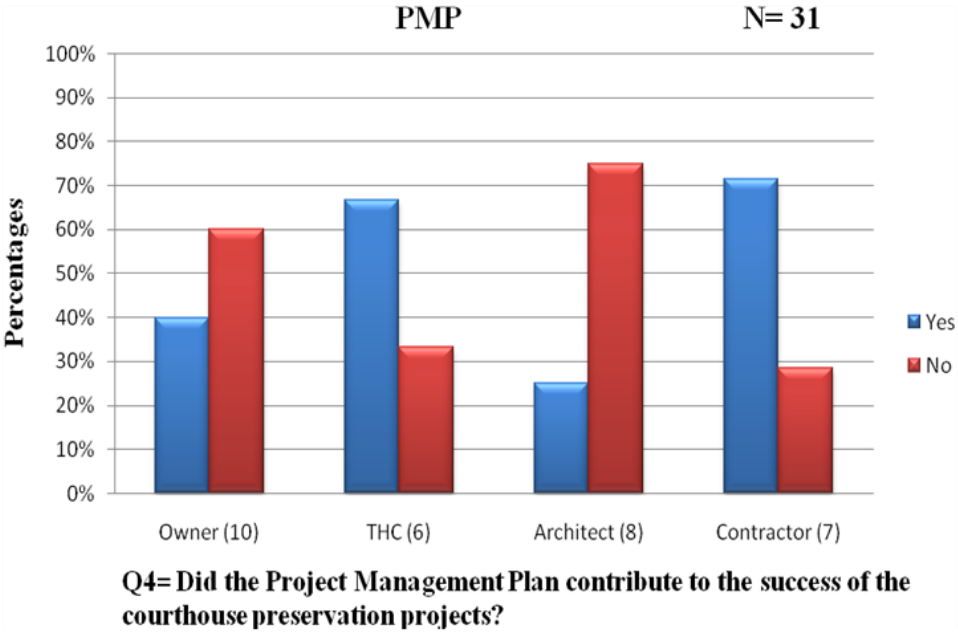


Figure 2. Results for PMP Question 4.

Conclusions for PMP-Descriptive Statistics

Conclusions were drawn from the compiled results for each of the project team member groups (THC reviewers, architects, and contractors). The individual figures presented in the previous section express the attitudes of each independent group. Each group was asked the same questions for the PMP: Q3 "Was there a Project Management Plan in place during the courthouse renovation?" and Q4 "Did the Project Management Plan contribute to the success of the courthouse renovation projects?"

The findings show that if it was perceived that a PMP was in place during the courthouse renovation, then the project team members believed that the PMP contributed to the success of the courthouse renovation project. The contractors and THC reviewers responded with "Yes" at a high rate followed by owners and architects.

Analysis of Success Criteria Variables Using Descriptive Statistics

To determine the perception of the contractors, architects, owners, and THC reviewers towards the Success Criteria Variables, responses to each of the questions associated with Success Criteria in the sample were collected and analyzed. From the survey questionnaire, four questions were specifically focused on the significance of the success criteria that led to the successful delivery of the courthouse preservation project.

All four Likert scale questions asked the respondent to answer strongly agree, agree, disagree, or strongly disagree. Questions 5 through 8 asked respondents to acknowledge if logistics management practices utilized to establish the Success Criteria Variables (e.g., Budget, Time, Performance, and Satisfaction) were the most significant criteria that led to an

overall successful courthouse preservation project. The descriptive statistical results are graphically represented in the following charts. These charts included four separate graphs, which illustrate the respondents' roles (e.g., Owner, THC, Architect, and Contractor).

Owners as observers (N=10) had similar assessments in their perceptions of the success criteria variables. As a result, planning for the budget was the highest ranked success criteria variable perceived by the owner to have had the highest impact on the success of the project (20.0% strongly agreed, 40.0% agreed).

Planning for performance ranked as the second most important (30.0% strongly agreed, 40.0% agreed). Planning for satisfaction ranked as the third most important (60.0% agreed). Planning for time was the success criteria variable that was perceived as being least developed during the courthouse preservation project (50.0% agreed). Figure 3 shows Owner responses.

THC reviewers as invested respondents (N=6) had similar assessments in their perceptions of the success criteria variables. As a result, planning for performance was the highest ranked success criteria variable that led to a successful courthouse preservation project (83.0% strongly agreed), followed by planning for satisfaction (17.0% strongly agreed, 50.0% agreed). Planning for budget was ranked third (50.0% agreed). Planning for time was perceived as the least developed success criteria (33.0% agreed). Figure 4 shows Texas Historical Commissions' responses.

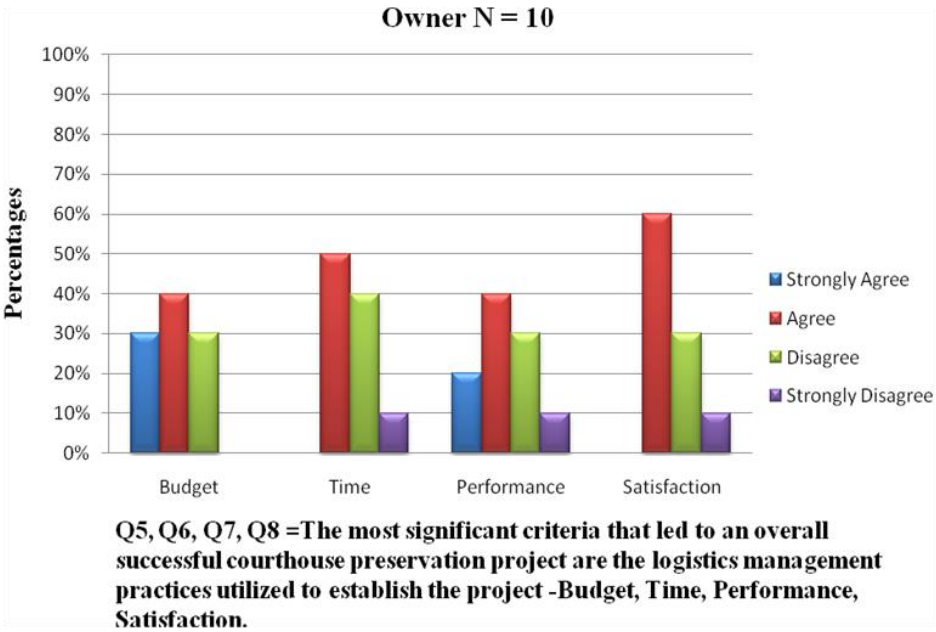


Figure 3. Descriptive analysis for owners and success criteria.

Architects as invested respondents (N=8) were similarly divided in their perceptions of success criteria variables. As a result, planning for performance was the most significant criteria that lead to an overall successful courthouse preservation project (38.0% strongly agreed, 13.0% agreed). Planning for satisfaction closely followed the performance criterion (25.0% strongly agreed, 25.0% agreed). Planning for the budget was next in rank order

(13.0% strongly agreed, 38.0% agreed), while planning for time was perceived to be less developed (13.0% strongly agreed, 25.0% agreed). Figure 5 shows Architects' responses.

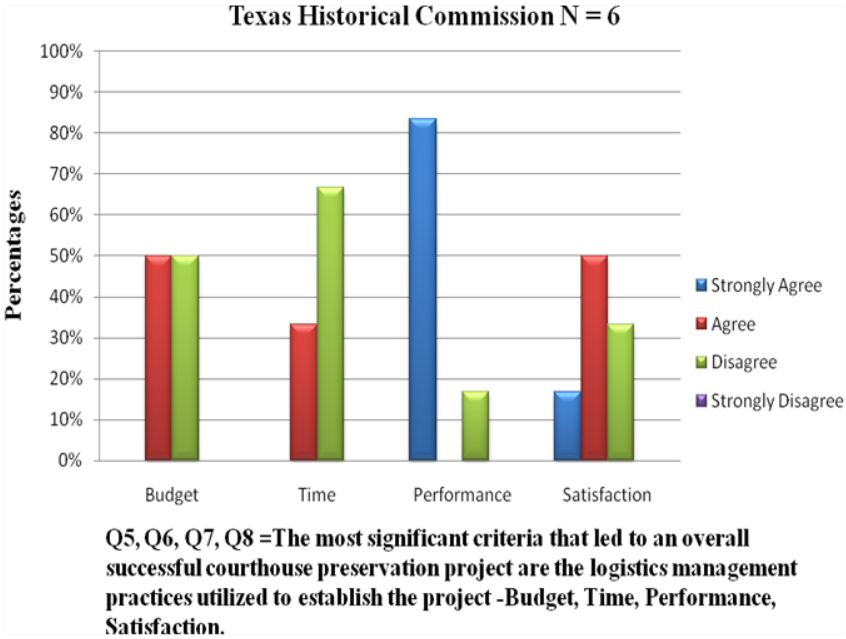


Figure 4. Descriptive analysis for THC reviewers and success criteria.

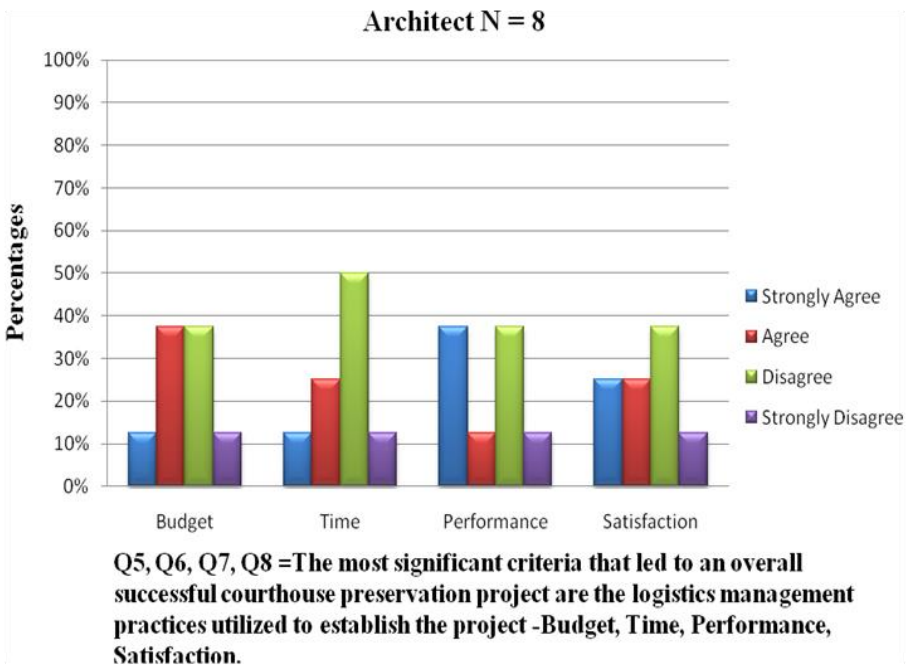


Figure 5. Descriptive analysis for architects and success criteria.

Contractors as invested respondents (N=7) were uniquely divided in their perceptions of success criteria variables. As a result, planning for satisfaction was the most significant criteria that led to an overall successful courthouse preservation project (29.0% strongly agreed, 43.0% agreed). Planning for performance closely followed (14.0% strongly agreed, 57.0% agreed). Planning for time was third in the order of success criteria (14.0% strongly agreed, 43.0% agreed), leaving planning for the budget as the criteria that was perceived as the least developed strategies that were used during the construction phase. Figure 6 shows Contractors' responses.

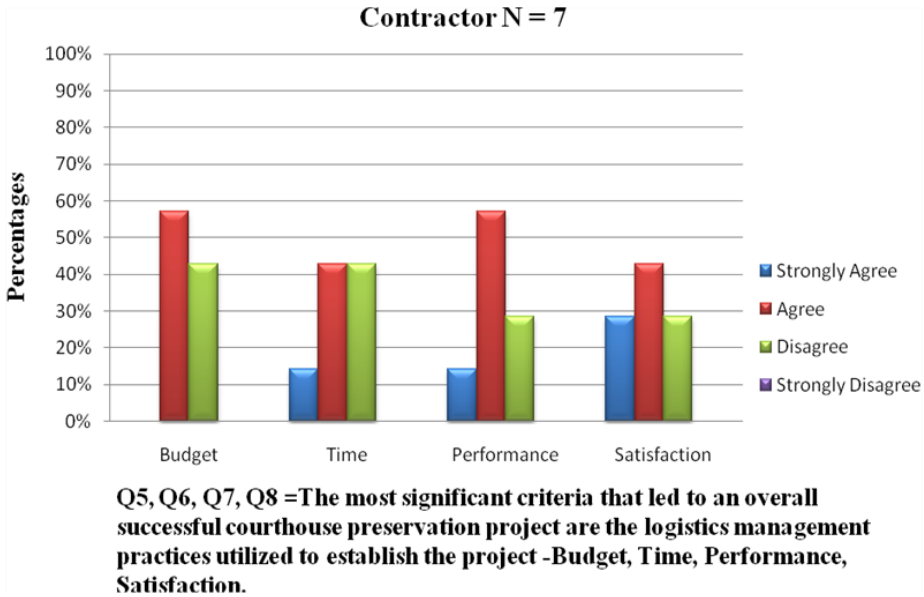


Figure 6. Descriptive analysis for contractors and success criteria.

Conclusion for Success Criteria - Descriptive Statistics

Conclusions were drawn from the compiled results for each of the project team member groups. The individual figures presented in the previous section express the attitudes of each independent group. Each group was asked about their perceptions regarding the success criteria variables, ranging from strongly agree to strongly disagree: "The most significant criteria that led to an overall successful courthouse preservation project are the management practices utilized to establish the project – Budget (Q5), Time (Q6), Performance (Q7), and Satisfaction (Q8)."

The following is a short summary of how this study evaluated each of the success criteria variables. Planning the budget was evaluated along the total project cost. Because the projects contained both state funds and local county money, the projects were monitored continuously to ensure the project would remain within budget. Planning for time was assessed on three general areas: total duration of the project, uniqueness of the project activities, and unforeseen issues within the project scope. Planning for performance was evaluated across a number of characteristics, such as building significance, value engineering, and quality assurance. Planning for satisfaction was the final success criteria variable. Satisfaction planning involved development and implementation of strategies to ensure a successful project. This evaluation

focused on the communication and feedback between the project team and decision making efficiency. The list of evaluation specifics is by no means complete, but it serves to inform the researcher of the diverse set of conditions that the project team members work under and the complexities associated with each courthouse preservation project.

Table 2, shows the project team leaders' perceptions of the order of criteria leading to the successful completion of the renovation projects. Owners perceived the order of success criteria that lead to the successful preservation project as follows: performance, budget, satisfaction, and time. This is attributed to the role of the owner as observer in this unique preservation project. Ultimately, the owner strives for the maximum return on investment. As invested team members, THC reviewers, architects, and contractors all have specific responsibilities. THC reviewers are responsible for maintaining the historical integrity of the courthouse building during the design and construction phases. In addition, the THC is guided by the National Historic Preservation guidelines to ensure the retention of the historic integrity of the building. THC reviewers perceived the order of success criteria that led to the successful preservation project as follows: performance, satisfaction, budget, and time. Architects are responsible for the development of the scope of work and design solution as determined by the owner and the THC reviewer. Furthermore, architects establish a preliminary budget and preliminary schedule to give the owner and THC reviewers an intelligent overview of what would be required to meet the approved design scope. Architects perceived the order of success criteria that led to the successful preservation project to be: performance, satisfaction, budget, and time. Contractors are responsible for the means and methods to execute the approved scope of work. Once the award has been given and the notice to proceed has been issued, the contractor will have an approved budget and detailed schedule to serve as the basis of decision making for the project. Contractors perceived the order of success criteria that led to the successful preservation project is as follows: satisfaction, performance, time, and budget.

Table 2. Project team members' perception of the order of criteria leading to success

	Most Important	Important	Less Important	Least Important
Owners	Budget	Performance	Satisfaction	Time
THC Reviewers	Performance	Satisfaction	Budget	Time
Architects	Performance	Satisfaction	Budget	Time
Contractors	Satisfaction	Performance	Time	Budget

Analysis of Success Factors Using Descriptive Statistics

To determine the perception of the owners, THC reviewers, architects, and contractors towards the Success Factors Variables, responses to each of the questions associated with Success Factors in the sample were collected and analyzed. Eleven questions on the survey questionnaire were focused specifically on the significance of the success factors that led to the successful delivery of the courthouse preservation project. In other words, this was done to establish the perception of each of the project team members regarding the importance of

each success factor that was used as a project management practice during the courthouse preservation process.

Questions 9-18 were all Likert response scale types. The respondents were asked to give a fixed alternative response that could only be answered as strongly agree, agree, disagree, or strongly disagree. Question 19 was an ordinal type that asked the respondents to rank the success criteria variables from a lessons learned point of view. Questions 9-19 asked respondents to answer a series of questions focused on the management practices utilized to establish the success criteria variables of budget, time, performance, and satisfaction.

Building Significance

Results for Question 9 regarding building significance are shown in Figure 7. Findings show that the project team members (N=31) had similar agreement believing there was an assessment of the building significance during the pre-planning phase of the courthouse preservation projects. Architects were most convinced (100.0% strongly agreed), followed by THC reviewers (67.0% strongly agreed/33.0 agreed), contractors (43.0% strongly agreed, 57.0% agreed), and finally, owners (40.0% strongly agreed, /60.0% agreed). The building significance played a very important role in these preservation projects. The successful delivery of the preservation project for this significant courthouse building is paramount to the historic fabric of Texas history.

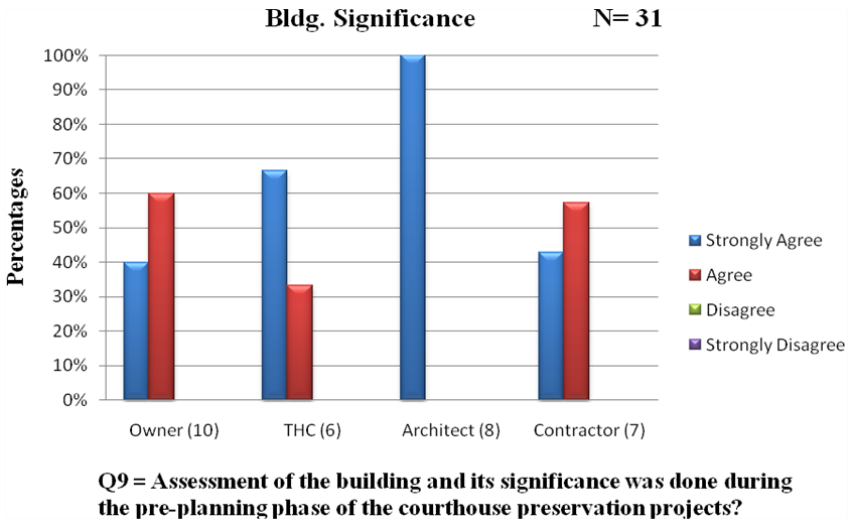


Figure 7. Descriptive Analysis for Building Significance.

Site Analysis

The results for Question 10 site analysis are shown in Figure 8. Findings show that the project team members (N=31) had agreement, believing that there was a comprehensive analysis of the site done prior to the construction phase. As a result, architects again were most convinced (88.0% strongly agreed, 13.0% agreed). The results continued to break down

as follows: contractors (29.0% strongly agreed, 71.0% agreed), owners (20.0% strongly agreed, 33.0% agreed), and finally THC reviewers (100.0% agreed). Site analysis includes the understanding of vital site conditions that are associated with planning a construction project in an urban area with an historic context. These include but are not limited to historic significance, location, topography, climate, density of population, and circulation.

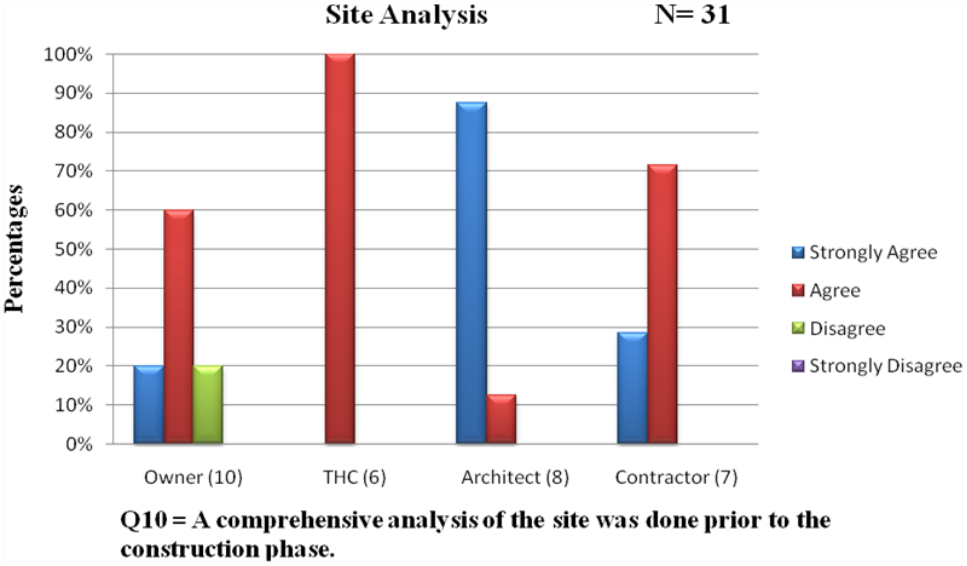


Figure 8. Descriptive analysis for site analysis.

Site Layout and Staging

Results for Question 11 regarding site layout and staging are shown in Figure 9. Findings show that the project team members (N=31) had a more diverse perception of the staging and site layout plan that was developed and implemented during the courthouse preservation.

Again, architects were most convinced (50.0% strongly agreed, 38.0% agreed), followed by contractors (29.0% strongly agreed, 29.0% agreed), owners (20.0% strongly agreed, 70.0% agreed), and finally, THC reviewers (67.0% agreed). Site layout and staging of materials accounts for the design and spatial requirements needed to maintain an efficient day-to-day transition of construction activities such as access routes, security, material staging areas, temporary buildings, and waste handling.

Value Engineering

Results for Question 12 regarding value engineering are shown in Figure 10. Findings show that the project team members (N=31) had a more varied perception when asked if there were sufficient opportunity for value engineering throughout the courthouse preservation project. Contractors were most convinced (29.0% strongly agreed, 43.0% agreed), followed by architects (25.0% strongly agreed, 63.0% agreed), owners (20.0% strongly agreed, 30.0 agreed), and finally, THC reviewers (83.0% agreed).

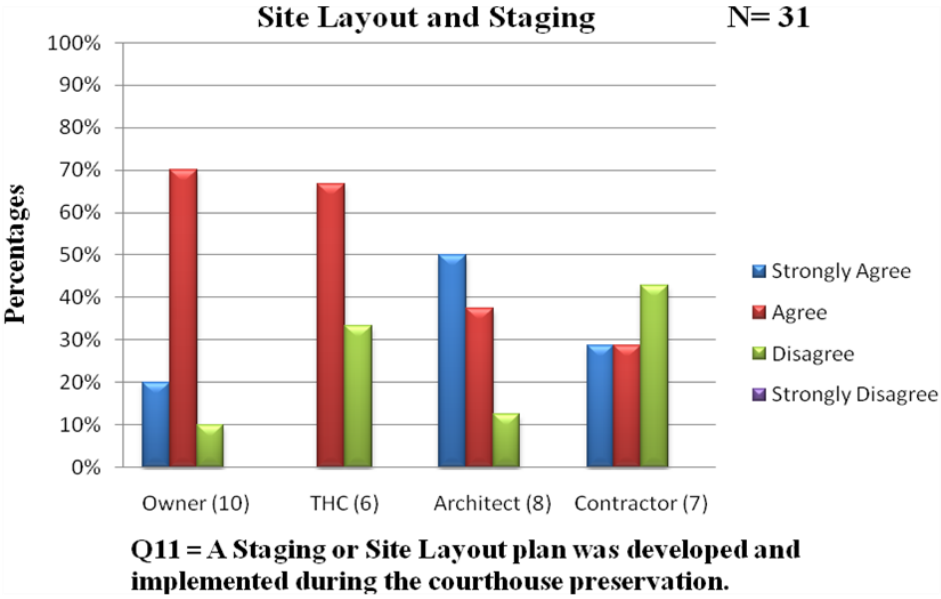


Figure 9. Descriptive analysis for site layout and staging.

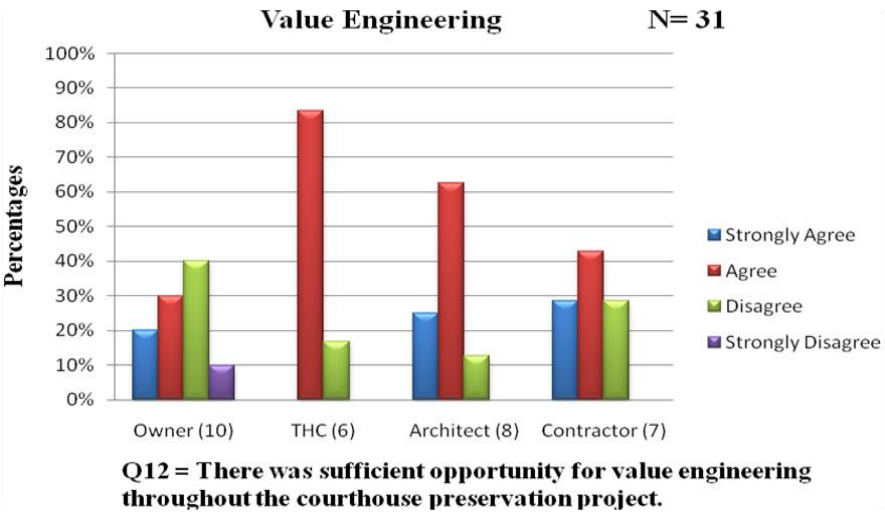


Figure 10. Descriptive analysis for value engineering.

Funding

Results for Question 13 regarding funding are shown in Figure 11. Findings show that the project team members (N=31) had more similar perceptions when asked if there was adequate funding throughout the project. Contractors were most convinced (29.0% strongly agreed, 43.0% agreed), followed by architects (25.0% strongly agreed, 50.0% agreed), THC reviewers (17.0% strongly agreed, 50.0% agreed), and finally, owners (10.0% strongly agreed, 70.0% agreed). Differences in perceptions are noted when the owners and THC

reviewers are compared to the architects and contractors. Owners and THC reviewers provided the funding while the architects and contractors established the budget to complete the scope of work. Owners and THC reviewers were less convinced that the funding was adequate, while the architects and contractors were more satisfied.

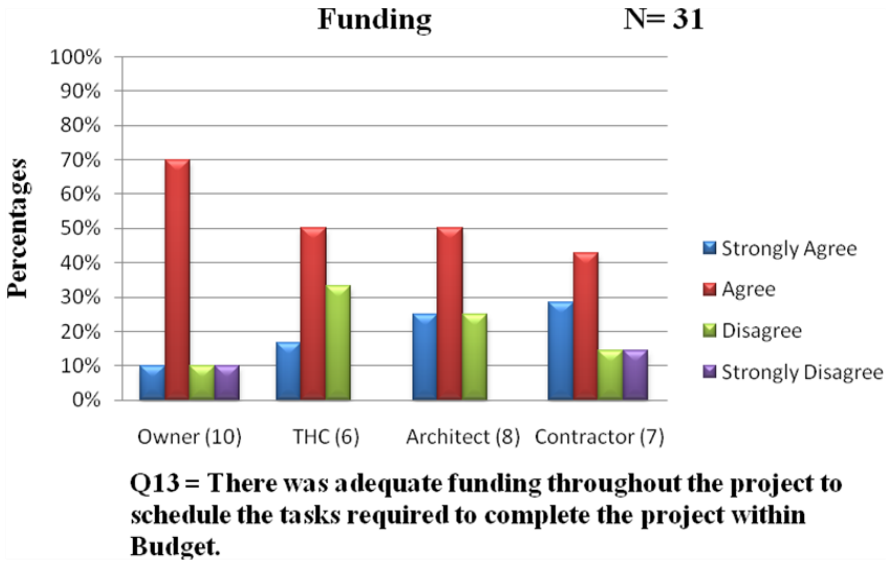


Figure 11. Descriptive analysis for funding.

Scheduling

Results for Question 14 regarding scheduling are shown in Figure 12. Findings show that the project team members (N=31) had more similar perceptions when asked if construction tasks were clearly defined during the schedule development for the courthouse preservation project. Architects were most convinced (38.0% strongly agreed, 50.0% agreed), followed by owners (10.0% strongly agreed, 70.0% agreed), contractors (86.0% agreed), and THC reviewers (67.0% agreed). The overwhelming sentiment of the project team groups was that construction tasks were clearly defined. This is at odds with the actual project data related to the success criteria "Time" which affirms that the majority of projects were delivered with large time growth percentages.

Communication and Feedback

Results for Question 15 regarding communication and feedback are shown in Figure 13. Findings show that the project team members (N=31) had more similar perceptions when asked if there was consistent communication and feedback within the project team groups. Architects were most convinced (63.0% strongly agreed, 25.0% agreed), followed by THC reviewers (50.0% strongly agreed, 33.0% agreed), owners (40.0% strongly agreed, 50.0% agreed), and finally, contractors (29.0% strongly agreed, 43.0% agreed). As a group, contractors had more disagreement with the consistency of communication and feedback.

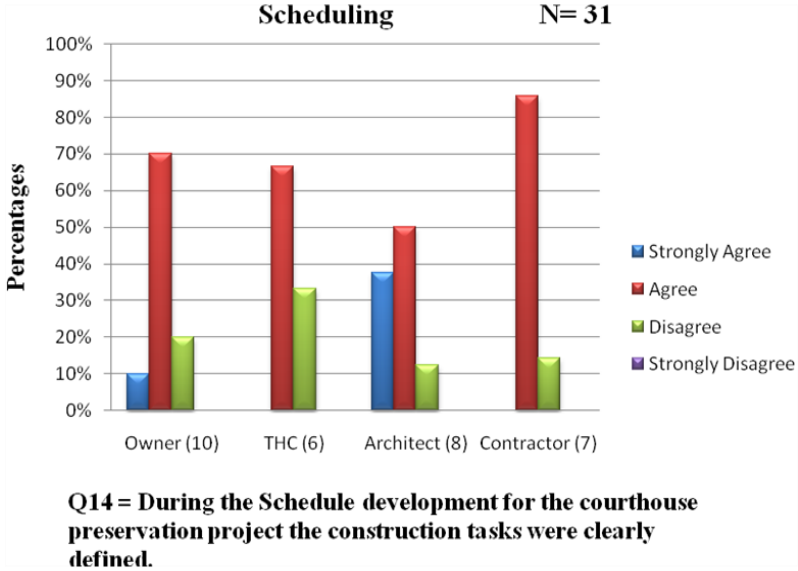


Figure 12. Descriptive analysis for scheduling.

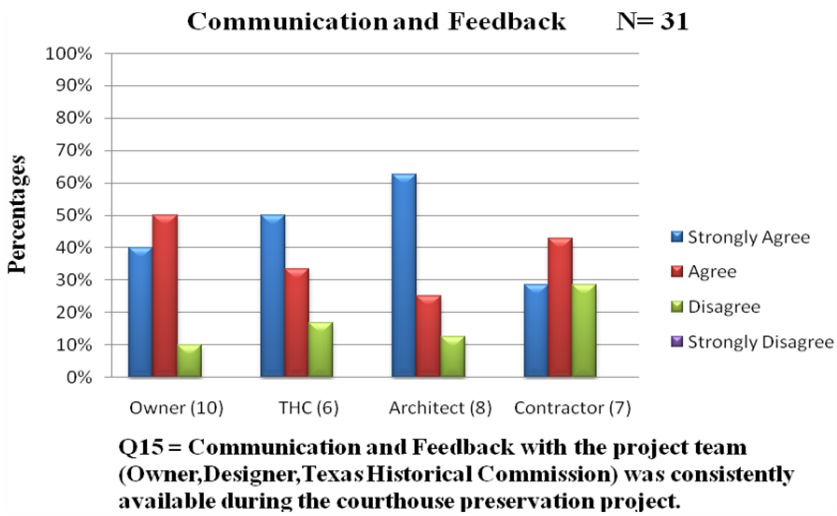


Figure 13. Descriptive analysis for communication and feedback.

Decision Tracking

Results for Question 16 regarding decision tracking are shown in Figure 14. Findings show that the project team members (N=31) had more varied perceptions when asked if requests for information and change order directives were quickly resolved to limit the impact on the courthouse preservation project.

Architects were most convinced (50.0% strongly agreed, 38.0% agreed), followed by owners (30.0% strongly agreed, 50.0% agreed), contractors (14.0% strongly agreed, 43.0% agreed), and finally, THC reviewers (50.0% agreed). RFIs and COs should be made in writing with reasonable promptness in order to limit delays in time.

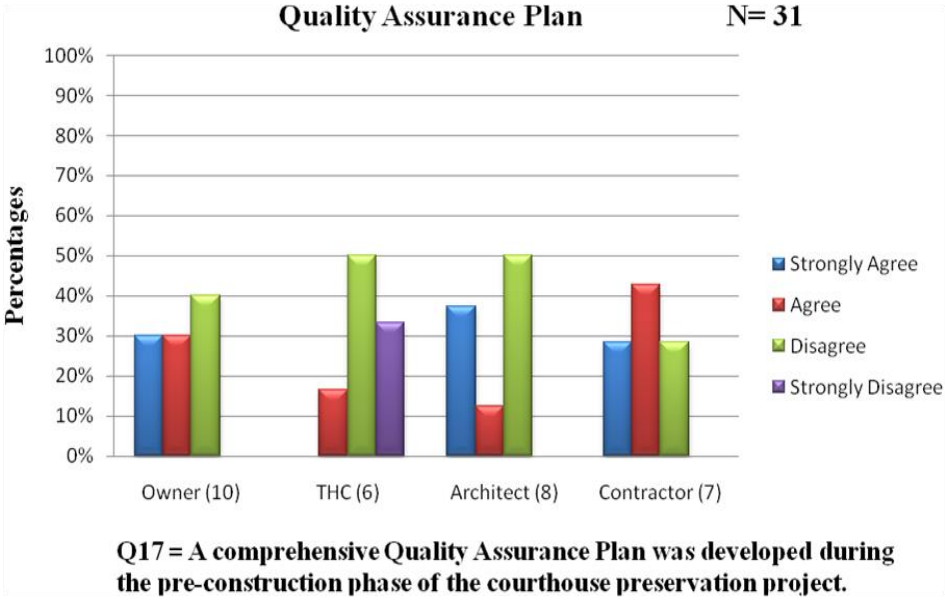


Figure 14. Descriptive analysis for decision tracking.

Quality Assurance Plan

Results for Question 17 regarding quality assurance plan are shown in Figure 15. Findings show the project team members (N=31) had significantly different perceptions when asked if a comprehensive quality assurance plan was developed during the pre-construction phase of the courthouse preservation project.

Architects were most convinced (38.0% strongly agreed, 13.0% agreed), followed by owners (30.0% strongly agreed, 30.0% agreed), contractors (29.0% strongly agreed, 43.0% agreed), and finally, THC reviewers (17.0% agreed).

Mock-ups and Samples

Results for Question 18 regarding mock-ups and samples are shown in Figure 16. Findings show that the project team members (N=31) had more similar perceptions when asked if detailed mock-ups and samples were effective contributors in conveying the design and construction intent.

Architects were most convinced (75.0% strongly agreed, 13.0% agreed), followed by THC reviewers (50.0% strongly agreed, 33.0% agreed), owners (30.0% strongly agreed, 40.0% agreed), and finally, contractors (29.0% strongly agreed, 57.0% agreed). Mock-ups ensure quality workmanship and a successful result and a mockup can reduce guesswork in scheduling by conducting a test run.

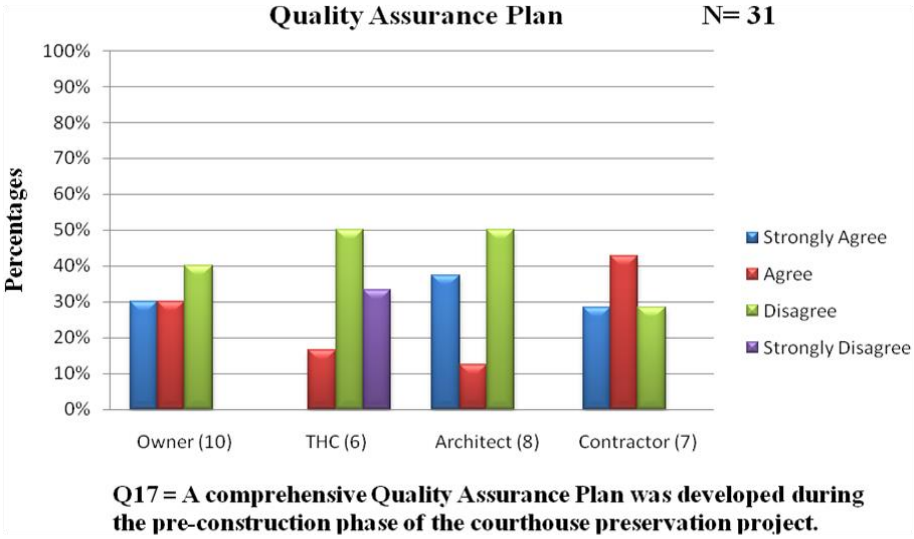


Figure 15. Descriptive analysis for quality assurance plan.

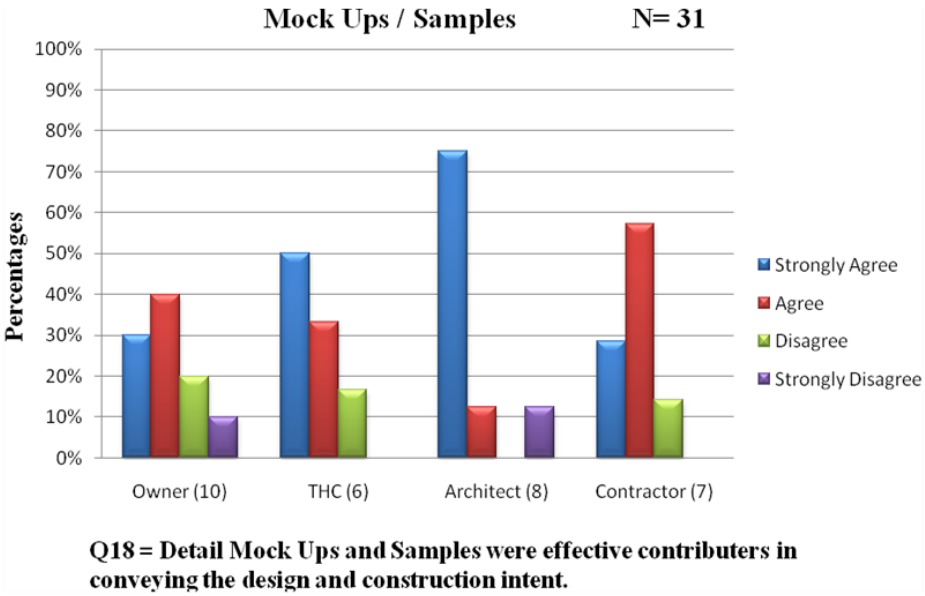


Figure 16. Descriptive analysis for mock ups and samples.

Success Criteria Variables vs. Lessons Learned

Results for Question 19 regarding success criteria variables vs. lessons learned are shown in Figure 17. This figure depicts a combination of two different questions asking the respondents to evaluate the success criteria variables. This was done by first asking the

project team members to answer the question, "What was the most significant criterion that led to overall successful courthouse preservation?"

The second question, about lessons learned, was asked of the same project team members, "Where would the project team members focus their resources to ensure a successful project?" Results show that the success criteria question conveyed that project team members were most convinced that performance is the most significant (38.0% strongly agreed, 13.0% agreed).

The results continued to break down as follows: satisfaction (25.0% strongly agreed, 25.0% agreed), budget (13.0% strongly agreed, 8.0% agreed), and finally, time (13.0% strongly agreed, 25.0% agreed). In addition, the lessons learned question depicted performance as the most important (42.0% strongly agreed, 35.0% agreed). The results continued to break down as follows: budget (29.0% strongly agreed, 16.0% agreed), satisfaction (26.0% strongly agreed, 32.0% agreed), and finally time (3.0% strongly agreed, 16.0% agreed).

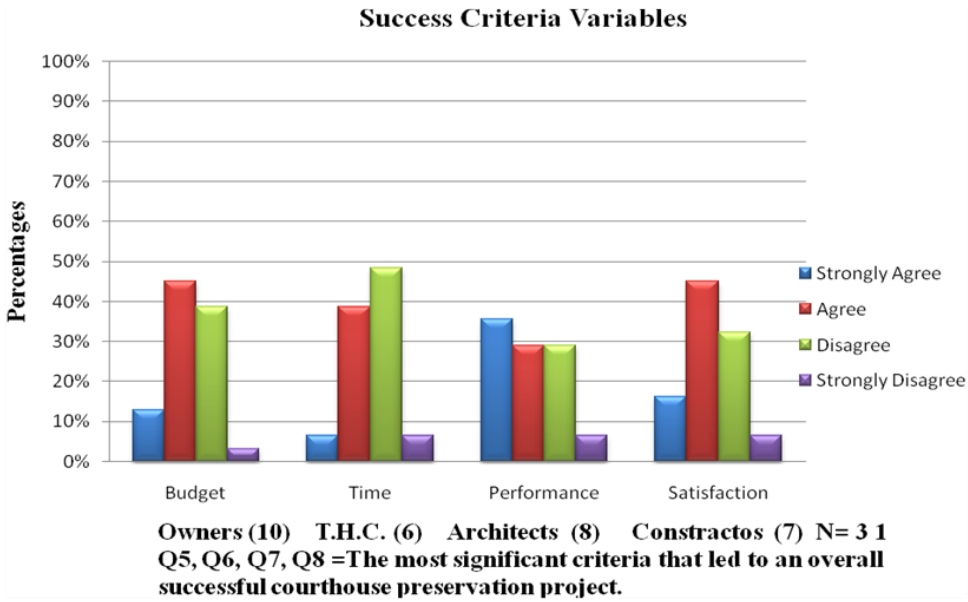


Figure 17. Descriptive analysis for success criteria variables vs. lessons learned.

The objective of combining both Success Criteria Variables vs. Lessons Learned was to compare perceptions of which success criteria variable had the most impact on project success vs. lessons learned views, ranking the success criteria variables in order of importance for delivery of a successful courthouse preservation project. For instance, evaluating the success criteria variables in the order of importance as they are presented for both questions is as follows: according to the results depicted in the figures, the project team members should place substantial emphasis on the amount of resources allocated for the planning of the performance success criteria variable.

Subsequently, planning for the budget was next in importance, followed by planning for satisfaction, and finally planning for time was once again seen as being the least important success criteria variable.

DISCUSSION

The purpose of this research was to identify PMP practices used by project team members (owners, THC reviewers, architects, and contractors) who worked with the THCPP and determine which, if any, of these PMP practices are significant indicators of successful project. The focus of the research was a threefold process. The first objective was to develop a list of success criteria indices (budget, time, performance, satisfaction) from the literature review and refinement thorough a series of reviews and interviews. The results were then used as an index of project success. The second objective was to develop a list of project management practices used by the sample of project team members who were surveyed. The third objective was to determine which, if any, of the success criteria variables or project management practices examined in the study correlated significantly to project success. The literature review has shown a limited focus on project success planning studies for historic renovation projects.

The findings of this study have established a framework for future research into Project Management Planning (PMP) practices for project team members (Owners, Other State Agencies, Architects, and Contractors) in the construction industry. The findings from this research may apply to other project types in the construction industry. For example, project management planning of new and existing construction projects may benefit from the results, but it cannot be stated with any degree of certainty whether or not that is the case. Currently, project team members rely on past project experience to achieve project success. The findings of this research, in addition to future research, may provide data allowing project team members to focus their project management planning practices across a broad spectrum of project types and deliver future successful projects.

This study also establishes a benchmark of PMP practices that was derived through a current literature review, developed through personal interviews, and tested with a survey instrument that was given to the project team members. The findings depicted the correlations between specific success factor project management practices and project success. This data is available to project team members as a form of comparison between their current project management practices and those of successful project team members. Furthermore, the value of this research provides project team members an opportunity to improve their planning practices and to become more effective and competitive when working on a historical preservation project.

CONCLUSION

It should be noted that this study has been an investigation into a complex problem that faces every construction project. It appears from the research that there is no unanimous agreement in previously published studies or in the perceptions of the project team members on what PMP practices predict project success. This study was limited in three ways. First, only completed renovation projects of historic courthouses in Texas were included in the study. Second, the sample included some project team members who worked on more than one project. Third, this study was intended to explain only the success criteria variables (budget, time, performance, and satisfaction) and those project management success factors that are significant indicators of project success. Because there are so many project

management planning practices and non-controllable outside influences that may affect project success, it is beyond the scope of this study to try to address all the possible issues in one study.

To state with any degree of certainty that one, or even a combination of PMP practices, is solely responsible for project success does not seem possible, given the results of this study. However, the research study that was developed was able to test, analyze, and report on the PMP practices of project team members that worked on the THCPP, and thus has added a better understanding of the perceptions of project success. In addition, the results analyzed in the descriptive statistics expressed the perceptions of the project team members. These findings were developed from the data collected and reflect a diverse summary of collective attitudes towards PMP practices and project success. In addition, when the project team members were separated in terms of observational (owners) and invested (THC reviewers, architects, and contractors), the findings indicated that the project team members‟ perceptions align similarly along the individual professions.

Several future directions for this research are suggested by the results of this study. Primarily this research should continue to test other types of construction projects, including new construction projects, existing renovation projects, and other historical preservation projects. In addition, future research should focus on expanding the location of the construction projects to include national and international sites. Another area of future research would be to introduce the survey instrument during the final stages of the construction phase; this would ensure that the project team members are still bound and engaged in the delivery of the project. Problems of locating the project team members arose during this study because of the ad hoc approach to survey instrument implementation.

Ultimately, including different types of construction projects, expanding the locations of the work being done, and revising the methodology that was used during this study to express the altered time of data collection would certainly advance generalization of PMP practices and project success between different segments of the project team members. Future outcomes could show that there are PMP practices that predict project success between the different types of construction.

REFERENCES

Ali, A. S., Rahmat, I., and Hassan, H. (2008). Involvement of key design participants in refurbishment design process. *Facilities,* 26(9/10), 389-400.

Atkinson, R. (1999). Project management: Cost, time and quality, two best guesses and a phenomenon. It's time to accept other success criteria. *International Journal of Project Management,* 17(6), 337-342.

Baccarini, D. (1999). The logical framework method for defining project success. *Project Management Journal,* 30(4), 25-32.

Baker, B. N., Murphy, D. C., and Fisher, D. (1983). Factors affecting project success: Project management handbook (2nd edition). New York: Van Nostrand Reinhold Co.

Belassi, W., and Tukel, O. I. (1996). A new framework for determining critical success/failure factors in projects. *International Journal of Project Management,* 14(3), 141-151.

Borges da Silva, F., and Cardoso, F. F. (1999). Applicability of logistics management in lean construction: A case study approach in Brazilian building companies; retrieved on October 15, 2011 from: http://www.ce.berkeley.edu/~tommelein/IGLC-7/PDF/DaSilvaandCardoso.pdf

Caron, F., Marchet, G., and Perego, A. (1998). Project logistics: Integrating the procurement and construction processes. *International Journal of Project Management,* 16(5), 311-319.

Chan, A. P. C., and Chan, A. P. L. (2004). Key performance indicators for measuring construction success. *Benchmarking: An International Journal,* 11(2), 203-221.

Chan, A. P. C., Scott, D., and Chan, A. P. L. (2004). Factors affecting the success of a construction project. *Journal of Construction Engineering and Management,* 130(1), 153-155.

Chan, D. W. M., and Kumaraswamy, M. M. (2002). Compressing construction durations: Lessons learned from Hong Kong building projects. *International Journal of Project Management,* 20(1), 23-35.

Cleland, D. I., and King, W. R. (1983). Systems analysis and project management (3rd edition). New York: McGraw Hill.

Cole, L. J. R. (1991). Construction scheduling: Principles, practices, and six case studies. *Journal of Construction Engineering and Management,* 117(4), 579-588.

Curwell, S., and Cooper, I. (1998). The implications of urban sustainability. *Building Research and Information,* 26(1), 17-28.

Damanpour, R. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal,* 34(3), 555-590.

Dawson, R. J., and Dawson, C. W. (1998). Practical proposals for managing uncertainty and risk in project planning. *International Journal of Project Management,* 16(5), 299-310.

De Wit, A. (1988). Measurement of project success. *International Journal of Project Management,* 6(3), 164-170.

Dewar, R. D., and Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management Science,* 32(11), 1422-1433.

Dillman, D. A. (2000). Mail and internet surveys: The tailored design method (2nd edition). New York: John Wiley and Sons, Inc.

Dvir, D., Lipovetsky, S., Shenhar, A., and Tishler, A. (1998). In search of project classification: A non-universal approach to project success factors. *Research Policy,* 27(9), 915-935.

Egbu, C. O. (1999). Skills, knowledge and competencies for managing construction refurbishment. *Construction Management and Economics,* 17(1), 29-43.

Fei, W., Weijian, H., Lihua, M., and Juwei, Y. (2008). The study of logistics management theory in material cost control; retrieved on October 5, 2011 from: http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=04679981

Feilden, B. (2003). Conservation of historic buildings (3rd edition). New York: Architectural Press.

Friedman, D., and Oppenheimer, N. (1997). The design of renovations (1st edition). New York: W.W. Norton and Company.

Gransberg, D. D., Badillo-Kwiatkowski, G. M., and Molenaar, K. R. (2003). Project delivery comparison using performance metrics, *AACE International Transactions,* CSC 2.1-2.5.

Grimmer, A. W., and Weeks, K. D., (1995). The Secretary of the Interior's standards for the treatment of historic properties: With guidelines for preserving, rehabilitating, restoring and reconstructing historic buildings (1st edition). Darby: Diane Publishing Co.

Hatush, Z., and Skitmore, M. (1997). Evaluating contractor prequalification data: selection criteria and project success factors. *Construction Management and Economics*, 15(2), 129-147.

Hosey, L. (2009). The future of the past: Tradition + innovation = evolution. *Architect; r*etrieved on August 7, 2011 from: http://www.architectmagazine.com/preservation/the-future-of-the-past.aspx

Kohler, N., and Hassler, U. (2002). The building stock as a research object. *Building Research and Information*, 30(4), 226-236.

Kumaraswamy, M. M., and Thorpe, A. (1996). Systematizing construction project evaluations. *Journal of Management in Engineering*, 12(1), 34-39.

Locke, D. (1984). Project management (9th edition). New York: St. Martin's Press.

Look, D. W. (2004). When disaster strikes at your historic site during construction; retrieved on September 12, 2011 from: http://www.georgewright.org/0343look.pdf

Meredith, J. (1998). Building operations management theory through case and field research. *Journal of Operations Management*, 16(4), 441-454.

Mitropoulos, P., and Howell, G. A. (2002). Renovation projects: Design process problems and improvement mechanisms. *Journal of Management in Engineering*, 18(4), 179-185.

Myers, D., and Wyatt, P. (2004). Rethinking urban capacity: Identifying and appraising vacant buildings. *Building Research and Information*, 32(4), 285-292.

National Register of Historic Places (NRHP). (2010). United States map of Historic Places; retrieved on September 10, 2011 from: http://www.nationalregisterofhistoric places.com/state.html

Nguyen, L. D., Ogunlana, S. O., and Lan, D. T. X. (2004). A study on project success factors in large construction projects in Vietnam. *Engineering Construction and Architectural Management*, 11(6), 404-413.

O'Donnell, C. (2004). Getting serious about green dollars. *Property Australia*, 18(1), 1-2.

Oyetunji, A. A., and Anderson, S. D. (2006). Relative effectiveness of project delivery and contract strategies. *Journal of Construction Engineering and Management*, 132(1), 3-13.

Parfitt, M. K., and Sanvido, V. E. (1993). Checklist of critical success factors for building projects. *Journal of Management in Engineering*, 9(3), 243-249.

Pinto, J. K., and Slevin, D. P. (1987). Critical factors in successful project implementation. *IEEE Transactions Engineering Management*, 34(1), 22-27.

Pinto, J. K., and Slevin, D. P. (1988). Project success: Definitions and measurement techniques. *Project Management Journal*, 19(1), 67-72.

Pinto, J. K., and Slevin, D. P. (1989). Critical factors in project implementation: A comparison of construction and RandD projects. *Technovation*, 9(1), 49-62.

Quah, L. K. (1991). An evaluation of the risks in estimating and tendering for refurbishment work. *Building Research and Information*, 19(6), 356-359.

Robson, P. (1999). Structural repair of traditional buildings (1st edition). Shaftesbury, UK: Donhead Publishing Limited.

Sanvido, V., Grobler, F., Parfitt, K., Guvenis, M., and Coyle, M. (1992). Critical success factors for construction projects. *Journal of Construction Engineering and Management*, 118(1), 94-111.

Sayles, L. R., and Chandler, M. K. (1971). Managing large systems: organizations for the future (1st edition). New York: Harper and Row.

Shenhar, A. J. (1993). From low to high-tech project management. *RandD Management*, 23(3), 199-214.

Shenhar, A. J., and Dvir, D. (1996). Toward a typological theory of project management. *Research Policy*, 25(4), 607-632.

Solomon, D. J. (2001). Conducting web-based surveys. *Practical Assessment, Research and Evaluation*, 7(19); retrieved on August 10, 2011 from: http://PAREonline.net/getvn.asp?v=7andn=19

Swanke Hayden Connell Architects. (2000). Historic preservation: Project planning and estimating (1st edition). Kingston, R.S. Means Company, Inc.

Texas Historical Commission (THC). (1999). Historic preservation at work for the Texas economy. retrieved on September 17, 2011 from: http://www.thc.state.tx.us/publications/reports/EconImpact.pdf

Texas Historical Commission (THC). (2010a). Courthouses restored through the Texas historic courthouse preservation program. retrieved on September 12, 2011 from: http://www.thc.state.tx.us/courthouses/chreded.shtml

Texas Historical Commission (THC). (2010b). *Texas historic courthouse preservation program*. retrieved on September 12, 2011 from: http://www.thc.state.tx.us/courthouses/chthcpp.shtml

Wyatt, J. C. (2000). When to use web-based surveys. *Journal of the American Medical Informatics Association*, 7(4), 426-429.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 7

RELATIONAL CAPITAL IN WIDER DISSEMINATING CONSTRUCTION PROJECT KNOWLEDGE

Sepani Senaratne [*] ***and Kushan Balasuriya***
Department of Building Economics
University of Moratuwa
Sri Lanka

ABSTRACT

The nature of knowledge generated within construction projects is more experience-based. This study investigates the role of relational capital in enabling wider-dissemination of construction project knowledge. The case study research method was employed using two large-scale contracting organisations in Sri Lanka. Data was collected through five semi-structured interviews targeting middle-level managers of from each. The findings revealed several types of strong informal social networks hidden within construction organisations. These networks had led to build relational capital to considerable extent within these organisations and enabled better knowledge dissemination. It is hoped that these research findings can be generalised to other traditional construction industries in similar settings.

Keywords: Construction management, Knowledge management, Social networks, Relational capital

INTRODUCTION

The success of a construction business in the competitive market place depends critically on the quality of the knowledge it possesses regarding its markets, products, and technologies (Faraj et al., 1999). Knowledge gained on a particular construction project may be used by construction organisations to avoid similar mistakes being repeated (Carrillo, 2004); and, to prevent 'reinvention of the wheel', facilitate innovation, increase agility, improve teamwork

[*] T +94 1 2650 738; F +94 1 2650 622; E-mail: sepani@uom.lk.

and improve project performance (Kamara et al., 2003). However, as Anumba (2009) mentions, there are challenges in implementing knowledge management with the complexities in construction project environments. In particular, projects are problematic as they lack organisational memory and natural knowledge transfer mechanisms as in permanent organisation settings (Bresnen et al., 2003). Hence, the challenges and problems in construction need to be understood to improve construction organisations through knowledge management.

According to extant construction literature, the construction industry faces a knowledge diffusion problem. The knowledge generated within projects is mostly limited to individuals involved and is not widely diffused within the organisation (Winch, 2002; Barlow and Jashapara, 1998). According to the empirical findings of Gieskes and Broeke (2000, p194), "lessons learnt may become individual tacit knowledge when they are not captured on an organisational level and there are no signs of a systematic diffusion within the organisation." The construction literature on knowledge management mainly addresses this knowledge diffusion problem by introducing technology-based solutions or approaches to measure knowledge management. For example, Bresnen et al. (2003, p159) mention; "recent work on knowledge management in the construction sector still emphasises the opportunities and possibilities opened up with the applications of such technologies [information and communication technologies]." Bresnen et al. (2003) argue that there are difficulties, challenges and limitations in attempting to capture and codify construction project-based learning by using technological mechanisms. According to them, the processes of knowledge capture, transfer and learning in project settings rely very heavily upon social patterns, practices and processes in ways which emphasise the value and importance of adopting a community-based approach to managing knowledge.

The transfer of construction project knowledge to organisation level is subjected to several research studies and is mainly addressed by the researchers through effective lessons-learned practices (for example, see Carrillo, 2004; Kamara et al, 2003). However, the rich tacit knowledge that cannot be solely captured by such practices, but resided in the individuals need be passed to others through different mechanisms. Borrowing Hansen et al. (1999)'s knowledge management strategies concept, Senaratne and Sexton (2008) argue that, while codification strategies should be in place in an appropriate level, it is the personalisation strategies that need more recognition and strengthening for wider dissemination of construction project knowledge. Wider knowledge dissemination through personalisation is essential to pass one's project experience to others. If not, by heavily relying on specific individuals, construction organisation could face severe situations such as knowledge loss and work disruptions, when such individuals leave the organisation.

In general knowledge management literature, several authors (Nonaka and Takeuchi, 1995; Athanassiou and Maznevski, 2002; Lang, 2004) identified that complex tacit knowledge is likely to be transferred through socialisation processes and networks. Nonaka and Takeuchi's (1995) explain socialisation process where tacit knowledge is shared directly between individuals in joint activities without the need for making such knowledge explicit. This happens through observation, imitation and practice while individuals engage in joint activities such apprenticeships, informal networks, social events, face-to-face settings and prior interactions. Cousins et al. (2006) show how such socialisation activities impact on building social networks, in particular, the relational dimension of social capital of an organisation.

Research has proven that by improving the social capital of an organisation intra-organisational knowledge transfer process (or wider dissemination as referred to in this research) can be facilitated (Inkpen and Tsang, 2005). In fact, Hoffman et al. (2005) revealed that the presence of social capital could enhance the entire knowledge management process because it encourages cooperation behaviour and it makes collective action more efficient. Nahapiet and Ghoshal (1998) defines social capital as the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Among the dimensions of social capital, relational dimension is discussed in this research due to its higher emphasis compared to others (Nahapiet and Ghoshal, 1998). Other dimensions include, structural dimension which refers to the overall pattern of connections between the actors within a network; and, cognitive dimension which refers to the learning process among the individuals. The relational dimension (relational capital) of social capital addresses the role of direct links between actors and the relational outcomes such as trust, norms and identification of interactions (Inkpen and Tsang, 2005). This research aimed to explore the significant role of relational capital in wider dissemination of construction project knowledge, which is not deeply discussed in the extant literature.

Building on these insights from general knowledge management literature, this research argues that social capital, in particular, relational capital enables wider dissemination of project knowledge in construction organisations.

As the next sections describes, even though there are few studies in construction that has explored the importance of social capital in the field of knowledge management in construction organisations, these are arguably limited in exploring how to enable relational capital for wider knowledge dissemination of project knowledge in construction organisations. The next section offers the key literature findings on this.

RELATIONAL DIMENSION OF SOCIAL CAPITAL

Nahapiet and Ghoshal (1998) describes four key facets of the relational dimension namely; trust, norms of corporation, sense of identification, and obligations and expectations as briefly explained in Table 1.

All in all, according to Nahapiet and Ghoshal (1998), the embedded and available knowledge resources within cohesive social networks, which can be derived from the relational dimension of social capital through trust, norms of cooperation, sense of identification and obligations and expectations (see Table 1), can be described as 'organisational relational capital.' Relational capital is owned jointly by the parties to a relationship and such social relationships could die out if not maintained. Thus, this study argues that identifying such strong relationships that exist within construction firms and strengthening such will enable wider dissemination of project knowledge at firm level.

In construction literature, Bresnen et al. (2005) and Styhre (2008) revealed that relational capital is of key importance to any construction organisation. Among these, several studies exist on importance of trust. For example, Munns (1995) showed the importance of building trust within construction project teams from the outset for successful project outcomes. Manu and Walker (2006) and Brookes et al. (2006) also revealed that trust-based relationships built through construction projects would lead to improved knowledge sharing. Ding et al. (2007)

further revealed how trust within project design teams lead to better sharing of knowledge. Chinowsky et al. (2010) also showed how high performance teams could establish professional trust in construction projects. These studies in general have shown importance of building trust within construction project teams. However, they fail to describe nature of relationships (networks) that enable knowledge dissemination in construction organisations. In particular, there is insufficient depth in these studies in focusing on the role of relational capital that is built in a construction firm as an enabler for wider dissemination of project knowledge. General knowledge management literature on social capital offers a deeper understanding on this as discussed next.

Table 1. Four facets of relational capital

Facets	Concepts	Authors
Trust	Trust is the willingness of a party to be vulnerable to the actions of another party based upon the expectation that the other will perform a particular action to the trustor, irrespective of the ability to monitor or control that other party. *Trust can be divided into two:* 1. Cognitive trust which is grounded in an outcome-focused belief in a social group's dependability and reliability. This is similar to competence trust that is mentioned by Whittaker et al. (2003). 2. Affective trust which is grounded in beliefs about the less tangible process elements of reciprocal (friendly) concern and interpersonal caring.	Mayer et al., 1995 McAllister, 1995 Whittaker et al., 2003
Norms of cooperation	Norms of cooperation are internalised sets of accepted behaviour for members of the social network. These are important in knowledge sharing and include norms such as emphasis on cooperation, open disclosure of information, loyalty, willingness to value, openness to criticism, and a tolerance of failure.	Hoffman et al., 2005 Starbuck, 1992 Leonard-Barton, 1995
Sense of identification	Identity occurs when individuals see themselves as one with another person or group of people. Identification within a group enhances concern for collective processes and outcomes thus, increases the opportunity for knowledge sharing and the actual frequency of cooperation	Nahapiet and Ghoshal, 1998 Hoffman et al., 2005 Kramer et al., 1996
Obligations and expectations	These represent a commitment or duty to undertake some activity in the future. Key manifestations of these, is reputation, which is the expectation of others (outside the network) concerning an organisation's future conduct.	Hoffman et al., 2005 Lucas, 2005

HOW RELATIONAL CAPITAL ENABLES DISSEMINATION OF KNOWLEDGE

General Knowledge management literature elaborates that there are four conditions if exchange of knowledge is to take place. They are accessibility, anticipation of value, motivation and capability to exchange (Nahapiet and Ghoshal, 1998; Whittaker et al. 2003). These authors show that first there must be an opportunity existing for exchange of knowledge through access to social networks. Second, there must be an anticipation of the

value to be derived from such exchange of knowledge. Third, there must be a motivation to exchange knowledge. Fourth, the parties should be capable of such exchange of knowledge. Whittaker et al. (2003) revealed that relational capital has a major impact on these four conditions in enabling exchange of knowledge (referred to as knowledge dissemination in this study). Manu and Walker (2006) emphasise that these four conditions are highly challenging for many traditional construction industry organisations. Hence, this research argues by focusing on building relational capital that construction firms could attain the above conditions that enable knowledge dissemination.

Koskinen (2003) referred to similar constructs to above four conditions when he described factors that affect tacit knowledge utilization in project-based contexts. 'Accessibility to knowledge' is influenced by communication systems that include interaction, language, and proximity. "Motivation to knowledge', Koskinen (2003) explains in two elements: commitment and trust. Commitment is a manifestation of the motivation of an individual while trust motivates to share and receive knowledge. Accordingly, the memory systems which include experience, mental models and intuition can lead to the 'capability of knowledge exchange.' Hence, Koskinen's work can be regarded as a further support for above conditions for knowledge dissemination. The other external factors are disregarded in this study as the above for conditions are seen as directly relevant.

Considering above key literature findings, the research problem of this study is defined in a conceptual framework. This framework reflects how relational capital could be enabled by satisfying the four conditions to disseminating project knowledge within construction organisations (see Figure 1).

As Figure 1 depicts, the organisational relational capital that is developed under its four dimensions (trust, norms of cooperation, sense of identification; and, obligations and expectations), could be effectively utilised as an effective enabler in disseminating project knowledge by satisfying the four conditions for successful knowledge dissemination (accessibility to parties to exchange knowledge; anticipation of value through exchange; motivation to exchange knowledge; and, capability to exchange knowledge). This conceptual framework is used as a framework for guiding the empirical investigation. The next section explains the research method used for this study.

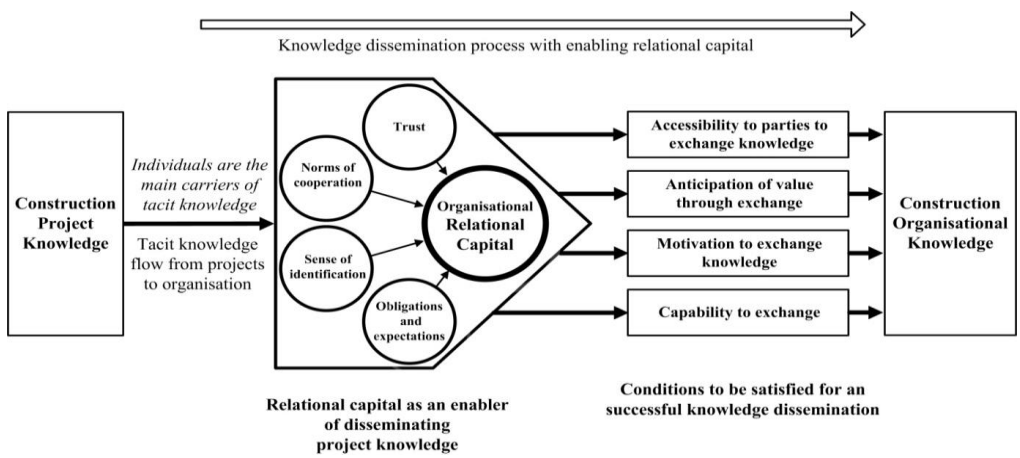


Figure 1. Conceptual framework.

RESEARCH METHODOLOGY

Literature offers different ways to identify social networks. Some favour quantitative measures, for example use of techniques such as social network analysis or organisational analysis. However, such measurements may not reveal important informal networks which could be found by interviewing the key network players while making them reflect on their social relationships in a detailed manner. Hence, the study opted for a qualitative approach falling in line with the assumptions in the interpretive research paradigm.

Qualitative approaches are essentially descriptive and inferential in character and focus primarily on the kind of evidence (what people tell you, what they do) that will enable to understand the meaning of what is going on. Among the qualitative research, this research adopted the case study research approach as it allows an in-depth inquiry in a real-life setting when variables are tied to the context and cannot be separated. Other qualitative research methods such as action research, ethnography and ground theory were ruled out due to several reasons. Since the study aimed to identify and understand the variables of the problem environment rather than a change, pure action research approach was ruled out. Further, the study did not consider a pure inductive approach such as grounded theory or ethnography as the phenomenon studied is not completely novel and was possible be conceptualised through the extant literature.

Miles and Huberman (1994) explain the suitability of a tight design for qualitative research (this is explained by Yin (1994) as prior theory in case studies) where the phenomenon is better-understood. As Yin (1994, p27) states "the role of theory development, prior to primary data collection, is one point of difference between case studies and related methods." Through such theory development, even though the case study research starts with a deductive reasoning approach, it later leads to an inductive reasoning process of theory building allowing novel theoretical versions to emerge through the case study findings (Eisenhardt, 1989).

However, this approach is criticised for its weakness on generalisability. As Yin (1994) explains, case studies, like experiments, are generalisable to theoretical propositions and not to populations or universes. Therefore, the case studies lead to analytical generalisation rather than statistical generalisation. Yin (1994, p31) explains analytical generalisation: "a previously developed theory is used as a template within which to compare empirical results of the case study." This is done by studying theoretically significant cases in depth in its real-life context using multiple sources of evidence.

When considering the multiple organisations setting in construction, this research focused on contracting organisations and selected the organisation level as the main unit of analysis. Future research is expected to expand the understanding of the research problem in other organisations such as consulting firms. In selecting particular cases, Eisenhardt (1989) states that it makes sense to choose cases in which the purpose is 'transparently observable.' Accordingly, through few pilot interviews with experienced construction experts and based on the working experience of one author, two large-scale contracting organisations that had demonstrated good practices of network ties were selected for this research. These two contracting firms are based in Sri Lanka, which generally procure projects through separated contract arrangements. Interviewing was selected as the main data collection technique for this study, in addition to other methods such as document reviews, observations and passive

participation (such as participating as observers in project meetings). Ten semi-structured interviews targeting five middle level of management of each organisation were conducted. Middle level managers such as project managers were selected as they are the main personnel who disseminate project knowledge to organisation level and link project and organisation levels in contracting organisations. Table 2 offers details of the cases and the interview panel.

Table 2. Case study details

Case	Specialisation areas in construction	Years in the field	Annual turnover (Rs. Mn)	No of direct staff	Organisation structure	Managerial role interviewed	No of interviews per role	Abbreviations
A	High-rise buildings, roads and bridges, water supply and drainage, infrastructure development, property development.	28	5000	800	Divisional coordinators (DC) are co between the directors and the project managers (PM).	Divisional Coordinator	3	DC-A1, DC-A2, DC-A3
						Senior Quantity Surveyor	1	SQS-A4
						Project Manager	1	PM-A5
B	Civil engineering construction including roads and bridges, harbour construction and water supply and irrigation	15	2500	300	Manager engineering (MEng) is co between the general manager and the PMs.	Manager Contract Administration	1	MCA-B1
						Project Manager	3	PM-B2, PM-B3, PM-B5
						Manager Engineering	1	MEng-B4

The interview guidelines comprised of mainly three sections. The first section focused on obtaining the background information of the organization. The second section was on indentifying types of social networks present within the organisation. Interviewees were asked to separately indentify formal and informal networks while examples were given to them to probe answers. Further, taking each network type that they identified, the interviewees were requested to explain how they use these networks, closeness of network members and frequency of exchange, what opportunities are available for knowledge exchange and how knowledge dissemination happens through these networks. The third section explored the four facets of relational capital in detail by asking the interviewees how each (trust, norms of corporation, sense of identity, obligations and expectations) assisted in knowledge exchange. For example, how each of them offered accessibility, value, motivation and capability for knowledge exchange.

After transcribing these interviews in written interview transcriptions, data reduction and concept identification was done through qualitative code-based content analysis. More than the frequency of word usage, this 'qualitative content analysis' attempts to find similar cognitions under a same concept. This is done by bringing together all bits of data that relate to a particular theme; and, giving a code with the purpose of identifying concepts/ emerging categories (Glaser and Strauss, 1967).

In this research, first, the coding was done in a tree structure with major themes and sub themes, which were drafted from the conceptual model. This initial coding structure was refined when each interview transcription was coded. This allowed moving from theory testing to a theory building process. As observed by Miles and Huberman (1994, p.91), the coding reports are "a weak and cumbersome form of display", because it is dispersed over many pages and it is not easy to see as a whole. Therefore, content analysis technique should be incorporated with a data display technique to enhance data analysis process. Among such data displaying techniques, mapping techniques are popular. A cognitive map is some form of network-based representation of an individual's cognition, as revealed to the researcher (Swan, 1997). This method is selected due to its suitability in displaying the relationships of views and concepts that were identified from interview transcripts. Figure 2 in the next section shows a cognitive map developed in this study. The key findings of this research are presented next.

RESEARCH FINDINGS

First, various networks that were present within the case studies were identified, including details on the opportunities offered through these networks to interact with various individuals; and, the nature of project knowledge that is accessible through such networks. These networks ties were grouped into two main categories; namely, 'Business ties' and 'Social ties'. The business ties were expressly developed by formally defined relationships to fulfil organisationally defined objectives by the management of the organisation. Social ties were mainly emotional relationships between individuals which were nurtured by an informal pattern of work-related and/or social interaction. First, the findings related to business networks are presented in Table 3.

Table 3 shows both formal business networks and other formal opportunities for interaction that prevailed in the case studies. Among several business networks that were identified, only the networks that were regarded by the case study participants as very strong in terms of opportunity and accessibility for project knowledge dissemination are depicted in this table. 'Formal organization structure' was seen as a very strong formal network, which led to frequent interaction between head office (H/O) and project individuals via electronic means; and, daily physical and electronic interaction between other head office members to complete formally assigned tasks.

Other strong formal networks were observed in 'weekly progress review meetings' both at H/O and site and also 'monthly progress review meetings' (MPRM), which denoted close work-orientated relationships on behalf of the project success. Further, there were few strong formal opportunities for interaction such as progress review site visits and head office site visits. There were frequently taking place in nearby sites and at least once fortnight with others.

Table 3. Business ties

	Network ties	Opportunities to interact with project and Head Office (H/O) individuals	Accessible project knowledge (PK) through the network ties
Formal business networks			
1	Formal organisation structure	Project people interacted with their superiors up to the director	PK flow via the formal organisational hierarchy
2	Weekly progress review meetings (H/O)	Project representatives interacted with the DC/MEng, divisional heads & the director	Weekly found information relating to project progress, difficulties & identified solutions were disseminated
3	Weekly progress review meetings (site)	DC/ME interacted with project individuals	Weekly found information relating to project progress, difficulties & identified solutions were disseminated
4	Monthly progress review meetings (H/O)	Project representatives interacted with head office top people	Superiors' PK was disseminated to the project individuals
Other formal opportunities for interaction			
5	Progress review site visits	DCs/MEng, directors & safety officer visit sites & interacted with project people	Information relating to project progress & difficulties were shared & solutions were made
6	Head office visits	Project individuals given unlimited opportunities to interact with particular head office individuals	PK & experience was shared & problems were solved
Formal knowledge-sharing networks			
7	Training academy (case A)	Group of Second force members appointed for the training academy	Decided the importance of new PK to improve the organisation, based on their collective expertise
8	Second workforce (case A)	Senior PMs, DCs & other head office senior executives interacted	Primary PK sharing network dedicated to capture & preserve valuable PK. The necessity of training sessions, seminars, mentoring programs, procedures & technical manual for an continuous improvement in the organisation were decided
9	Knowledge disseminating presentations	Opportunities were available for the participants of monthly head office meetings	PK regarding specific construction aspect or subject domain was disseminated

In addition to above strong business networks, several other moderate business networks and opportunities were revealed. For example, ISO meetings along with ISO internal audits and quality assurance site visits were observed as a way to disseminate quality related project knowledge. Similarly, safety awareness meetings were helpful in disseminating safety related project knowledge in between Project Mangers (PMs) and safety committee members. Certain periodic meetings of Divisional Coordinators (DCs) were observed as good practices. In particular, in 'think tank' meeting in Case A, experienced project people interacted with DCs and divisional heads to share useful project experience for future bidding. Similarly, in project planning meetings, key project team members interacted with the DCs and shared their previous project experience during planning.

In addition to above discussed business networks, formal networks that especially operate as knowledge sharing networks were observed within the cases. These include training sessions, special seminars, meetings and presentations. In particular, case A demonstrated several such networks. Within these, 'second workforce' and 'training academy' demonstrated strong knowledge sharing networks (see Table 3) which led to friendly company relationships. Knowledge disseminating presentations held during MPRMs were also seen as a strong knowledge sharing opportunity. Next, the findings related to social networks are presented in Table 4.

Table 4. Social ties

	Network ties	Opportunities to interact with project and H/O individuals	Accessible PK through the network ties
Informal social networks			
1	Divisional coordinators' informal network (case A)	DCs informally interacted during formal working times & social events	DCs gained the accessibility to other DCs' PK resources
2	Project managers' informal network	PMs informally interacted during formal working times & social events	PMs gained the accessibility to other PMs' PK resources
3	Comfortable social networks	Comfortable network members more closely & frequently interacted	Members gained the accessibility to comfortable members' PK resources
4	Informal company networks	Company friends interacted during working times to achieve their formal tasks & during social events	Company friends gained the accessibility to their friends' PK resources
Other opportunities for interaction (social events)			
5	Second force get-together (case A)	Second force members such as Senior PMs, DCs & other head office senior executives interacted	-
6	Annual trips	Project people interacted with head office people	-
7	Christmas carnival (case B)	Families of all the H/O & project individuals interacted	-

As Table 4 presents, in terms of social ties, almost all the informal social ties that were identified within the case studies showed very strong ties built on trust. Some of the relationships such as Divisional Coordinators' (DC) and Project managers' (PM) informal

networks were very old and some of them were even family friends who helped each others as friends. They frequently contacted via telephones and also met physically at formal meetings. In fact, comfortable social network members had frequent informal electronic and physical interaction outside the organisation. When searching for other opportunities for social interaction, several social events were identified. Among these, 'second force get-together' in Case A, 'annual sports meet' and 'Christmas carnival' in Case B and the annual trips in both cases were identified as strong opportunities which led to friendly company relationships.

In summary, the case study results indicated that the links between project and H/O individuals were very important in disseminating project knowledge to organisation level. In these organisations, the strength of the social ties, which were nurtured from informal social networks, was dominant against the business ties. The next section reports on the findings on the relational outcomes of these network ties.

Existence of Relational Capital

The existence of relational capital was explored within case studies across the four facets as presented below.

Most of the respondents identified that they had to take care of others due to task dependencies and collective achievement. For example, DC-A1 stated; "*we feel that some people should be improved as his improvement may be a service or a value addition to the organization at some point*." In particular, network members showed much care on reputed knowledge receivers or providers who had good image on knowledge exchange. Sometimes qualities of leaders were followed by their followers. In DC-A3 words; "*as leaders when we become very close to our followers, we could transfer them good attitudes and beliefs*." These facts show that network members were able to develop cognitive (competence) trust through the formally assigned tasks and responsibilities. On the other hand, the informal social network members and comfortable network members demonstrated affective trust. For example, PMs' informal network (in both cases) and DCs' informal network (in case A) demonstrated strong trust-based relationships. High affective trust was demonstrated through comfortable networks such as graduates from same university or family friends.

Significant norms of cooperation to govern the standard behaviour within formal business ties existed in case studies through supportive leadership. These were mainly visible at meetings and discussions in particular at weekly and monthly project review meetings at head office. During these meetings, norms such as valuing other members' ideas to arrive at a consensus decision, compulsory participation of key members, progress review presentations at meetings were revealed. Further, an atmosphere for friendly criticisms and collective approach was observed. For example, PM-B5 stated "*at meetings we can openly say our problems to others… most members views are considered in arriving at consensus decisions*" and DC-A3 mentioned "*as learning organizations, we should value all the information contributed by other people*"

Sense of identification was developed mainly when members were in same position working together. These were mainly visible in separate horizontal informal networks. For example, PMs in organisation B identified that they felt as one group of PMs when suffering from a common problem; and, DCs in organisation A mentioned that most of them had more

than ten years of working experience and felt as they were equal in experience. In addition, some members developed individual sense of identification when they were recognised, respected and valued by their management.

In terms of obligations and expectations, even though the formal obligations and expectations were arising from the organisational hierarchy, several informal obligations and expectations were also noted within the identified networks. For example, the project and H/O individuals intended to maintain informal social networks, by caring and helping their comfortable company friends while anticipating the same in return.

The next section explores how this identified relational capital within the case studies satisfied the conditions for knowledge dissemination.

Relational Capital as an Enabler of Disseminating PK

This section presents research findings on how relational capital enabled major conditions of knowledge dissemination such as accessibility to parties to exchange knowledge (AE); anticipation of value through exchange (AV); and, motivation to exchange knowledge (ME).

How Trust Enables Knowledge Dissemination?

First, case studies highlighted that network members gained increased access to the knowledge that was privately possessed by caring parties. Generally, comfortable network members gained accessibility to the knowledge possessed within its network. Some respondents described that company friends may be the first point of contact to gain, 'know how' or 'know who' for project problems. Some intended that their friends would help for sure. For example, PMs and DCs gained access to the knowledge within their informal networks. Thus, friendly relationships enhanced AE.

Second, respondents explained that project knowledge flowing along the work-orientated relationships disseminated most of the time as advices, commands or guidance. They perceived value from these disseminated knowledge to fulfil formally defined tasks. Several interviewees mentioned that they were assigning more responsibilities to their subordinates based on the competence trust. A similar view is reflected in a statement of DC-A1, "*according to my style, I trust my staff and give more chances to them. So they can try by themselves.*" Thus, by assigning network members with more responsibilities, they anticipate positive and valuable outcome from the network members, which in turn enable AV. Similarly, knowledge gained from a trustful party was treated as highly valuable. This is consistent with Whittaker et al. (2003) who note that if an individual has competence trust, they will anticipate that the exchange process will result in a valuable ending.

Third, according to the developed competence trust-based relationships, network members were motivated to share knowledge openly on assigned tasks with each other, which enabled ME. For example, the PM-B2 said, "*if we feel that this person should be aware on this knowledge to properly get the work done, we share our knowledge with him. That will directly help to develop my goodwill too*." Furthermore, interpersonal caring within comfortable network members led to willingly intervene and disseminate their knowledge to avoid others' making mistakes. PM-B5 mentioned, "*to share best practices with others, there must be a motivation in you to share. It's happening only if they are much close to you*." This

finding is consistent with Lucas (2005) who emphasised that the successful transfer of best practices is highly dependant on the willingness of employees to share. Overall, results indicate that trust and interpersonal caring lead to ME.

How 'Norms of Cooperation' Enables Knowledge Dissemination?

First, network meetings, which were governed by strict discipline on participation increased opportunities to access knowledge. Further, in case studies each PM was given an opportunity to discuss and present their work progress. This gave equal accessibility to parties to exchange project knowledge (AE).

Second, empirical data showed that the network members anticipated value of knowledge of others during discussions. Sometimes, meetings were conducted as brainstorming sessions, in order to anticipate more value contribution from the network members. The MEng-B4 stated, *"the way the meetings are carried out, give chances to improve through others' experience."* Hence, such norms of cooperation enabled AV.

Third, the strong norms of cooperation on attendance in meetings and flexibility at meetings enhanced motivation to exchange knowledge. Mainly, the role of the facilitator or leader at the meetings was highlighted. When leadership appreciated good norms of coopertion it enhanced ME.

How 'Sense of Identification' Enables Knowledge Dissemination?

Generally, employees perceived them as one group working for the company which led to anticipate value from the exchange. Many PMs in organisation B, revealed that as one group of PMs, when suffering from a common problem they used to anticipate knowledge and guidance through the informal network of PMs. At the same time, in case A, DC-A2 disclosed, "*If I know that this DC is better than me for this matter, I ask for his help. It is common in our DCs' group*." Hence, such sense of identification enabled AV. However, the empirical data did not sufficiently show how sense of identification led to AE.

As employees perceived them as one group working for the company, they were motivated to disseminate knowledge to resolve problems on behalf of the company benefit. For example, PM-B3 said, *"as company individuals, we all have one common goal it's the success of the company."*

Further, they described that if the group was challenged by the management, increased cohesion and motivation could be achieved. Hence, it resulted in increased ME. Also, recognition given at discussion or meetings led to increased ME. For example, SQS-A4 said, *"if anybody calls me and take an opinion or advice from me, I think I'm an important person in this organisation. That is my satisfaction in sharing knowledge."* Further, PM-B2 explained how ownership feeling led to increased ME, *"when you are working together you have the feeling that this is our company…our families are here…so we should help each other.*"

How 'Obligations and Expectations' Enable Knowledge Dissemination?

First, network members along the hierarchy gained access to knowledge under hierarchical order. Moreover, all knowledge sharing networks discussed before were manipulated under formal level and accessibility for such networks was entirely granted by a formal decision. Moreover empirical data highlighted that reputed knowledge receivers who valued and effectively utilised knowledge by the knowledge providers gained increased AE.

Second, empirical data showed how network members formally anticipated value across the hierarchy. Most of the respondents formally expected that subordinates will honestly reveal their failures and come with solutions and active responses.

The above instances show that there was certain positive influence to the AV through the formal expectations. On the other hand, informal obligations between caring parties led to increased AV. DC-A3 said,

> "when I'm in a problem I expect that some will contact me and help me. First I believe in my subordinates and then in my close friends [comfortable network members]."

Also, findings revealed the significant role of reputed knowledge providers in this regard. Respondents believed that reputed knowledge providers provided them with increased confidence and assurance for a better solution. Therefore they anticipated positive outcome from being engaged with such reputed knowledge providers.

Third, the findings showed how network members were formally motivated to exchange project knowledge (ME) under the formal obligations. For example, PMs stated that they were required to present their project progress and issues to superiors and other network members as a formal rule. Further, DC-A2 said,

> "formally I have an obligation in providing knowledge to others. If anyone requires knowledge from me, I'm always responsible."

On the other hand, various informal obligations that developed between caring parties lead to willingly intervene and disseminate their knowledge to their very close caring friends.

Figure 2 brings together the key research findings discussed under this section in a cognitive map. The numbering of the concepts should be ignored when reading the map as it does not represent a particular flow.

The "development of organisation capital" (appears in the centre in bold, large-sized fonts) is the main category in the map. This is divided into four sub-categories (see next level in bold medium-sized fonts): namely, high levels of interpersonal trust; strong norms of cooperation; salient sense of identification; and, strong obligations and expectations.

Each of these sub-categories is described in the next level, in cause and effect relationships, using the key case study findings that are presented in this section. Different styles are used here to identify concepts that belong to AE, AV or ME as explained by a sample in the key. Accordingly, concepts that are underlined belong to AE, concepts in bold belong to AV and concepts in italics belong to ME.

In summary, empirical study revealed that relational capital through its four facets is significantly influencing the project knowledge dissemination process by enabling three of the major conditions namely, accessibility to parties to exchange knowledge (AE); anticipation of value through exchange (AV); and, motivation to exchange knowledge (ME). There was no significant evidence to describe how relational capital satisfies the capability to exchange knowledge. The next section offers conclusions about the overall research problem.

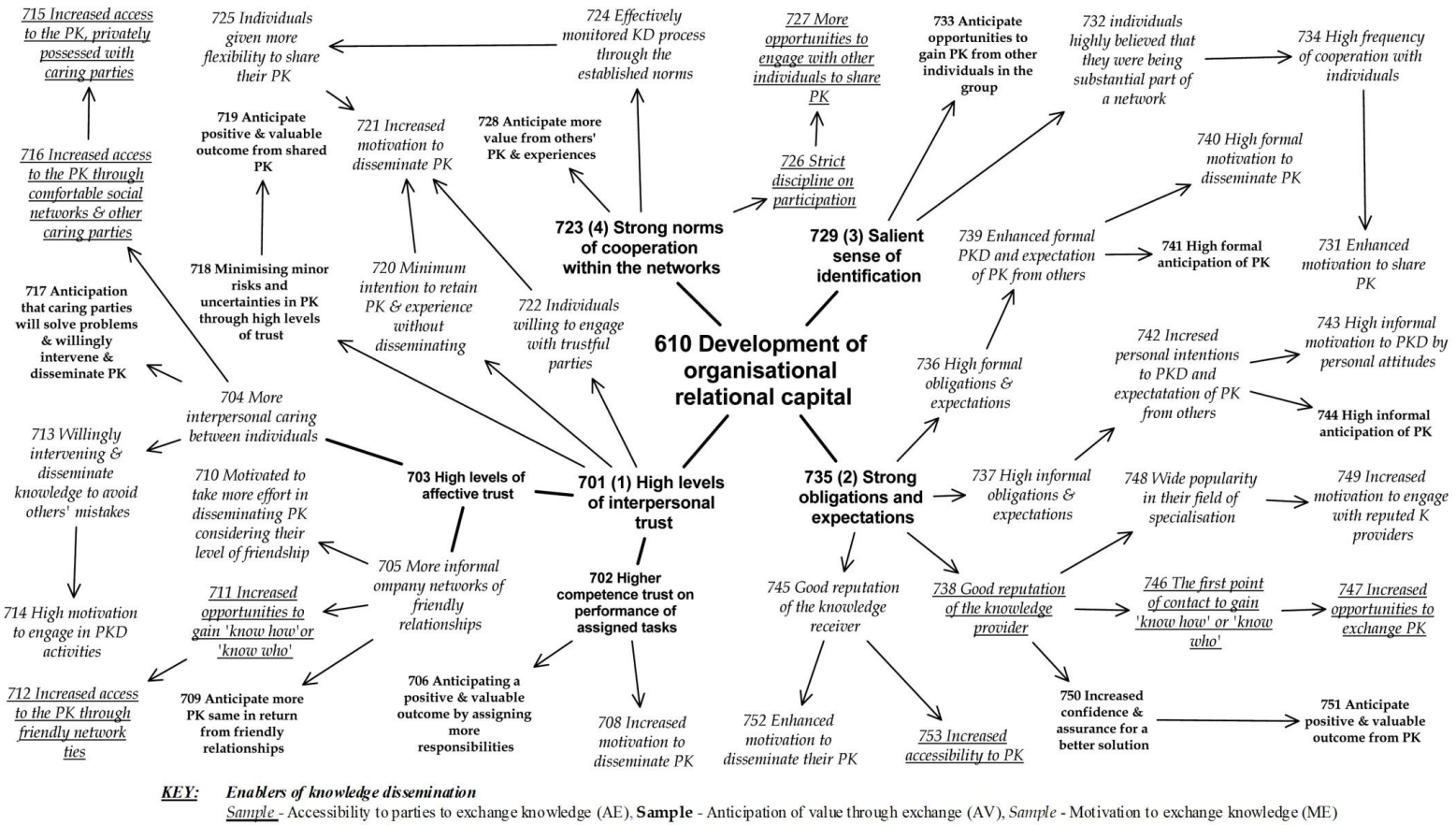


Figure 2. Cognitive map on relational capital.

CONCLUSION

The aim of the study was to investigate how relational capital could be used as an effective enabler in disseminating project knowledge within construction organisations to improve organisation performance and learning. Accordingly, the research conducted two case studies on construction organisations in Sri Lanka that represented good practices of building networks and relational outcomes.

The overall results show that organisational relational capital (through its four key drivers namely: trust; norms of cooperation; sense of identification; and, obligations and expectations) could effectively enable the project knowledge dissemination within construction organisations. This knowledge dissemination happens through trust; norms of cooperation; sense of identification; and, obligations and expectations that is built through the formal and social networks.

Mainly, social ties which were developed by the relational capital amongst project and head office individuals in the studied construction organisations, nurtured four types of invisible informal social networks namely: project managers' informal network; divisional coordinators' informal network; comfortable social networks; and informal company networks. These identified informal social networks play a key role in disseminating project knowledge by enabling their relational capital. Such strong social networks demonstrated high levels of interpersonal trust along with certain norms of cooperation, sense of identification and formal/informal-obligations and expectations. These, in turn, offered accessibility, motivation and value to parties to engage in effective knowledge dissemination.

All in all, this study has linked relational capital with knowledge dissemination within construction project context and offers useful implications for construction organisations as described below.

- *Strengthen valuable relationships between project and H/O individuals*: It is important to effectively identify and efficiently utilise project and H/O individuals' project knowledge through formal and informal relationships. Therefore, the middle level managers such as project managers in construction organistaions need to know 'who knows what' through their prior experience and relationships. Further, construction organisations should be educated to recognize, value, strengthen and preserve strong relationships, in particular the informal social networks, between project and H/O individuals. They could encourage network leaders and other higher level managers to build trust by showing trustworthiness and delegating responsibilities. Organisations could further consider efficient rewarding system to encourage effective PK sharing through between network members.
- *Reuse developed strong network ties especially for project knowledge (PK) dissemination:* Organisations should identify business networks that possess specialised construction experience and take necessary actions to such PK to wider audience. For example, project individuals involved in a specialised project can be used in training sessions. Strong social networks can be identified and used by the top managers for PKD purposes. For example, horizontal informal social networks of project managers' and divisional coordinators' indentified in the cases can be formally assigned with specific PKD obligations.

- *Provide time and space for frequent interaction between project and H/O individuals*: The available formal business ties should enable equal opportunities for all project and H/O individuals to interact in order to share their PK within a formal context. For example, some site QSs or engineers could be provided with opportunities to participate for several H/O meetings even though they were not formally required. Further, construction organisations should facilitate more time and space for formal interaction between project and H/O individuals. On the other hand, organisations should consider expanding frequency of social events to nurture more social ties within the organisations.
- *Promote reputed PK providers within the organisation*: Similar to promoting business and social networks, construction organisations should identify and promote reputed PK providers. For example, organisations can promote identified list of highly experienced and specialised construction professionals for various aspects within the organisations. Further, Organisations should facilitate formal opportunities for project and H/O individuals to interact with such reputed PK providers.

All in all, the research findings offer useful implications for construction organisations in identifying and strengthening such strong social ties for better dissemination of project knowledge. It is hoped that these research findings can be generalised to other traditional construction industries in similar settings. However, more studies are required to compare and contrast the above findings in different contexts.

REFERENCES

Anumba, C. J. (2009). Towards next-generation knowledge management systems for construction sector organizations - Editorial. *Construction innovation, 9*(3), 245-249.

Athanassiou, N. A., and Maznevski, M.L. (2002). "Top management team social capital, tacit knowledge and the internationalization of the multinational corporation". *In Proceeding of the 3rd European conference on organisational knowledge, learning and capabilities (OKLC 2002)*, (pp. 1-3). 5-6 April 2002, Athens, Greece.

Barlow, J., and Jahapara, A. (1998). Organisational learning and inter-firm 'partnering' in the UK construction industry. *The learning organisation*, *5*(2), 86-98.

Bresnen, M., Edelman, L., Newell, S., Scarbrough, H., and Swan, J. (2003). Social practices and the management of knowledge in project environments. *International journal of project management*, *21*, 157-166.

Bresnen, M., Edelman, L., Newell, S., Scarbrough, H., and Swan, J. (2005). Exploring social capital in the construction firm. *Building research and information*, *33*(3), 235-244.

Brookes, N. J., Morton, S. C., Dainty, A. R. J., and Burns, N. D. (2006). Social processes, patterns and practices and project knowledge management: A theoretical framework and an empirical investigation. *International journal of project management*, *24*, 474–482.

Carrillo, P. (2004). Managing knowledge: Lessons from the oil and gas sector. *Construction management and economics*, *22*(6), 631-642.

Chinowsky, P. S., Diekmann, J., and O'Brien, J. (2010). Project organiations as social networks. *Journal of construction engineering and management*, *136* (4), 452-458.

Cousins, P. D., Handfield, R. B., Lawson, B., and Petersen, K. J. (2006). Creating supply chain relational capital: The impact of formal and informal socialization processes. *Journal of operations management, 24* (6), 851-863.

Ding, Z. K., Ng, F. F., and Cai, Q.Y. (2007). Personal constructs affecting interpersonal trust and willingness to share knowledge between architects in project design teams. *Construction management and economics, 25*(9), 937-950.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review, 14*(4), 532-550.

Faraj, D. B. I., Jarvis, P., and Anumba, C. (1999). Managing and exploiting knowledge assets in the construction industry. Construction informatics digital library. Available from: http://itc.scix.net/papperw78-1999-2419.content.

Glaser, B. G., and Strauss, A. L. (1967). *Discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.

Gieskes, J. F. B., and Broeke, A. M. (2000). Infrastructure under construction: Continuous improvement and learning in projects. *Integrated manufacturing systems, 11*(3), 188-198.

Hansen, M. T., Nohria, N., and Tierney, T. (1999). What's your strategy for managing knowledge. *Harvard business review, 77*(s), 106-116.

Hoffman, J., Hoelscher, M., and Sherif, K. (2005). Social capital, knowledge management and sustained superior performance. *Journal of knowledge management, 9*(3), 93–101.

Inkpen, A. C., and Tsang, E. W. K. (2005). Social capital, networks and knowledge transfer. *Academy of management review, 30*(1), 146-165.

Kamara, J.M., Anumba, C.J., Carrillo, P.M., and Bouchlaghem, N. (2003). Conceptual framework for live capture and reuse of project knowledge. Construction informatics digital library. Available from: http://itc.scix.net/papperw78-2003-178.content.

Koskinen, K. U. (2003). Evaluation of tacit knowledge utilization in work units. *Journal of knowledge management, 7*(5), 67-81.

Kramer, R. M., Brewer, B., and Hann, B. (1996). Collective trust and collective action: The decision to trust as a social decision. In R.M. Kramer, and T.M. Tyler (Eds.), *Trust in organizations, frontiers of theory and research* (pp.357-89). Newbury Park, CA : Sage Publications.

Lang, J. C. (2004). Social context and social capital as enablers of knowledge integration. *Journal of knowledge management, 8*(3), 89-105.

Leonard-Barton, D. (1995). *Wellsprings of knowledge*. Boston: Harvard Business School Press.

Lucas, L. M. (2005). The impact of trust and reputation on the transfer of best practices. *Journal of knowledge management, 9*(4), 87-101.

Manu, C., and Walker, D. H. T. (2006). Making sense of knowledge transfer and social capital generation for a Pacific island aid infrastructure project. *The learning organisation, 13*(5), 475-494.

Mayer, R. C., Davis, J. H., and Schoorman, F. D. (1995). An integrated model of organizational trust, *Academy of management review, 20*(3), 709-735.

McAllister, D. J. (1995). Affect and cognition-based trust as foundations for interpersonal cooperation in organisations. *Academy of management journal, 38*(1), 24-59.

Miles, M. B., and Huberman, A. M. (1994). *An expanded sourcebook - Qualitative data analysis*. USA: Sage Publications.

Munns, A.K. (1995). Potential influence of trust on the successful completion of a project. *International journal of project management, 13*(1), 19–24.

Nahapiet, J., and Ghoshal, S. (1998). Social capital, intellectual capital, and the organisational advantage. *Academy of management review*, *23*(2), 242-266.

Nonaka, I., and Takeuchi, H. (1995). *The knowledge creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.

Senaratne, S., and Sexton, M. (2008). Managing construction project change: A knowledge management perspective. *Construction management and economics*, *26* (10-12), 1303-1311.

Starbuck, W.H. (1992). Learning by knowledge intensive firms, *Journal of management studies*, *29*, 713-740.

Styhre, A. (2008). The role of social capital in knowledge sharing: The case of a specialist rock construction company. *Construction management and economics*, *26*, 941-951.

Swan, J. (1997). Using cognitive mapping in management research: Decisions about technical innovation. *British journal of management*, *8*, 183-198.

Winch, G. (2002). *Managing construction projects*. London: Blackwell science ltd.

Whittaker, J., Burns, M., and Beveren, J.V. (2003). "Understanding and measuring the effect of social capital on knowledge transfer within clusters of small-medium enterprises". *In Proceedings of the 16th annual conference of small enterprise association of Australia and New Zealand",* 28 September - 1 October 2003, University of Ballarat, Ballarat.

Yin, R. (1994). *Case study research: Design and methods* (2nd edition). London: Sage Publications.

BIOGRAPHICAL DETAILS

Dr. (Mrs.) Sepani Senaratne

Sepani is a senior lecturer in the Department of Building Economics, Faculty of Architecture, University of Moratuwa, Sri Lanka. She is currently the director of postgraduate research studies at the faculty and the coordinator of the department's research unit. She obtained a First Class Honours in BSc in Quantity Surveying and also has a PhD from the Research Institute for the Built and Human Environment (BuHu), University of Salford, UK.

Mr. Kushan Balasuriya

Kushan was a research student of the Department of Building Economics, Faculty of Architecture, University of Moratuwa, Sri Lanka. He has a first class in B.Sc. Quantity Surveying and is currently practicing as a quantity surveyor in Middle East.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 8

A QUAL-QUANT (Q^2) METHOD FOR EXPLORING AND APPRAISING PROJECT MANAGEMENT COMPETENCY REQUIREMENTS FOR MANAGING LARGE PROJECTS IN GHANA

R. Dogbegah[1], K. Omoteso[2] and D. Owusu-Manu[3]*

[1,2]Leicester Business School
De Montfort University, Leicester, United Kingdom
[3]Department of Building Technology
Kwame Nkrumah University of Science Technology
Kumasi, Ghana

ABSTRACT

This research aims to explore project management competency requirements specific to managing large and complex projects in the context of the Ghanaian construction industry. It adopted a Focus Group Discussion to identify eighteen core project management competency areas (PMCAs). A structured survey questionnaire was then administered to one hundred project managers to elicit relevant data (on these PMCAs) that were analysed through the chi-square test of hypotheses. The study's findings identify important competency profiles that can be mapped and customised towards improving workplace learning and training requirements of project managers in Ghana and, perhaps, other developing countries.

Keywords: Competency, Focus Group, Large Projects, Project Management, Qual-Quant

* Corresponding Author: Dr. De-Graft Owusu-Manu, Department of Building Technology Kwame Nkrumah University of Science Technology, P.O Box UP 629, KNUST-Kumasi, Tel.: +233 (0) 51 60311; Email: degraft2000@yahoo.com.

INTRODUCTION

The evolution of Project Management as an academic field has traditionally conformed to the Lateral Curriculum Philosophy that assumes few courses in advanced concepts, terminal in nature and continued professional development-based (Alter and Koontz, 1996). For instance, Caupin et al. (2006) and Helgadottir (2008) examined the International Project Management Association Competence Baseline definition and argued that project management competency requirements assume three interrelated areas mainly: contextual, technical and behavioural. These interrelated dimensions of project management competencies have assumed prominence in project management literature. In order to meet specified performance within cost, time and quality, the focus of project management educators, researchers and practitioners have traditionally been directed to an intensive search for new and better methods of fulfilling these three competency requirements (Helgadottir, 2008). As a result, there are a number of accredited Ghanaian academic institutions now collaborate with recognized world class institutions such as Project Management Institute, Association of Project Management and International Project Management Association to offer project management training and capacity building programmes to individuals employed in the construction industry.

A cursory observation of the training content and modules of these project management institutions indicates an inclination to the competency areas mentioned by Caupin et al. (2006) and Helgadottir (2008). However, project managers' competencies in handling construction projects to achieve desired deliverables, budget and quality have been questioned in the context of the Ghanaian construction industry (Ahadzie, 2008). This underscores the findings of the studies that have reported untimely completion of projects, sub-optimal workmanship, cost-overruns, delay in honouring certificates, exorbitant variations and fluctuations in the context of developing countries (Sambasivan and Soon, 2007; Olatunji 2008). Typical with most developing countries, project management education has constantly been modelled on the experiences of the developed countries without due recognition of the possible "contentual" and "contextual" differences.

Surprisingly, up till the end of the 20th century, most of the literature on project management competency was reported to be relevant to the developed countries (Low and Ben, 1999). However, a recent study by Crawford (2005) has shown that project management practices differ across geographical regions and applications areas. This suggests that, in developing professional qualification and academic programmes for project managers, the contentual and contextual dimensions of the training should be considered within the framework of the various knowledge constructs identified in the literature; and also in the light of the recommendations by Crawford (2005).

Drawing on from this, there is therefore the need for project-based organisations in the construction industry in developing countries to also strive towards establishing the appropriate measures, which are in tandem with their technological, socio-economic, structural and cultural practices. The contribution of Project Managers (PMs) towards achieving effective managerial performance on project delivery has also recently been heightened (Ahadzie et al, 2009). Furthermore, the problems hindering project management education and practice in Ghana remain unknown. Thus, this research is founded on the contention that, if the performance of PMs of large construction firms is to be relevant in the

construction industry in developing countries, then the underlying competencies and competency requirements that would help project managers to articulate their strategies within the overall business process need to be identified. Identification and development of appropriate performance measures could therefore enable PMs operating in Ghana to have a clear understanding of the important skills they should acquire towards improving their own professional development. It is hoped that the findings would be beneficial to other emerging sectors of the Ghanaian construction industry particularly in respect to the future development of appropriate project management curriculum. While the study is unique to Ghana, there is also the potential that many project-based sectors of the construction industry in developing countries will find the findings useful towards the advancement of improved project management practices due to similarities in their technical, socio-economic and cultural practices.

In sum, the prime aim of this research is to explore, identify and prescribe key project management competency domains for PMs' capacity building in Ghana. The rest of the paper follows the following order: Section 2 contains a review of previous studies with a view to draw out research questions capable of filling some of the existing research void. Section 3 discusses the adopted methodology used in collecting and analysing primary data for the study. Sections 4 and 5 focus on qualitative and quantitative data analyses respectively. Section 6 highlights the implications of the study's findings for project management while the last section contains conclusions and recommendations based on the findings of the study.

LITERATURE REVIEW

Contextualising Project Managers' Functions

While the central role being played by Project Management and PMs in the success of various organisations is widely recognised in the construction industry, it is interesting to note that the interpretation of the title itself is often far from agreement (Ahadzie, 2007: p.28). In some instances, the term has been used to describe persons or entities that monitor, oversee and/or provide broad supervision on projects (Morris, 2003). Some researchers have also attempted to provide an alternative understanding by distinguishing the roles of the PM from that of, say, a project coordinator. However, the same researchers have acknowledged that the distinction can be very thin depending on the roles assigned and prevailing (Ahadzie, 2007: p.27). More recently, Jha and Chandrashekhar (2006) also attempted to provide some further insights and reported that, generally, the term PM, project coordinator, construction manager, project administrator and project controller are often used interchangeably. As this debate continues, one critical issue that cannot be overlooked is the suggestion that the title should be used for one who exercises total authority and also accepts full responsibility for the management of projects (Jha and Chandrashekhar, 2006). Equally, Ahadzie, (2007: p.28) contends that it is important to focus on what the PM does rather than what should be the precise definition or title, as this holds the key to achieving project objectives.

Ahadzie (2007) further argues that if there should be any definition at all, such a definition should uphold the principles of project management, which is to consider the interests of the client as a priority. However, given that stakeholder interest is gradually replacing the traditional client focus, PMs are faced with not only playing the role to satisfy

the traditional single client but also "multiple clients" whose diverse interests also have to be satisfied. The role of a PM involves considering various aspects of planning, coordinating and controlling of project. These roles can be categorised into two: one is the core role of a PM (activity planning, creating charts scheduling, risk analysis and control) and the other role is the general role played by the PM dealing with the project teams and other subsidiary tasks which are essentially performed by all managers (Lei Seng and Skitmore, 2005). It is important to discuss the responsibilities of the PM whilst discussing the role of project management as an efficient tool to tackle complexities and uncertainties in projects.

Conventionally, PMs are responsible to key project stakeholders which include the client and the project team. Performing responsibilities towards each of this stakeholder group is essentially a core and vital role of the PM. For instance, the project manager is expected to keep the senior management of the organisation informed about the project status at all stages, including the problems anticipated, chances of running over budget or being late in completion of the project. Likewise, the PM is responsible towards the project team by ensuring that their integrity is maintained even in the case of conflicting demands made by the other stakeholders with legitimate interests. At the same time, the manager is expected to ensure the quality, dimensions and other specifications of the client.

On the other hand, the PM's role in the project team varies with the nature of the team. The PM's contribution in the project specialized team will be different from his contribution in other functional teams. Several authors have argued that it is crucial for the PM to help project workers with the transition of work or new projects (Hayes, et al. 2000; Crawford, 2005). The project worker tends to pay more attention towards their own career as the project nears completion, leading to non completion of project on time. Hence, the manager should be aware of this and help in the transition process. With the advent of agile projects combined with increased modern complexities and uncertainties, the role of PM has become more intense and challenging. The PM has to perform the role of a risk manager along with the other project management roles s/he performs (Atkinson, et al. 2006).

The Contention of Project Management Competency

Whiddett and Hollyforde (2003) acknowledge that definitions for competency are hard to find in literature perhaps Gale (2007) offer a valid reason why it is difficult to find a universal definition for competency by arguing that competency is a normative concept and not a descriptive concept but Gale (2007) went further to describe competency as with the capacity to undertake specific types of actions, and it can be considered a holistic concept involving the integration of attitudes, skills, knowledge, performance, and quality of application. In a practical view, Parry (1998) defined competency as "A cluster of related knowledge, attitudes, and skills that affects a major part of one's job (i.e., one or more key roles or responsibilities); that correlates with performance on the job; that can be measured against well-accepted standards; and that can be improved via training and development.

Wood (2009) defined competence as the goal to manage competence in an organization involves identifying a set of highly desirable attributes that can positively influence desired organizational outcomes. Wood (2009) further pointed out that researchers and practitioners are interested in creating competency models that are used for hiring, retention, and training practices to improve the quality of the organizational workforce; it is in meeting this desire

that most common definition in literature consist of skills such as technical, social or interpersonal, and cognitive or problem-solving that, ideally, can be measured and improved over time. Project management competency can be viewed in several angles, for instance the Queensland University of Technology(QUT, 2010) identified organizational project management competency theme to consist of education initiatives for senior management and certification for Project Board members. The QUT (2010) conceded that these are really part of a strategic feature that draws support from other project management themes.

In an empirical study, Barry (2005) clearly pointed out competency characteristics to include motives, self-concept, knowledge, skill, business, personal, interpersonal, management, and project management objectives. Barry (2005) further made an interesting revelation on project management competencies in which Barry (2005) contended that it is more difficult to measure some aspect of project management competencies namely leadership skills; Barry (2005) clearly suggested that these skills are observed through practice and cannot be directly measured in the sense of determining whether or not a person has them and to what degree. According to Barry (2005) those competencies that cannot be measured largely consist of personality traits which are mostly due to innate culturally or by hereditary, these traits are difficult to develop through training.

In another perspective Taylor (1998) also advocated project management competencies to be categorized under personal characteristics consisting of being flexible and adaptable, possessing and exhibiting initiative and leadership, being confident and persuasive, possessing verbal fluency, possession of ability to balance technical and human components of a project, problem-solving and decision-making capability, and good time management skills; behavioural characteristics namely leadership, mentoring others, negotiations, strong interpersonal skills, and the ability to communicate effectively; general business skills consisting of the understanding of organizational culture and organization's core business; understanding marketing, change control, contracting, purchasing, law, personnel administration, and the general concept of profitability; understanding the concept of direct and indirect cost allocation; and knowing how to transmute business requirements into project system requirements; and technical skills comprising of being knowledgeable in the field, but a generalist with broad awareness of supporting engineering and scientific principles, technology, human relations, management, and communication skills. Barry (2005) affirmed that the professional competence is paramount in the management of projects successfully especially in recognition of the emerging trends in project management and with the fact that many projects commissioned ends up as failure. In a similar manner the, the views of Kerzner (2000) are worth considering at this instance that current trends in project management does not demand only technical competence but equally important to possessing powerful project management competence is the understanding of technology rather than being a technical expert. In consonance with Kerzner (2000), the Project Management Institute(PMI, 2000) advocates that certain general management competencies are needed for successful project execution; these management competencies consist of leading, communicating, negotiating, problem solving, and influencing the Organization. According to Pierce (1994) jobs consist of deliverable outputs which are occupationally specific job-task competencies with underlying abilities as behavioural competencies.

In an empirically derived model, Rubin and Dierdorff (2009) categorize managerial competencies as managing decision-making processes which comprises of getting information; judging the qualities of things, services, or people; managing human capital

consisting coaching and developing others; resolving conflicts and negotiating with others; developing and building teams; managing strategy and innovation involving thinking creatively; developing objectives and strategies; provide consultation and advice to others; managing the task environment consisting of communicating with persons outside organization; establishing and maintaining interpersonal relationships; selling or influencing others; managing administration and control which comprises evaluating information to determine compliance with standards; documenting or recording information; performing administration activities; and managing logistics and technology inspecting equipment, structures, or material; controlling machines and processes; interacting with computers. According to Brannick et al. (2007) competencies are conceptualize in terms of the activities and personal attributes in relation to discharging specific duties of an occupation.

Again Cheng et al.(2005) contends that the understanding of the competency for a particular role is important for the identification of the areas of work that is job-task competencies managers need to be competent together with the behavioural competencies that they need in order to be effective. Similarly, Boyatzis (1997) opined that for the understanding of the attributes that a person brings to work there is the need to distinguish not only the competency type but the level of the competency displayed. Additionally, in their research Cheng et al. (2005) contended that behavioural competenciy is the basis for distinguishing superior managers from average managers; and that this differentiation is possible through the identification of behavior. The job-task model is suitable for the construction industry while the behavioural competency is generic in nature (Cheng et al., 2005). In an empirical research, Cheng et al. (2005) found twelve competencies that distinguish mangers to include achievement orientation, initiative, information seeking, focus on client's needs, impact and influence, directiveness, teamwork and cooperation, team leadership, analytical thinking, conceptual thinking, self-control and flexibility. According to Wood (2009) much of the contentions concerning project management competency revolve round the inclusion of personal innate characteristics such as attitude and personality. For instance, Northouse (2004) developed a skills-centric model which wholly considered a person's problem-solving skills, social judgment skills, and knowledge, but neglects individual attributes such as cognitive ability, motivation, and personality outside the competency definition. Wood (2009) argued that attitudes included in Parry model of competence are not included in Northouse model because they are not traits that are acquired through training or experience yet on the contrary, the Northouse model considered social component involving the skills necessary to work with others to solve problems, garner support for change, and understand underlying human environment of an organization.

The most striking contention or confusion surrounding project management competency is demonstrated in Pellegrinelli and Garagna (2010) in which they contended that those responsible for selecting project managers have desperate sources draw on. Pellegrinelli and Garagna (2010) further argued that a key problem is the untangling trait attributes and taking decision on what to do with other factors such as values and motivations. Pellegrinelli and Garagna (2010) contend that project competency must commensurate the complexity of projects to be executed; Pellegrinelli and Garagna (2010) pointed out that a project manager who is able to manage a less, easier project may not be competent to manage a harder, more complex project.

Ahadzie (2007: p.34) reports that there is confusion over the use of the term competency in construction management research. It is therefore important to put the meaning of the term

in context before taking this study further. Cheng et al. (2003) have identified two interpretations in the use of the term "competency" stemming from the US and UK perspectives. The US perspective defines competency as the underlying attributes of a person - largely an input-based methodology. In contrast, the UK perspective sees competency as a set of performances and standards often linked to output-based measures (i.e. competence). An existing review of literature by Brophy and Kiely (2002) also revealed three main positions taken towards the definition of the terminology, attributed mainly to observable performance, the standard or quality of the outcome of the person's performance and the underlying attributes of the person. To this effect, it is common to find in the literature that the terms competency and competence are often used indiscrimately as a synonyms (Dainty et al., 2004).

In the opinion of Cheng et al. (2003) and consistent with recent findings by Ahadzie et al. (2009), the divergent interpretations adopted by the US and the UK have largely led to confusion in the definition of the terminology. Nevertheless, following the increasing attention that competency-based approaches are gradually receiving in construction management research, it is now becoming clear and accepted that competency is best used to describe input-based measures (Low and Ben, 1999) rather than an externally or output-based measure (Dainty et al, 2004). There is now a general acknowledgement by HRM researchers that, the term competency should be defined as a person related concept that refers to the dimensions of behavioural action as against competence which is a concept related to some output-based measures (Ahadzie, et al. 2008).

Drawing on from the above, it has been demonstrated that universal definition for project management competency are hard to find in literature; those that exist are divergent. Project management competency has been defined to suit the perceptions, opinions and circumstances at a particular period of time. In spite of the non-uniformity in the definition of project management competency; there exist some level of similarity in the determination of skills that constitute the components of project management competency. Numerous literature have identified project management competency skills to include flexibility, adaptability, verbal fluency, mentoring ability, general business skills, leadership skills, technical skills, management skills, technology comprehension, negotiation; this list is endless as project circumstances will require which project management competency skills to use. Literature also demonstrated the use of competency skills to differentiate job titles especially senior project managers from junior project managers. For instance competency skills such as achievement orientation, initiative, information seeking, focus on client's needs, impact and influence, directiveness, teamwork and cooperation, analytical thinking, conceptual thinking, self-control and flexibility are all used to distinguish senior managers from juniors. It is possible that a junior manager may possess these skills or in another vein a manager may not possess these skills but will deliver complex projects that senior managers are not able to deliver. Thus, this practice is unfair in the sense that possession of skills alone should not be the basis for the differentiation of job titles but the task accomplishment must be one of the paramount criteria that should be used in this differentiation.

Again, there is evidence of efforts on competency-based measures for PMs within the contexts of large projects (Ahadzie et al., 2008a; 2009); continuing education in project management with reference to the sub-contracting industry (Alter and Koontz, 1996); qualities of a good PM (Cheng et al., 2005; Jha and Chandrashekhar, 2006); senior management perceptions of project management competence (Hayes, et al., 2000 ;Crawford,

2005); performance measures/models for construction PMs (Dainty et al., 2003; 2004; 2005); the impact of corporate strengths/weaknesses on project management competencies (Isik, et al., 2009). Furthermore, similar previous works on PM competencies and skills have been carried out in different parts of the world. These include Singapore (Ling, 2003); Australia (Lei-Seng and Skitmore, 2005) and Ghana (Ahadzie, 2007).

In spite of the novel attempts to develop an acceptable concept for project management competency; there exist contentions that must be addressed. The contentions concerning the formulation of a workable definition for project remains one of the tasks that must be addressed. In this light, it is therefore pertinent to address this gap by formulating a universal definition for project management competency. Similarly, developers of project management competency models disagree on which competency skills to include in these important models. For instance, the Northouse competency model does not the competency attitudes in Parry model. Hence much of the contentions here revolve round the inclusion of personal innate characteristics. The understanding of the competency needed for a particular job-task is also a missing link since these competency skills are variedly defined to suit different situations for a particular project.

Equally contentious is the numerous desperate sources those seeking to select project managers draw on in their bid to hire project managers. Project management competency must commensurate the level of complexity of projects. Project managers can manage projects that are suitable to their ability. The question is "what level of competency is required for a particular type of project in order to successfully execute the project to the satisfaction of all project partners?" Literature has demonstrated the over concentration on project management competency skills to the neglect of measuring the or assessing the level of competency required for a particular project. With such a paucity of literature on project management competency skills assessment or measurement, it is pertinent to address this gap; it is in this vein that the use of a robust qual-quant approach is novel and significant for this study as far as construction projects are concerned.

RESEARCH METHODOLOGY

A mixed methodology involving qualitative and quantitative (QUAL-QUANT or Q-squared) approach was adopted in eliciting the relevant data from project managers in the Ghanaian construction industry. A mixed method of a Focus Group Discussion (FGD) and questionnaire administration was adopted because it will make the study more robust due to a variety of factors. These include the higher number of participants, the observer's independence, the quality of the data obtained, the ability to evaluate facts quantitatively and qualitatively and respondents' independence (Easterby-Smith et al., 2002). According to Easterby-Smith et al., this method of data collection prevents the research from being method-bound as the method combines the strengths of both approaches (qualitative and quantitative) as well as off-setting the deficiencies of one approach with the other's strengths.

The literature review identified appropriate theoretical framework and project management competency knowledge areas for this study. The review was followed by FGD using professional PMs and project management researchers to verify the known competencies and explore new domains which have not been given expanded view in the literature. Subsequently, a self-administered structured survey questionnaire was used to

collect primary data based on the insights obtained from the literature and the results from the FGD.

The focus group consisted of 12 participants excluding the moderator (i.e. one of the researchers) and a hired professional secretary to take and transcribe the minutes of the meeting. Three (3) of the participants were drawn from academia who have substantial experience in project management, curriculum development and educational psychology. Five (5) other participants were seasoned project managers (PM's) drawn from top construction firms in Ghana (PMs from contractors' perspective). The major commonalities of this category of participants is the fact that each member of the group has had an opportunity to enrol in a formal training in project management; have worked on many large and complex project in the past; and have had over 10 years involvement with project management practice where they were able to relate practical knowledge to the PMC development process.

Two (2) other project managers were drawn from the consultants' group. The unique attributes of these PMs are that each has obtained Architectural and Quantity Surveying first degrees with advanced qualifications in project management; substantial experience in supervising and managing large contractor groups on complex projects; and had previous experience working in the contractors outfit. The remaining two (2) participants of the group were drawn from the clients' group that has had project management experience working with several other PMs. One of the researchers has for many years been the CEO of a leading construction firm in Ghana and this was instrumental to securing the participation of the FGD members. The assemblage process of the focus group panel members commenced in early June 2009. The panel members were contacted through series of informal discussions and prior contacts on issues relating to project management education which triggered their interest.

The FGD started with the moderator welcoming the participants to the meeting and introducing the agenda of the meeting to them. Emphasis was laid on the fact that the goal of the discussion was to know what each participant thinks about the subject and that there were no right or wrong answers in the discussion. The rationale was to form common opinions that will aid the identification of PMC for PMs in large construction firms in Ghana. Each member, however, was entreated to: feel free, be frank and share viewpoints, regardless of other members' position on the subject. Guidelines for the discussion were also outlined after which printed open-ended questions together with notepads and pens were distributed to the participants. Participants were informed that the session will be recorded by both electronic (video) and manual media (note taking). Altogether, the FGD lasted for about 3 hours with intermittent breaks for refreshment.

Data obtained using the questionnaire approach is limited to the written responses of subjects to pre-arranged questions. Once the survey questionnaires were drafted, they were discussed with few project management researchers and small number of respondents having characteristics similar to those of the target group of respondents. This helped to re-design the questionnaires, making it more consistent and focusing it on strategic issues. The format of the questionnaires was guided by considerations of appeal to respondents and ease of reading. Similarly, the number of questions in each set was kept low as much as possible to encourage respondents to take their time in answering the questions. The questionnaire was designed to include; closed-ended questions and scaled-response questions.

The closed-ended questions were used to save the respondent time and effort in supplying the required data. The questionnaires consisted of four (4) groups of questions. The motives of the first two groups of questions were to determine the PMs' experience and professionalism. In the last two group of questions, respondents (PMs) were asked to respectively rate the relative importance of the 18 PMCA (which were generated through the FGD) and their proficiency in those variables on a Likert response scale of 1-5. The rating involved the respondents to decide whether the variable is "Not Important (1)", "Less Important (2)", "Quite Important (3)", "Important (4)" and "Very Important (5)"; and Not Proficient (1)", "Less Proficient (2)", "Quite Proficient (3)", "Proficient (4)" and "Very Proficient (5)" respectively.

Considering the geographically dispersed nature of large construction firms in Ghana, the questionnaires were personally administered via face-to-face and through the emails of some of the project managers; and with the help of two trained research assistants. This approach was chosen because it was suitable to the exploratory nature of the research and the main advantages of this approach lie in the fact that it enhances the response rate and being cost effective. The main disadvantages of the face-to face administering are inherent in the geographical limitations of the survey and the vast resources needed if such surveys are to be carried nationally, making it more expensive and time consuming (Frazer and Lawley, 2000).

The questionnaires were pre-tested using few samples of project managers in Ghana. After the questionnaire was pre-tested, it was revised based on the feedback received from them and finally administered. The questionnaires were randomly distributed to 100 PMs selected from these large construction firms in Ghana. Out of the 100 questionnaires distributed to the PMs, 54 were returned, completed and were used in the analysis, representing 54 percent of the response rate. The relative high response rate of 54 percent could be attributed to the strict adherence to the techniques employed in distributing the questionnaires and the approach by which the field survey was conducted. The whole survey process took approximately 4 weeks to be completed.

EXPLORING PROJECT MANAGEMENT COMPETENCIES USING FOCUS GROUP DISCUSSION

In order to understand the relevance of project management competencies in project outcomes and project success, it was important to provide an understanding into the terminology of project; what constitutes large construction projects and definition of project success to position the research in an appropriate context.

A member of the panel asked a question about the contextual meaning of a "project" and what constitutes "large projects" since the research intends to explore project management competencies for PMs working on large construction projects.

This question triggered a lot of interest by panel members. The premise for the discussion was that "it is possible that PMs would need special skills to handle a large project that involves several stakeholders and cost several million dollars than a relatively smaller project". It is therefore important to contextualise the definition of project and what

constitutes large construction projects. This would then provide insights into the various project management competencies required by project mangers in the context of Ghanaian construction industry. In exploring the meaning of a "project" a member of the panel who has several years experience working as project management consultant indicated that "a project may be defined as any series of activities and tasks that have a specific objective to be completed within certain specifications, have funding and time limitations and consume resources". This definition provided was consistent with earlier propositions by Kerzner (2001).

The next task was to contextualise the meaning of "large project" following the lead question posed by the panel member. During the discussion, one member who has several years of experience in managing projects for both public and private sector clients in Ghana and abroad explained that the distinction between large and small projects are often subjective and sometimes may be misleading. The emphasis was that, for instance, a "large project" in one context may be a "small project" in another context and vice versa. Another member supported this and cited an example that a large project in developing country like Ghana may be a small project in a developed country such as the United Kingdom. This contention tallies with the view of Kerzner (2001) who believed that there seems to be no universally accepted definition of the term 'large project' or 'project complexity' in the construction industry.

In recognition of this, however, another member of the FGD indicated that although an implicit definition of large project may not exist universally, but somewhat there should be boundaries for consideration when discussing issues on project size. The member further pushed forward his argument by stating that large construction projects are often referred to as being complex. Further to this point, it was mentioned by the moderator of the panel that: the definition of a complex or large construction project should refer to the interaction, interdependencies and interrelationships between parts of a project and that the greatest deal of complexity lies within the organisational aspects of a project. Majority of the panel members agreed with this view.

Another interesting question was put forward by a panel member; and that had to do with whether there is a distinction between a "large project" and a "mega project"? There were divisions amongst the responses provided by the panel members. Whilst some held the view that the terms large project and mega project are used interchangeably, and they have the same contextual meaning; others held opposing views. For instance, as indicated by Warrack (1985; 1992), a mega project usually is defined by absolute size, and the size criterion here is set at $1 billion (Sykes, 1990; Flyvbjerg, 2005). Elsewhere, Warrack (1992) argues for a relative rather than absolute size definition; thus, in some contexts, a $100 million size could constitute a mega project.

As the discussion proceeds, a panel member drew the panel's attention to the fact that differentiating large/mega projects from smaller projects based purely on financial terms whether absolute or relative may not be sufficient to define the competency requirements for project managers. Surprisingly, this suggestion by the panel member was vastly supported by other panel members as members tried to define the premise for understanding complexities of large/mega projects, and how these large/mega projects could be effectively managed within the context of project management genre. Subsequently, panel members reached a consensus by identifying the characteristics of large/mega projects that define both relative and absolute nature of large/mega projects. Quite a deviation from the financial definition as noted earlier by previous authors, among others, panel members indicated that large/mega

projects are inherently risky due to long planning horizons and complex interfaces. Consistent with the proposition made by Warrack (1992), the discussion pointed out that there are several stakeholders with conflicting interests in mega projects decision-making. This make is quite difficult to manage the varying stakeholder values, interests and aspirations of mega projects. Further manifestations of large/mega projects as explained by the panel members were embedded in the often reported misinformation about benefits, costs, risks and the high socio-economic and environmental impacts.

Another question was put forward by the moderator; and quoting from the question list "What do you think are some of the roles that Project Managers (PMs) on large construction projects are expected to perform"?

It is clear that much has been reported in the literature review section about innate roles played by project managers throughout the project cycle. However, during the panel discussion, a member indicated that the main role played by project managers on large/complex projects is decision-making; and the decision process involves interactions between the project, people and finances. Implicitly, panel members held convergent views about the role of project managers. These roles include: leading, coordinating, controlling, planning, organising, monitoring, managing, communicating, empowering and delegating. Furthermore, while some panel members expressed that all these roles played by project managers' focus on the "art" and "science" of project management, others differentiate between "leaders" and "managers." Another panel member summed up the thinking by stating that the "leader/art side requires strong communication, visioning, and interpersonal skills, while the manager/science side requires detailed knowledge of methodology and tools, plus strong analysis and problem-solving skills".

The panel also discuss issues regarding to project management competencies required for PMs to be able to discharge their roles. This was followed when the moderator put forward the lead question "Could you please share your views on project management competencies for PMs on large constructions projects".

Drawing on the premise that actual management experiences (Egger et al., 1996); ethical knowledge (Helgadottir, 2008); and financial knowledge (Owusu-Manu and Badu, 2009) should be incorporated into project management education, panel members were asked to share their views on project management competencies and, identify as much as possible, expected project management competency areas. Such information was necessary because it provided the platform for the group to develop the broad philosophy of project management competencies. In order to get at specific competencies, the need was felt by panel members to be directive by asking participants to identify a list of both technical (task/work-oriented competencies) and managerial competencies (contextual/people-oriented) of project management. The constant comparative method of data analysis was adopted at this stage of the discussion. According to Bogdan and Biklen (1998) and Merriam (1998), this method involves an iterative process of collecting data, identifying major and recurring themes in the data, developing categories for these themes, and working with and coding the data to reveal representations of the identified categories. Next, each panel member condensed initial identified the initial list of raw data on project management competencies into more refined

categories representing higher-level themes. For example, initial raw codes of "outcomes," and "objectives" were condensed into one code, such as "goals," that captured the common theme as expressed by panel members.

After the completion of independent analyses, the panel met to compare and discuss identified themes referring back to the raw data for guidance when needed. As a result of the discussion, the panel finally agreed upon a list of eighteen (18) core project management competency areas. These are: schedule management and planning, cost management, quality management, human resources management, risk management, supply chain management, claims management, knowledge management, health and safety management, conflict and dispute management, environmental management, ethical management, stakeholders' management, information technology management, communication management, materials resources management, financial management and plant and equipment resources management. Indeed, these findings support the conceptual maps of project management competency in the literature and the argument made by Alter and Koontz (1996), Morris (2003), Chen and Partington (2006), Chen et al. (2008) and Ahadzie et al. (2008a,b; 2009), that project management must be conceptualised beyond the commonly emphasized project administration expertise (setting and managing scope, timelines, and budgets). Moreover, certain competency areas such as finance, ethics and culture which are rarely mentioned by most authors were also identified by the focus group as important competency areas for a 21st century business process. It has earlier been mentioned that project management is a complex process targeting multiple outcomes; requiring the acquisition of a variety of knowledge and skill sets that often cross different areas of expertise, including management, information technology, engineering, etc (Kerzner, 2001). The next step of the research is to test these project management competency areas (PMCA) on large sample of project managers using survey questionnaires to improve validity of the results. The justification for this test is that, these variables are firmly rooted in the theoretical literature of project management and it is important to determine whether these conceptual maps confirm the empirical realities of large number of project managers in the Ghanaian construction industry.

APPRAISING PROJECT MANAGEMENT COMPETENCIES

Data Analysis and Discussion of Survey Results

In order to put the discussion in its context, it is important to describe the characteristics of the respondents (project managers) involved in the survey. As earlier indicated, the main characteristics that were of interest to this study were experience and professionalism. The criteria for experience and professionalism in the context of this research are determined by the number of years of practice and the financial scope of projects handled. Tables 1 and 2 respectively presents the results of the years of experience and the average size of projects (financial scope) managed within the period of project management practice. From Table 1, 14.8 percent of the project managers involved with the survey had less than or equal to 5 years work experience in project management practice; 35.2 percent had a work experience of 6-10 years; 20.4 percent had working experience of 11-15 years; 14.8 percent had working experience of 16.20 years; and the remaining 14.8 percent had over 20 years experience. Regarding the financial value of projects executed, less than 2.0 percent (1.85) has managed

and executed projects of less than or equal to $ 2.5million dollars while an overwhelming majority of the project managers, representing 48.15 percent had worked on projects that are over $10 million dollars in value. The conclusions drawn on these findings are that the respondents have reasonable experience in project management practice. Furthermore, the findings suggest that most respondents are regularly active and have executed large construction projects. It seems, therefore, plausible to conclude that those who responded to the survey are sufficiently experienced in project management competency to provide data which is credible and representative.

Table 1. Project Managers Years of Experience in Project Management

Years	Frequency	Percent	Valid Percent	Cumulative Percent
=<5yrs	8	14.8	14.8	14.8
6-10yrs	19	35.2	35.2	50.0
11-15yrs	11	20.4	20.4	70.4
16-20yrs	8	14.8	14.8	85.2
>20yrs	8	14.8	14.8	100.0
Total	54	100.0	100.0	

Table 2. Financial Scope of Project Executed by Project Managers

Project Size ($ X10^3)	Frequency	Percent	Valid Percent	Cumulative Percent
=<2,500	1	1.85	1.85	1.85
2,000 – 5,000	7	12.96	12.96	14.81
5,000 – 7,500	11	20.37	20.37	35.18
7,500 – 10,000	9	16.67	16.67	51.85
>10,000	26	48.15	48.15	100.0
Total	54	100.0	100.0	

Working Hypotheses

Towards the appraisal of the identified project management competencies; two categories of hypotheses were developed. Whilst the rationale for the first category of hypotheses was to confirm whether the PMCAs identified in the literature and the focus group discussion conform to the general thinking of large sample of project managers in Ghana, that of the second category of hypotheses was to test whether indeed project managers have the requisite proficiency in the application of these competencies. This would then provide pointers as to where future training needs should be directed at.

In the first category of hypotheses, the hypotheses were stated as follows:

1. *Null Hypothesis (H0):* The project management competency areas identified by the focus group are unnecessary or unimportant competency requirement for project managers in the Ghanaian context.

2. *Alternative hypothesis (HA):* The project management competency areas identified by the focus group are necessary or important competency requirement for project managers in the Ghanaian context.

In the second category of hypotheses, the *hypotheses* were stated as follows:

1. *Null Hypothesis (H_0):* Project managers working on large construction firms in Ghana have weak proficiency in the project management competency areas identified by the focus group.
2. *Alternative hypothesis (H_A):* Project managers working on large construction firms in Ghana have strong proficiency in the project management competency areas identified by the focus group".

Preliminary Test and Descriptive Analysis

Before the Chi Square test was performed to test the hypotheses of the study, preliminary descriptive analysis such as mean ranking of each of the PMCA variable was conducted to help provide a clearer picture of the consensus reached by the respondents; and the results are tabulated in Table 3.

For each of the PMCA, the null hypothesis was that each variable was unimportant (H_0: $U = U_0$) and the alternative hypothesis was that the variable was important (H_A: $U > U_0$); where U_0 is the population mean and drawing from Ling (2003), the U_0 was fixed at 3.5. Thus, based on the five-point Likert rating scale, and consistent with Ahadzie et al., (2007) and Ling (2003); a PMCA variable was deemed important if it had a mean of 3.5 or more. Where two or more variables have the same mean, the one with the lowest standard deviation is traditionally assumed the highest importance (Field, 2005). According to Ahadzie et al., (2007 and Field (2005), the standard error is the standard deviation of sample means and it is a measure of how representative a sample is likely to be to the population. Based on the results presented in Table 3; since virtually all the PMCAs (except the one on ethical management) have mean values above the accepted population mean of 3.5, it is reasonable to conclude that they are necessary competency requirements for project managers in the context of the Ghanaian construction industry.

Test of Hypotheses

Hypotheses Category 1

The hypotheses were tested using Chi Square test at conventionally p-values of $p \leq 0.05$. The rule for the acceptance or rejection of a hypothesis is that if a p-value of >0.05 is achieved, the hypothesis is accepted but if p-value of ≤ 0.05 is achieved, the hypothesis is rejected. The results of the chi square tests as presented in Table 4 below indicated that; all the PMCA variables identified recorded p-values of ≤ 0.05. This signals that the null hypothesis which was postulated on the premise that the PMCA identified by the focus group are not necessary project management competency requirement for project managers in the Ghanaian context was not supported and therefore rejected. The results contribute to the

project management competency debate and suggest that, the PMCA identified pertains to the Ghanaian construction industry; and support the key conceptual strands earlier noted. However, there was an exception as to the rejection of the null hypotheses. For instance, the chi-square test presented in Table 4 recorded p-value (0.164) which is more than the conventional p-value >0.05 for the variable "Ethical Management". Drawing on this premise, the null hypothesis which stated that *"Ethical management related issues are not necessary project management competency requirements for project managers on large construction projects"* was accepted.

Table 3. Descriptive Statistics of the Importance of PMCA as Necessary Project Management Competency Requirement

Importance of PMCA	N	Mean	Std. Deviation	Std. Error
Financial management	54	4.78	.502	.072
Cost management	54	4.59	.599	. 078
Materials resources management	54	4.54	.573	.074
Schedule management and planning	54	4.57	.665	.090
Quality management	54	4.44	.634	.085
Plant and equipment resources management	54	4.44	.634	.085
Communication management	54	4.39	.685	.095
Human resource management	54	4.30	.717	.101
Claims management	54	4.28	.878	.124
Information Technology	54	4.09	.708	.102
Supply chain management	54	4.08	.756	.109
Risk management	54	4.04	.776	.113
Health and Safety management	54	4.00	.801	.117
Stakeholders' management	54	3.87	.933	.129
Knowledge management	54	3.87	.825	.119
Environmental management	54	3.67	.777	.114
Conflict and dispute management	54	3.63	.958	.135
Ethical management	54	3.39	.998	.138

This is not surprising because, practically, ethical issues are concerned with what is right, wrong, fair, just, good or bad; about what we ought to do, not just what is the case or what is most acceptable or expedient (Preston, 1996). Recently, Walker, et al., (2007: p.103) contributed to the scarcely ethical debate and concluded that "ethics is a multifaceted concept that includes the study of morality, the legitimacy of moral claims and basis of justification of decisions and may include: conflict of interest, fraudulent behaviours and corruption". Conventional wisdom tells that many of the ethical issues mentioned above are rarely addressed in project management literature until recently. This result is consistent with what a member of the focus group discussion earlier said indicated "in my career development in project management, I hardly sat in ethical management modules; and people virtually do not talk about ethical issues". However, Walker et al. (2007: p.104) have argued that ethics is

fundamental to business conduct. Conventional wisdom informs the thinking that a moral relationship lays at the confluent of agreements and contracts between two people or two organisations, and that unless there is a basis of trust, business cannot proceed. This view suggests that the organisation is a moral player in society with duties and responsibilities, and in order to advance its interests it must engage in behaviour that is acknowledged to be at least the minimum moral standard.

Table 4. Chi Square Test of Project Management Competency Requirements

	Chi-Square	Df	Asymp. Sig. *p* values	Decision
Schedule management and planning	53.943[a]	3	.000	Reject
Cost management	28.778[b]	2	.000	Reject
Quality management	28.778[b]	2	.000	Reject
Human resource management	33.407[c]	3	.000	Reject
Risk management	27.037[c]	3	.000	Reject
Supply chain management	24.962[a]	3	.000	Reject
Claims management	29.704[c]	3	.000	Reject
Knowledge management	16.963[c]	3	.001	Reject
Health and Safety management	18.741[c]	3	.000	Reject
Conflict and dispute management	25.259[d]	4	.000	Reject
Environmental management	26.889[c]	3	.000	Reject
Ethical management	5.111[c]	3	.164	**Accept**
Stakeholders' management	11.037[c]	3	.012	Reject
Information Technology	7.444[b]	2	.024	Reject
Communication management	13.000[b]	2	.002	Reject
Materials resources management	24.111[b]	2	.000	Reject
Financial management	57.333[b]	2	.000	Reject
Plant and equipment resources management	17.333[b]	2	.000	Reject

[a] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 13.3;

[b] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 18.0;

[c] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 13.5;

[d] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.8

Hypotheses Category 2

Similar to category 1, the hypotheses were tested using Chi Square test at conventionally p-values of $p \leq 0.05$. The rule for the acceptance or rejection of a hypothesis is that if p-value is >0.05 is achieved, the hypothesis is accepted but if p-value of ≤0.05 is achieved, the hypothesis is rejected (Field, 2005). The results of the chi square tests are presented in Table 5 below. They indicated that project managers working on large construction projects in

Ghana have strong proficiency in the PMCA variables identified since the variables recorded p-values of ≤0.05.

Table 5. Chi Square Test of Project Managers Proficiency in the Project Management Competency Areas

	Chi-Square	df	Asymp. Sig. *p* values	Decision
Schedule management and planning	21.340[a]	3	.000	Reject
Cost management	37.231[b]	4	.000	Reject
Quality management	52.231[b]	4	.000	Reject
Human resource management	14.923[c]	3	.002	Reject
Risk management	9.231[c]	3	.026	Reject
Supply chain management	17.094[d]	4	.002	Reject
Claims management	22.200[e]	4	.000	Reject
Knowledge management	24.000[c]	3	.000	Reject
Health and Safety management	42.377[d]	4	.000	Reject
Conflict and dispute management	41.245[d]	4	.000	Reject
Environmental management	24.731[b]	4	.000	Reject
Ethical management	25.308[b]	4	.000	Reject
Stakeholders' management	29.400[e]	4	.000	Reject
Information technology	30.868[d]	4	.000	Reject
Communication management	38.962[b]	4	.000	Reject
Materials resources management	22.308[c]	3	.000	Reject
Financial management	30.863[f]	4	.000	Reject
Plant and equipment resources management	11.231[c]	3	.011	Reject

[a] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 13.3.

[b] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.4.

[c] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 13.0.

[d] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.6.

[e] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.

[f] 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.2.

This signals that the null hypothesis which was postulated on the premise that project managers working on large construction projects in Ghana have strong proficiency in the PMCA was not supported and therefore rejected. The rejection of the variable "Ethical Management" in this context is quite surprising.

Conventionally, one would expect that since the variable has been rejected as a necessary project management competency requirement in the previous test, it should follow that project managers would not be proficient in its application. This suggests that ethical issues may be assumed to be traditional and cultural practices in organisations and that may not necessarily need a separate module to teach. It follows that organisations develop policies and procedures as part of corporate governance for individuals to follow – this is an example of normative ethics or the clarification of behaviour standards about what we ought to do. As ethics is directly concerned with behaviour, it therefore has relevance to the way people behave in organisations. However, in recent times, studies on ethics have been popularised in academic literature and there has been a renewed emphasis to incorporate ethical management in project management and construction disciplines (Helgadottir, 2008). An important question to answer is, why should we consider ethics at all in business? There are some who argue that business transactions and business activities are limited activities and, as such, managers are constrained to only consider actions that advance the interests of the organisation. This position advocates that managers are constrained in their decision making to only consider decisions that advance shareholder interests and it is wrong for them to engage in socially responsible activity, other than obeying the law – a view of the classical approach to social responsible practices.

IMPLICATIONS OF FINDINGS FOR PROJECT MANAGEMENT

The foregoing findings of this study have implications for project management education, practices and effectiveness. They are also of importance to PMs (particularly those working on large projects in developing economies) in relation to their efficiency and career progression. This study sheds more light on the important skills PMs should acquire towards improving their own professional developments.

It identifies and recommends seventeen key project management competency domains that have not been hitherto given prominence in the current literature for PMs' capacity building in a developing economy, Ghana.

These various competency profiles can be mapped and customised towards improving workplace learning and training requirements of project managers in Ghana. While the study is unique to Ghana, there is also the potential that many project-based sectors of the construction industry in developing countries will find the results useful towards the advancement of improved project management practices due to similarities in their technical, socio-economic and cultural practices. The results of this study should help these in establishing the appropriate competency measures which are in tandem with their technological, socio-economic, structural and cultural practices.

Furthermore, the study provides an important guideline to project management educators; working project managers; and aspiring project managers on what is expected of them in terms of their project management skills. The findings also implies that project management educators may assume ethical issues to be traditional and cultural practices in organisations

and may not necessarily need a separate module to teach current and potential PMs. The study also provides a basis for which large construction firms, consultants and clients (who employ the services of project managers) in the Ghanaian construction industry could recruit, monitor, retain and promote PMs.

CONCLUSION

Drawing extensively on the conceptual maps of project management competencies in the literature, a focus group discussion was held to explore the appropriateness of these competency areas in the context of the Ghanaian construction industry.

As a result of the literature review and subsequent focus group discussions, eighteen (18) core project management competency areas were generated and tested on a large number of project management professionals in Ghana. It was hypothesized that "the project management competency areas identified by the focus group are unnecessary or unimportant competency requirements for project managers in the Ghanaian context".

The chi-square test revealed that, pertaining to the Ghanaian context, all the project management competency areas identified are important except one variable, "ethical management"; and an explanation was advanced for this observed trend. The study was able to establish that the project managers involved in the survey had significant proficiency in the application of all the 18 competency areas identified.

Practically, the identification of these competency profiles provides an important guideline to project management educators, working project managers and aspiring project managers on what is expected of them in terms of their project management skills.

Subsequently, these findings may help PMs who lack the relevant skills to strive to acquire the relevant training as part of their professional development. The findings also provide a basis on which large construction firms, consultants and clients who employ the services of project managers in the Ghanaian construction industry could recruit, monitor, retain and promote PMs. Clearly, a well-designed and delivered project management education and training programmes are critical to developing and maintaining the required level of technical, professional and managerial expertise for managing large and complex projects in Ghana.

The study has wider implications for project management and project delivery within the Ghanaian construction industry. It is recommended that project management education and training courses should be consistent with the core competency profiles for project managers as identified by this research.

As project management educators, researchers and practitioners continue to search for new and better methods of fulfilling the main three project management competency requirements (contextual, technical and behavioural), this research provides some answers to the important competencies and skill-sets requirements for large construction projects in a developing economy using a robust qual-quant approach. This represents a unique contribution to the discipline.

Future research may adopt longitudinal approach or a multi-country focus in order to enhance the validity and generalizability of findings.

REFERENCES

Ahadzie, D.K. (2007), "A Model for Predicting the Performance of Project Managers in Mass House Building Projects in Ghana", PhD Thesis, University of Wolverhampton, United Kingdom.

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P.O. (2007). Critical Success Criteria for Mass Housing Building Projects in Developing Countries, *International Journal of Project Management*, 25 (2), 1-13.

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008a). Model for Predicting the Performance of Project Managers in Mass House Building Projects. *Journal of Construction Engineering and Management*. 134 (8), 618 – 629.

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008b). Towards Developing Competency-based Measures for Construction Project Managers: Should Contextual Performance Behaviours Be Distinguished from Task Performance Behaviours? *International Journal of Project Management*, 26 (1), 631 – 645.

Ahadzie, D.K., Proverbs, D.G., Olomolaiye, P. and Ankrah, N. (2009). Towards Developing Competency-based Measures for Project Managers in Mass House Building Projects in Developing Countries. *Construction Management and Economics*, 27 (1), 89-102.

Alter, K. and Koontz, J., (1996). Curriculum Development and Continuing Education in Project Management for the Specialty Subcontracting Industry, *Journal of Construction Education*, 1 (2), 66 – 78.

Atkinson, R., Crawford, L., and Ward, S. (2006). Fundamental Uncertainties in Projects and the Scope of Project Management, *International Journal of Project Management* 24 (2006), 687–698.

Barry J.B. (2005). A Success Paradigm for Project Managers in the Aerospace Industry. PhD. Dissertation, Capella University.

Bogdan, R. E., and Biklen, S. K. (1998). *Qualitative Research for Education: An Introduction to Theory and Method*, Boston: Allyn and Bacon.

Boyatzis, R. (1997). 'Management: a sociological introduction'. *Human Relations*, 50: 4, 461-467.

Brannick, M. T., Levine, E. L., and Morgeson, F. P. (2007). *Job analysis: Methods, research, and applications for human resource management* (2nd ed.). Thousand Oaks, CA: Sage Publications

Brophy, M. and Kiely, T. (2002). Competencies: a New Sector. *Journal of European Industrial Training*, 26 (2/3/4), 165-176.

Brown, A., Hinks, J., and Sneddon, J. (2000). The Facilities Management Role in New Building Procurement. *Facilities Journal*, 19 (3/4), 119-130.

Caupin, C., Knopfel, H., Koch, G., Pannenbacker, K., Perez-Polo, F., and Seabury, C. (2006). I*nternational Project Management Association* (IPMA) Competence Baseline Version 3.0", IPMA Nijkirk.

Chen, P. and Partington, D. (2006). Three Conceptual Levels of Construction Project Management Work. *International Journal Project Management*; 24 (1), 412–421.

Chen, P., Partington, D., and Wang, J.N. (2008). Conceptual Determinants of Construction Project Management Competence: A Chinese Perspective. *International Journal of Project Management*, 26 (1), 655–664.

Cheng, M.I., Dainty, A.R.J., and Moore, D.R. (2005). What Makes a Good Project Manager? *Human Resource Management Journal*, 15 (1), 25– 37.

Cheng, M.I., Dainty A.R.J. and Moore, D.R. (2003). The Differing Faces of Managerial Competency in Britain and America. *Journal of Management Development*, 22 (6), 527-537.

Chinowsky, P.S. (1998). Strategic Management in Construction Education. *Journal of Construction Education*, 3 (1), 21-30.

Crawford, L. (2005). Senior Management Perceptions of Project Management Competence. *International Journal of Project Management*, 23 (1), 7-16.

Dainty, A.R.N, Cheng-Mei, I. and Moore, D.R. (2003). Redefining Performance Measures for Construction Project Managers: An Empirical Evaluation. *Construction management and Economics*, 21 (1), 209 –218.

Dainty, A.R.J., Cheng-Mei, I. and Moore, D.R. (2004). A Competency-based Performance Model for Construction Project Managers, *Construction Management and Economics* 22 (1), 877–886.

Dainty, A.R.J Cheng-Mei, I. and Moore, D. R. (2005). Competency- based Model for Predicting Construction Project Managers, Performance. *Journal of Engineering in Management, ASCE*, 21 (1), 2-9.

Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002). *Management Research: An Introduction.* Second Edn, London: Sage.

Egger, H.S, Varzavand, S. Lyle, S.P. and Rod, D.O. (1996). Infusing Actual Management Experiences into Construction Education. *Journal of Construction Education*, 1 (1), 45-49.

Field, A. (2005). *Discovering Statistics Using SPSS for Windows*. London: Sage Publications.

Flyvbjerg, B. (2005). Policy and Planning for Large Infrastructure Projects: Problems, Causes, Cures. *World Bank Policy Research Working Paper* 3781.

Gale, A. (2007). Competencies: Organizational and personal. In P. W. G. Morris and J. K. Pinto (Eds.), *The Wiley guide to project organization and project management competencies* (pp. 143-167). Hoboken, NJ: Wiley.

Goodman, R. and Chinowsky, P. (1997). Construction Education: Are Executives Being Served? ASCE *Journal of Management in Engineering*, 13 (4), 55-61.

Hayes, J., Rose-Quire, A., and Allinson, C.W. (2000). Senior Managers' Perceptions of the Competencies they Require for Effective Performance: Implications for Training and Development, *Personnel Review*; 29 (1), 92–105.

Helgadottir, H. (2008). The Ethical Dimension of Project Management, *International Journal of Project Management*, 26 (1) 743–748.

Isik, Z., Arditi, D., Dikmen, I., M. and Talat Birgonul, M. (2009). Impact of Corporate Strengths/weaknesses on Project Management Competencies. *International Journal of Project Management*, 27 (1), 629–637.

Jha, K.N. and Chandrashekhar, K. (2006). What Attributes Should a Project Coordinator Possess? *Construction Management and Economics*, 24 (9), 977-988.

Kerzner, H. (2000). *Applied project management: best practices on implementation.* New York: NY. John Wiley and Sons, Inc.

Kerzner, T. (2001). *Project Management – A Systems Approach to Planning, Scheduling and Controlling, 7th Ed. New York:* John Wiley and Sons.

Lei-Seng, W. W. and Skitmore, M. (2005). Project Management Competencies: A Survey of Perspectives from Project Managers in Southeast Queensland. *Journal of Building and Construction Management*, 9 (1), 1- 12.

Ling, Y.Y. (2003). A Conceptual Model for the Selection of Architects by Project Managers in Singapore, *International Journal of Project Management*, 21 (1), 135-144.

Low, S.P., and Ben, L.S.K. (1999). Developing Construction Project Management Skills: Lessons from Zhuge Liang's Art of Management, *Career Development International*, 4 (1), 34-39.

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education*, San Francisco: Jossey-Bass.

Morris, P. W. G. (2003). The Validity of Knowledge in Project Management and the Challenge of Learning and Competency Development. Available from http://www.crmp.net/papers/index.htm, accessed on 12 June 2009.

Northouse, P. G. (2004). *Leadership: Theory and practice*. Thousand Oaks, CA: Sage.

Olatunji, A. (2008). A Comparative Analysis of Tender Sums and Final Costs of Public Construction and Supply Projects in Nigeria. *Journal of Financial Management of Property and Construction* 13 (1), 366-4387.

Owusu-Manu, D. and Badu, E. (2009). Determinants of Contractors' Investment Finance Strategy in Ghana: Conceptual and Empirical Explanations. *Journal of Financial Management of Property and Construction*, 14 (1), 21-33.

Parry, S. B. (1998). Just what is a competency? (And why should you care?). *Training*, *35*(6), 58-64.

Pellegrinelli, S and Garagna, L. (2010). Facilitating Selection and Development: The Case of the "Accidental Professionals" - Project and Programme Managers. Presented at the IPMA World Congress, Istanbul, Turkey, November 2010.

PMI (2000). A guide to the project management body of knowledge. Newtown Square, PA: Project Management Institute.

Pierce, C. (1994). 'Executive competencies: research issues, activities and responses'. *Executive Development*, 7: 4, 18-20.

Preston, N. (1996). *Understanding Ethics*. Leichhardt NSW: Federation Press.

QUT. (2010).Creating value in Project Management using Prince2®, a research project undertaken by Queensland University of Technology (QUT).

Rubin, R.S and Dierdorff, E.C. (2009). How Relevant Is the MBA? Assessing the Alignment of Required Curricula and Required Managerial Competencies. *Academy of Management Learning and Education*, 2009, Vol. 8, No. 2, 208–224.

Sambasivan, M. and Soon Y. (2007). Causes and Effects of Delays in Malaysian Construction Industry. I*nternational Journal of Project Management*, 25 (1) 517–526.

Sykes, A. (1990). Macro Projects Status, Prospects, and the Need for International Cooperation. *Technology in Society;* 12 (1), 157-172.

Taylor, J. (1998). *A survival guide for project managers*. New York, NY: American Management Association.

Walker, D.H.T, Segon, M. and Rowlinson, S. (2007). *Business Ethics and Corporate Citizenship*. Australia: Derwal Publishers, 101-138.

Warrack, A. A. (1985). *Resource Mega Project Analysis and Decision Making*. Victoria, BC: Institute for Research on Public Policy, Western Resources Program.

Warrack, A. A. (1992). *Managing the Mega Project Decision Process*. A Paper presented at the Annual meeting of the Western Regional Science Association, Lake Tahoe, CA.

Whiddett, S., and Hollyforde, S. (2003). *A practical guide to competencies: How to enhance individual and organisational performance* (2nd ed.). London: Chartered Institute of Personnel and Development.

Wood,R.L. Jr. (2009). Identification and Assessment of Department of Defense Program Manager Competencies by Industry Partners. *PhD. Dissertation*, Capella University.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 9

COMPARING THE PROCUREMENT SELECTION PARAMETERS OF PRIVATE AND PUBLIC SECTOR CLIENTS

Raufdeen Rameezdeen[1*] and Eranga Jayasena[†,2]
[1]School of Natural & Built Environments, City East Campus,
University of South Australia, Adelaide SA, Australia
[2]Department of Building Economics, University of Moratuwa,
Katubedda, Sri Lanka

ABSTRACT

Construction procurement methods used in the construction industry have experienced many changes resulting in newly developed systems. Selecting a wrong method usually leads to project failure or client dissatisfaction. The procurement needs of public sector clients differ from those in the private sector for many reasons. However, previous research dealing with procurement selection has not taken these differences into account. Therefore the aim of this research is to test whether significant differences between procurement selection parameters exist for public sector and private sector clients. Three rounds of a Delphi survey were conducted to investigate the factors governing procurement selection in the two sectors. Based on the findings, a multi-criteria construction procurement selection model was developed for the Sri Lankan construction industry. This study concludes that procurement selection parameters for the private and public sectors are very different. It highlights the need for considering the clients separately when construction procurement selection decisions have to be made.

Keywords: Construction, Procurement selection, Public sector, Private sector, Sri Lanka, Delphi survey

* Rameez.Rameezdeen@unisa.edu.au.
† erangacj@uom.ac.lk.

INTRODUCTION

A construction procurement system is the organizational framework used by a client to manage the design and construction of a project. With the introduction of innovative ways of construction, many new procurement systems have also evolved in past decades. The procurement method selected for a project must address all clients' requirements and expectations (Ofori and Pin, 1996). Procurement selection has therefore received much attention from researchers in recent times (Love et al., 2012; Chen et al., 2011; Chan, 2007). Selection criteria may vary with the type of client as they have different objectives to be secured through procurement (Ng et. al., 2005). This is particularly true for the drastically differing objectives between public and private sector clients (Sporrong, 2012). Public sector clients are typically government officials who take responsibility for spending taxpayers' money. They are bound by various bureaucratic procedures that will require accountability and transparency. On the other hand private sector clients are usually free from bureaucratic red tape, are profit-oriented and want value for money in the decisions they make (Arlbjørn, and Freytag, 2012; Mustapha et al., 1994).

Previous research dealing with procurement selection has not considered this difference between public and private sector clients. The problem with this approach is that the true picture with regard to procurement selection will not emerge unless these two types of clients are dealt with separately. The aim here is to test whether there is a significant difference between procurement selection parameters concerning public and private sector clients. In this way an attempt is made to understand how these two client categories perceive various procurement selection parameters as project priorities.

PROCUREMENT SELECTION

The concept of "procurement" related to construction has been defined in many ways. Love et al. (1998 p. 222) viewed procurement system as "an organizational system that assigns specific responsibilities and authorities to people and organizations, and defines the relationships of the various elements in the construction of a project". Masterman (1992) authored a seminal work which attempted to categorize procurement systems in different ways. Oyegoke et al. (2009) more recently critically examined the efficacy of present categorization systems. In between these two studies, a large number of researchers has used different categories to describe procurement systems (which is beyond the scope of this study). As practiced in the Sri Lankan construction industry, procurement systems were categorized into three broader types, namely: Separated Systems; Integrated Systems; and Management Oriented Systems (Rameezdeen and De Silva, 2002). Table 1 illustrates this classification with common variants belonging to each category (some of the procurement systems practiced in other countries are not popular in Sri Lanka and are not included here).

Table 1. Categorization of Procurement Systems

Category	Variants
Separated systems	Lump Sum, Ad-measurement, Prime cost
Integrated systems	Design and Build, Package Deal, Turnkey
Management oriented systems	Construction Management, Management Contracting

Previous studies have identified a number of parameters influencing the selection of a procurement system for a construction project (Skitmore and Mardson, 1988; Hughes,1989; Masterman, 1992; Moshini, 1993; Masterman and Gameson, 1994; Sheath et al., 1994; Gordon, 1994; Kumaraswamy and Dissanayake, 1998; Molenaar, 1999; Ambrose and Tucker, 1999; Rowlinson,1999; Alhazmi and McCaffer, 2000; Chan et al., 2001; Kumaraswami and Dissanayake, 2001; Cheung et al., 2001; Ng et al., 2002; Thomas et.al., 2002; Luu et al., 2003; Hasim et al., 2006; Chan, 2007; Love et al., 2008 a and b; Chen et al., 2011; Love et al., 2012; Dada, 2012). These parameters can be divided into client requirements/ characteristics, project characteristics, and external environment. The external environment is a structure consisting of several variables what are economic, political, financial, legal, technological, etc., in character. The selection process is an open system which receives information from its environment, transforms and returns as an output to the environment (McDermott and Rowlinson, 1999). As a synthesis of past studies, factors affecting procurement selection can be grouped into two main categories, internal and external environment, as illustrated in Figure 1.

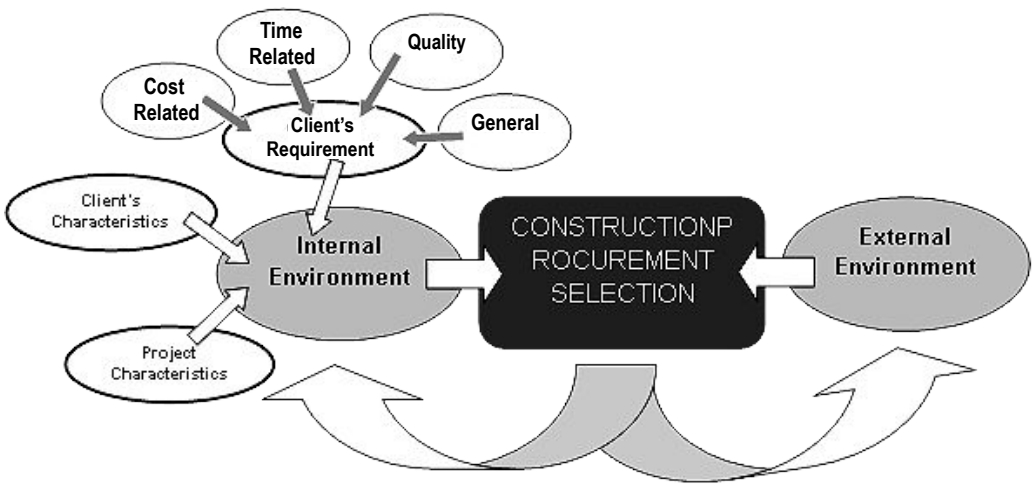


Figure 1. Conceptual framework of broad categories governing the selection criteria.

Several models have been developed to facilitate the selection of a suitable procurement system for a project. Multi Attribute Utility Technique (MAUT) has received the greatest attention. Chang and Ive (2002) discussed some of the problems associated with MAUT, the strongest one being the selection of procurement variables. The other is the method used to

develop utility values through the opinions of industry experts. Chang and Ive (2002) are particularly critical about the subjective nature of assigning values to procurement selection parameters to obtain mean utility values. Teo et al. (2012) consider MAUT to be tautological, disconnected from risk management plan and unable to achieve superior value for money. Chan et al. (2001) used the Delphi Method, Cheung et al. (2001) the Analytical Hierarchy Process and Chan (2007) the system of Fuzzy Logic to reduce the subjectivity of arriving at utility values.

As discussed previously, most models treat clients in public and private sector as the same when arriving at the best procurement method for a project. However, it could be argued that the procurement needs of the public sector differ from that of private sector due to the inherent differences between them (Arlbjørn and Freytag, 2012; Hawkins et al., 2011; Roodhooft and Abbeele, 2006). The major objective of a public sector project is to serve society rather than expecting a return from investment (Jafaar and Radzi, 2012). Public sector decision-makers are bureaucrats who are bound by accountability and transparency requirements (Jafaar and Radzi, 2012; Hawkins et al., 2011; Love et al., 2008a; Mustapha et al., 1994). They tend to avoid uncertainty and always prefer the same procurement method (Love et al., 2008b). Their selection is mainly governed by the concept of 'most economically advantageous' tender (Chen, 2008) or 'best value' tender (Palaneeswaran et al., 2003). They are also bound by 'public values' such as listening to public opinion, professionalism, risk-readiness and balancing of interests (Furneaux et al., 2008). Moreover, they are obliged to follow ethical and government guidelines or regulation in procurement dealings (Hawkins et al., 2011; Capio, 2006).

Table 2. Previous research on parameters affecting public sector procurement section

Factor	Love et al., 2012	Love et al., 2008 a	Raymond, 2008	Furneaux, et al., 2008	Palaneeswaran, et al., 2003
Risk avoidance	√	√		√	√
Price competition	√		√	√	√
Accountability			√	√	√
Value for money			√	√	√
Transparency			√	√	√
Quality level	√	√			√
Political constraints		√			√
Cost certainty	√				
Flexibility	√				
Allocation of responsibilities	√				
Complexity		√			
Project cost		√			
Location (city vs. regional)		√			
Client's knowledge and maturity		√			
Ethics			√		
Balancing of interests				√	
Effectiveness				√	
Efficiency				√	
Confidentiality					√

In contrast, private sector clients are mainly motivated by return on investment and the project is expected to serve the company's vision, mission and goals. They are much freer in decision-making than their public sector counterparts (Tadalis, 2012; Ward et al., 1991). Roodhooft and Abbeele (2006) found that public sector officials pay more attention to procurement criteria and to create a competitive environment than the private sector. They seem to rely more on rigid contracts and performance monitoring and less on trust (Hawkins et al., 2011). However, the private sector has a better knowledge of market conditions and the people working in it are able to obtain a better deal for their company or business (Arlbjørn and Freytag, 2012). It is expected that these differences will ultimately boil down to the procurement needs and methods to fulfill these requirements. Table 2 below summarizes previous studies that dealt with parameters affecting public sector construction procurement selection. Accordingly, risk avoidance, price competition, accountability, transparency, and quality level emerge as very important parameters for public sector clients.

Table 3. Profile of experts

Category	Number
Project manager	07
Engineer	04
Quantity surveyor	14
Architect	07
Total	32

RESEARCH METHODS

Multi Attribute Utility Technique (MAUT) has been considered useful for examining client needs and weighting preferences from experts with regard to procurement selection (Chan et al., 2001). However, the major limitation of this technique lies in the lack of consensus among experts on utility values. To overcome this deficiency, Delphi Technique is used here in this study. Delphi is a highly formalized method of communication that is designed to extract the maximum amount of unbiased information from a panel of experts (Rowe and Wright, 1999). Chan et al. (2001) have demonstrated that Delphi is a powerful and appropriate technique for creating objective opinions in a rather subjective area like MAUT. A panel consisting of 15-35 experts is recommended as the most appropriate sample for a Delphi study (Hallowell and Gambatese, 2010; Schmidt, 1997). Thus, thirty-two (32) experts from four disciplines, i.e. Project Management, Quantity Surveying, Architecture and Engineering comprising consultant and contractor organizations in the public and private sectors were selected. Purposive Sampling has been used for this research as the information obtained from experts required an in-depth knowledge and sound experience on various procurement options. Table 3 shows the profile of experts involved in the survey. The reason for the small number of Engineers is that they are not very interested in procurement issues compared to Quantity Surveyors, Architects and Project Managers. The high proportion of Quantity Surveyors was mainly due to their interest and involvement in procurement selection as cost consultants during the early stages of a project. Experts included in the panel had more than 10 years' experience of working in this area in construction management and

procurement selection. Table 4 presents the format used in the Delphi survey and data analysis techniques.

FINDINGS

All parameters relating to client requirements, project characteristics and external environment were derived from the literature (Figure 1 and Table 1) and then submitted to the expert panel for their opinions on suitability to the Sri Lankan construction industry. The results are summarized in Table 5. In the second round of Delphi, levels of importance to be given to these selected parameters ware evaluated by the expert panel members. Of the 26 parameters 16 obtained above average ratings. These parameters had a Severity Index (refer to Elhag et al., 2005) of more than 65%. Mean ratings of other 10 parameters were found to be below average. Of those, 8 recorded a Severity Index between 60% to 65% and the remainder 50% to 60%.

Table 4. Summary of the Delphi Survey and data analysis

	Round 1	Round 2	Round 3
Instrument	Questionnaire 1	Questionnaire 2	Questionnaire 3
Database for questionnaire	Literature review	Results from round one	Results from round two
Duration	Two weeks	Four weeks	Six weeks
Number of experts selected	32	30	30
Number of experts responded	30	30	27
Findings	Identification of factors affecting procurement selection in public and private sector projects	Level of importance in a three-point Likert Scale	Utility values for each factor obtained from round two against various procurement systems
Data analysis		Calculation of percentage, weighted mean, standard deviation, Severity Index, and Coefficient of Variation	Calculation of average utility values, Concordance Coefficient (W) and related level of significance

This indicates that 16 parameters have been considered by the panel to be highly important in public sector procurement selection. According to Elhag et al. (2005) Coefficient of Variation (COV) is a good indication of the agreement among responses made by an expert panel while a low COV indicates a higher level of agreement. Out of the 16 parameters, 5 have a COV below 20% and the remainder between 20% - 35%. These are comparatively low COVs and consequently they indicate a high agreement among experts. Table 6 shows the rank order of the first 10 parameters affecting public sector procurement.

Among the 26 parameters considered for round two of Delphi with reference to the private sector, 25 scored a mean rating higher than that of the average and a Severity Index of more than 65%. COV of 10 factors were below 20% and the remainder were between 20% - 30%.

This shows a high level of agreement among panel members. The ten most important parameters for private sector procurement selection are indicated in Table 7.

Table 5. Parameters that are considered relevant to the Sri Lankan construction industry subsequent to Delphi Round One

Cost related	Time related	Quality related	Other
Project cost	Early start of project	Quality of the product	Complexity of the project
Cost certainty	Tendering and evaluation time	Functionality of the product	Market condition
Price competition	Planning and designing time	Aesthetic appearance of the building	Market competitiveness
Financial risk	Construction time	Construction method	Availability of experienced contractors
Tendering cost	Time constraints		Accountability and transparency
Payment method of the project			Political constraints
Project funding method			Familiarity (client awareness on different procurement options)
Finance for the project			Allocation of responsibilities
			Regulatory feasibility

Table 6. Factors affecting public sector procurement selection

Factor	Mean Weight	Severity Index	SD	COV (%)	Rank
Accountability and transparency	2.90	96.67	0.30	10.34	1
Quality of the product	2.80	93.33	0.40	14.29	2
Price competition	2.77	92.33	0.42	15.27	3
Finance for the project	2.63	87.67	0.48	18.32	4
Payment method of the project	2.60	86.67	0.61	23.50	5
Cost certainty	2.57	85.67	0.50	19.28	6
Regulatory feasibility	2.47	82.33	0.66	26.88	7
Political constraints	2.33	77.67	0.52	22.20	8
Financial risk	2.30	76.67	0.59	25.48	9
Allocation of responsibilities	2.23	74.33	0.62	27.60	10

Though accountability and transparency ranked the most important for the public sector, it was almost negligible for the private sector, occupying 23rd position. Similarly, market competitiveness, availability of finance, payment method, political constraints, etc., have shown marked differences between the two sectors.

Table 7. Factors affecting private sector procurement selection

Factor	Mean Weight	Severity Index	SD	COV (%)	Rank
Cost certainty	2.93	97.67	0.25	8.51	1
Market competitiveness	2.80	93.33	0.40	14.29	2
Financial risk	2.77	92.33	0.42	15.27	3
Time constraints	2.73	91.00	0.44	16.20	4
Allocation of responsibilities	2.70	90.00	0.46	16.97	5
Project cost	2.67	89.00	0.47	17.66	6
Price competition	2.63	87.67	0.48	18.32	7
Complexity of project	2.60	86.67	0.49	18.84	8
Early start of project	2.57	85.67	0.50	19.28	9
Construction time	2.50	83.33	0.56	22.51	10

Thus, factors considered to be important for the public sector are quite different from that of the private sector. In order to statistically verify whether there is a difference in procurement selection parameters between the two sectors, Rank Correlation Coefficient (r_s) emerged as a promising tool (Tan, 2002).

$$r_S = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)} \quad (1)$$

where,

d_i is the difference between rankings of the i^{th} parameter obtained from Delphi Survey, and

n is the number of parameters included in the survey.

The resultant "t" value with "n-2" degree of freedom could be given as follows.

$$t_{cal} = r_s \frac{\sqrt{n-2}}{\sqrt{1-r_s^2}} \quad (2)$$

The null and alternative hypothesis for the test is:

Null hypothesis, $H_0 : \rho = 0$ (There is no correlation between rankings)

Alternative hypothesis, $H1: \rho \neq 0$ (There is a correlation between rankings)

Thus, the null hypothesis is to be rejected if $t_{cal} > 2.364$ or $t_{cal} < -2.364$. Based on the rankings obtained from the survey, the t_{cal} was found to be -0.563. This shows that there is not enough evidence to reject H_0. It proves that there is no relationship between the rankings of the two sectors. It could therefore be inferred that procurement selection parameters for the public sector are significantly different from that of the private sector.

Table 8. Utility values of public sector procurement systems

Procurement system/ Measures of significance	Five most significant factors from Round 2				
	Rank 1 Accountability and transparency	Rank 2 Quality of the product	Rank 3 Price competition	Rank 4 Finance	Rank 5 Payment method
Ad-measurement	94.13	85.61	93.26	79.80	78.50
Lump sum	79.30	76.17	82.83	74.35	77.22
Prime cost	89.57	69.00	69.57	76.00	78.00
Design and build	61.17	69.78	64.57	70.52	72.22
Package deal	60.52	66.57	62.35	66.45	69.43
Turnkey	54.09	59.70	51.74	48.30	51.30
Construction management	76.98	88.35	64.13	66.55	69.83
Management contracting	74.13	88.35	59.57	67.25	69.57
Concordance coefficient (W)	0.566	0.402	0.539	0.323	0.298
Significance (α)	0.000	0.000	0.000	0.000	0.000

Table 9. Utility values for different procurement systems – private sector

Procurement system/ Measures of significance	Five most significant factors from Round 2				
	Rank 1 Cost certainty	Rank 2 Market competitiveness	Rank 3 Financial risk	Rank 4 Time constraints	Rank 5 Allocation of responsibilities
Ad-measurement	66.41	87.61	66.83	58.83	67.87
Lump sum	95.43	77.17	82.74	60.00	70.13
Prime cost	43.70	69.00	59.06	65.00	60.43
Design and build	82.83	67.78	77.83	86.17	72.09
Package deal	76.71	64.57	69.57	84.30	67.39
Turnkey	86.96	59.70	81.43	88.13	74.35
Construction management	60.43	88.35	61.09	63.09	70.57
Management contracting	58.57	88.35	63.48	63.50	69.74
Concordance Coefficient (W)	0.623	0.502	0.386	0.455	0.337
Significance (α)	0.000	0.000	0.001	0.000	0.001

The third round of the Delphi Survey aimed to derive utility values for the first five factors of each sector against a wide range of procurement methods used in the industry. Consistency of the experts' utility values was subjected to Kendall Coefficient of Concordance (W) analysis. The results are summarized and presented in Tables 8 and 9 for the public and private sector, respectively. The purpose of this round was to find the most suitable procurement system(s) that fulfilled the major requirements placed by each sector. Utility values for the majority of factors were sufficiently consistent at 0.05 level of significance. For the public sector, Ad-measurement is the most suitable procurement system while Turnkey proved to be the most unsuitable. For the private sector, Lump Sum is the most promising while Prime Cost the most unsuitable.

DISCUSSION

Results reported above clearly indicate that the public sector is more focused on 'governance' related parameters while the private sector on 'profit maximization 'in deciding what the best procurement method for a project is. The results largely reflect this phenomenon as accountability, transparency, quality of end product, availability of finance, payment method, and political constraints are the main parameters that determine the procurement method to be used in public works. In contrast, parameters related to cost, early start, and competition dictated the procurement method to be used by private sector firms. Due to the complex nature of construction, private clients tend to use informal means such a long-term relationships, recommendations from other clients or colleagues, etc., as tools for procurement. However, due to strict procurement regulations such informal means cannot be attempted in the public sector. Often in the private sector, the links are formed on a personal basis and this is quite acceptable. For the public sector, however, its regulations and procedures would discourage personal connections, and tend to be based on an organization-to-organization relationship. In addition, public clients tend to look for measurable, objective, and evidence-based criteria in order to adhere to the regulations. As much as possible they tend to avoid vague non-measurable criteria like encouraging market competitiveness. The major objective of looking for evidence-based criteria is to fulfill the basic requirements of accountability and transparency. Research has shown that the added flexibility in private sector procurement offers efficiency advantages (Tadalis, 2012). Interestingly, 'political constraints' emerges as an important factor for the public sector due to the involvement of politicians in all levels of governance and particularly the negative effects of such involvement (Hui et al., 2011; Basheka and Bisangabasaija, 2010). See Raymond (2008) for a detail review of political interference and corruption involved in public sector procurement in Sri Lanka.

Ad-measurement type of traditional procurement method fulfills the accountability and transparency requirements while at the same time not compromising price competition. This has been one of the most common procurement methods used in Sri Lanka since the British colonial period. The practice in Sri Lanka emphasizes the use of Bill of Quantities as a way of obtaining a transparent but competitive tender which could then be used for post-contract administration. Use of detailed functional specifications ensures output quality, which was ranked by the expert panel to be the second most important parameter for the public sector. The progress payments based on 'unit rates' and re-measurement of work will ensure openness and probity. Thus, ad-measurement is the best suited procurement method for public sector clients in Sri Lanka. The results clearly support the argument that having utility values of more than 75% for all five factors deemed important for ad-measurement. Love et al. (2008 a) and Jafaar and Radzi (2012) have noted similar trends in Australia and Malaysia, respectively.

Lump Sum procurement method ensures cost certainty while reducing the risks for the client. It is not the best method to ensure market competitiveness in Sri Lanka. As the contractor is required to provide a lump sum quote, taking total responsibility including for scope, many contactors would avoid bidding for such projects and this makes it less competitive. However, the major weakness of this method comes from the need for a detail design with specification for bidding. An early start to the project cannot be achieved with

such requirements having to be met prior to tendering. Nevertheless the Lump Sum method emerged as the most promising for private sector clients.

CONCLUSION

An exclusive set of multiple decisive parameters has been identified as being generally adequate for the procurement selection of public and private sector projects. Delphi technique has been used in this study to ensure that consensus is reached for utility values provided by the panel of experts from industry. Results revealed that 16 procurement selection parameters are significant for the public sector while 25 are important for the private sector. With regard to the public sector, accountability and transparency ranked on top followed by quality of end product, price competition, availability of finance, payment method, etc. For the private sector, cost certainty, market competitiveness, financial risk, time constraints, and allocation of responsibilities occupied the first five ranks.

As expected, it was proven that parameters governing public sector procurement selection are quite different from that of the private sector. Though accountability and transparency was ranked first for the public sector, it was almost neglected in the private sector when decisions on procurement were made. Using Rank Correlation Coefficient it was shown that the ranks obtained for the two sectors differ significantly at 95% confidence level. Utility values obtained from experts showed that public sector procurement needs could be predominantly met by adopting Ad-measurement method while private sector needs could be satisfied via the Lump Sum method. Furthermore, it was concluded that Turnkey is the most unsuitable for the public sector while Prime Cost equally unsuitable for private sector needs. Further research is required to prove these observations in other settings and countries before it could be implemented.

REFERENCES

Alhazmi, T., and Mccaffer, R. (2000). Project procurement systems selection model. Journal *of Construction Engineering and Management*, 126(3), 176 – 183.

Ambrose, M.D., and Tucker, S.N. (1999). Matching a procurement system to client and project needs: a procurement system evaluator. Proceedings of the conference 'Customer Satisfaction: *A Focus for Research and Practice in Construction'*, P.A. Bowen and R.D. Hindle (Eds.), Cape Town.

Arlbjørn, J.S., and Freytag, P.V. (2012). Public procurement vs private purchasing: Is there any foundation for comparing and learning across the sectors. *International Journal of Public Sector Management*, 25(3), 203-220.

Basheka, B.C. and Bisangabasaija, E. (2010). Determinants of unethical public procurement in local government systems of Uganda: a case study. *International Journal of Procurement Management*, 3(1), 91-104.

Capio, R. J. (2006). Ethics in government procurement. *Contract Management*, March, 34-36.

Chan, A.P.C., Yung, K.H.E., Lam, P.T.I., Tam, C.M. and Chueng, S.O. (2001). Application of Delhi method in selection of procurement systems for construction projects. *Construction Management and Economics*, 19(3), 699-718.

Chan, C.T.W. (2007). Fuzzy procurement selection model for construction projects, *Construction management and Economics*, 25, 611-618.

Chang, C.Y., and Ive, G. (2002). Rethinking the multi-attribute utility approach based procurement route selection technique, *Construction Management and Economics*, 20(6), 275–284.

Chen, T.H. (2008). An economic approach to public procurement, *Journal of public procurement*, 8(3), 407-430.

Chen, Y.Q., Liu, J.Y., Li, B., and Lin, B. (2011). Project delivery system selection of construction projects in China. *Expert Systems with Applications*, 38, 5456-5462.

Cheung, U., Lam T.I., Leung, M.Y. and Wangwan, Y. (2001). Analytical hierarchy process based procurement selection method, *Construction Management and Economics*, 19(5), 427 – 437.

Dada, M.O. (2012). Predictors of procurement selection: An investigation of traditional and integrated methods in Nigeria, *Journal of Construction in Developing Countries*, 17(1), 71-85.

Elhag, T.M.S., Boussabaine, A.H., and Ballal, T.M.A. (2005). Critical determinants of construction tendering costs: Quantity surveyors' standpoint. *International Journal of Project Management*, 23, 538-545.

Furneaux, C.W., Brown, K., and Allan, D. (2008). Public values embedded in Australian public works procurement, *Public Money and Management*, June, 167-172.

Hallowell, M.R. and Gambatese, J.A. (2010). Qualitative research: application of the Delphi method to CEM research. *Journal of Construction Engineering and Management*, 136 (1), 99–107.

Hashim, M., Li, M.C.Y., Yin N.C, Hooi N.S., Heng S.M. and Yong T.L. (2006). Factors influencing the selection of procurement systems by clients. *Proceedings of the International Conference on Construction Industry*, 21st – 25th June, Padang, Indonesia.

Hawkins, T.G., Gravier, M.J., and Powley, E.H. (2011). Public versus private sector procurement ethics and strategy: What each sector can learn from the other. *Journal of Business Ethics*, 103, 567-586.

Hughes, W. (1989). Identifying the environments of construction projects, *Construction Management and Economics*, 7, 29-40.

Hui, W.S., Othman, R., Omar, N.H., Rahman, R.A., and Haron, N.H. (2011). Procurement issues in Malaysia, *International Journal of Public Sector Management*, 24(6), 567-593.

Jafaar, M., and Radzi, N.M. (2012). Building procurement in a developing country: a comparison study between public and private sectors, *International Journal of Procurement Management*, 5(5), 608-626.

Kumaraswamy, M. and Dissanayaka, S. (2001). Developing a decision support system for building project procurement, *Building and Environment*, 36 (3), 337-349.

Kumaraswamy, M.M., and Dissanayake, S.M. (1998). Linking procurement system to project priorities. *Building Research and Information*, 26 (4), 223-238.

Love, P.E.D., Davis, P.R., Baccarini, D., Wilson, G., and Lopez, R. (2008 a). Procurement selection in the public sector: a tale of two states. *Proceedings of the conference 'Clients Driving Innovation: Benefiting from Innovation'*, 12-14 March, Gold Coast, Australia.

Love, P.E.D., Davis, P.R., Edwards, D.J., and Baccarini, D. (2008 b). Uncertainty avoidance: Public sector clients and procurement selection. *International Journal of Public Sector Management*, 21(7), 753-776.

Love, P.E.D., Earl, G., and Skitmore, M. (1996). Selecting a suitable procurement method for building projects. *Construction management and economics*, 16(1), 221-233.

Love, P.E.D., Edwards, D.J., Irani, Z., and Sharif, A. (2012). Participatory action research approach to public sector procurement selection. *Journal of Construction Engineering and Management*, 138, 311-322.

Luu, D.T., Thomas, S., and Chen S.E. (2003). Parameters governing the selection of procurement system - an empirical survey. *Engineering, Construction and Architectural Management*, 10(3), 209-218.

Masterman, J. W. E. (1992). *An Introduction to Building Procurement Systems*, London : E and FN Spon.

Masterman, J.W.E., and Gameson, R. (1994). Client characteristics and needs in relation to their selection of procurement systems. In S. Rowlinson (Ed.), *Proceedings of the 'East Meets West – Procurement Systems Symposium',* CIB Publication 175, 4-7 December, Hong Kong, 79-87.

McDermott, P., and Rowlinson, S. (1999). *Procurement systems: A guide to best practice in construction*, London: E and FN Spon.

Molenaar, K.R. (1999). Selecting appropriate projects for design-build procurement. In S.O. Ogunalana (Ed.), *Proceedings of 'Profitable partnering in construction procurement: joint symposium of CIB W92* (procurement system) and CIB TG 23 (Culture in construction) , London: E and FN Spon, 349-60.

Moshini, R.A. (1993). Knowledge-based design of project procurement process, *Journal of Computing in Civil Engineering*, 7(1), 107-122.

Mustapha, F. H., Nauom, S. G., and Aygun, T. (1994). Public Sector Procurement Methods used in Turkey. In S. Rowlinson (Ed.), *Proceedings of the 'East Meets West – Procurement Systems Symposium'*, CIB Publication 175, 4-7 December, Hong Kong, 221-227.

Ng, S.T., Luu, D.T., and Skitmore, M. (2005). Capitalizing Experiential Knowledge for Guiding Construction Procurement Selection. *Australian Journal of Construction Economics and Building*, 13(3), 112-117.

Ng, T.S., Luu, D.T., Chen, S.E., and Lam K.C. (2002). Fussy membership functions of procurement selection criteria, *Construction management and Economics*, 20(2), 285-296.

Ofori, G., and Pin, T. (1996). Linking Project Procurement to Construction Industry Development, In R. G. Taylor (Ed.), *Proceedings of CIB W92 North Meets South Procurement System Symposium*, Durban, South Africa, 473-182.

Oyegoke, A.S., Dickinson, M., Khalfan, M.M.A., McDermott, P., and Rowlinson, S. (2009). Construction project procurement routes: an in-depth critique. *International Journal of Managing Projects in Business*, 2(3), 338-354.

Palaneeswaran, E., Kumaraswamy, M., and Ng, T. (2003). Targeting optimum value in public sector projects through "best value"-focused contractor selection. *Engineering, Construction and Architectural Management*, 10 (6), 418 – 431.

Rameezdeen, R., and De Silva, S. (2002). Trends in construction procurement systems in Sri Lanka. *Built-environment-Sri Lanka*, 2(2), 2-9.

Raymond, J. (2008). Benchmarking in public procurement. *Benchmarking: An International Journal*, 15(6), 783-793.

Roodhooft, F., and Abbeele, A.V.D. (2006). Public procurement of consulting services: Evidence and comparison with private companies. *International Journal of Public Sector Management*, 19(5), 490-512.

Rowe, G., and Wright, G. (1999). The Delphi technique as a forecasting tool: Issues and analysis. *International Journal of Forecasting Science*, 28(3), 763-774.

Rowlinson, S. (1999). Definition of Procurement Systems. In S. Rowlinson, and P. McDermott, (Eds.), *Procurement Systems: A Guide to Best Practice in Construction, CIB Documentation*, London: E and FN Spon., 27-53.

Schmidt, R.C. (1997). Managing Delphi survey using nonparametric statistical techniques, *Decision Science*, 28(3), 763-774.

Sheath, D.M., Jaggar, D., and Hibberd, P. (1994). Construction Procurement Criteria: a multi-national study of major influencing factors, *Proceedings of the 'East Meets West – Procurement Systems Symposium'*, CIB Publication 175, 4-7 December, Hong Kong, 361-370.

Skitmore, R.M., and Marsden, D.E. (1988). Which Procurement System? Towards a Universal Procurement Selection Technique. *Construction and Management Economics*, 6, 71-89.

Sporrong, J. (2012). Criteria in consultant selection: Public procurement of architectural and engineering services. *Australasian Journal of Construction Economics and Building*, 11(4), 59-76.

Tadalis, S. (2012). Public procurement design: Lessons from the private sector, International *Journal of Industrial Organization*, 30, 297-302.

Tan, W. (2002). *Practical Research Methods*, Singapore: Person Education Asia Ltd.,

Teo, P.L., Bridge, A.J., Gray, J., and Rawlinson, S. (2012). Towards testing a new first-order decision-making model for the procurement of public sector major infrastructure, In A.S. Akintoye, and S. Rowlinson, (Eds.), *International Conference on Facilities Management, Procurement Systems and Public Private Partnership*, 23rd – 25th January 2012, University of Cape Town, Cape Town.

Ward, S.C., Curtis, B., and Chapman, C.B. (1991). Objectives and performance in construction projects. *Construction Management and Economics*, 9, 343–53.

In: Construction Project Management Research … ISBN: 978-1-63321-857-4
Editor: Faisal Arain

Chapter 10

PROJECT MANAGEMENT LEADERSHIP STYLES OF NIGERIAN CONSTRUCTION PROFESSIONALS

Ayodeji Emmanuel Oke*
Department of Quantity Surveying,
Federal University of Technology, Akure, Nigeria

ABSTRACT

Leadership is a vital requirement of a project manager in ensuring that the efforts of other persons are directed toward the accomplishment of organizational objectives. The aim of this research is to assess project managers' leadership styles of construction professionals in Nigeria using various criteria. A total of 70 questionnaires were administered using convenience sampling method on construction professionals out of which a total of 57 were returned and considered fit for analyses. Jerrell/Slevin management instrument was used in the analysis based on the identified questions on the noted 4 leadership styles and construction professionals were also involved in ranking the 10 identified leadership styles. Mean item score was used in the analysis of the data collected through survey. Using the Jerrell/Slevin management instrument, architects and engineers were found to exhibit shareholder leadership styles while quantity surveyors and builders were found to be autocratic in exhibiting their project management leadership role. From respondents' opinion, it was observed on the general note that archtects and builders in Nigeria do exhibit autocratic leadership style while quantity surveyors and engineers exhibit task oriented leadership style. It was further observed that none of the construction professionals in Nigeria exhibit democratic or cooperative style which has been described as the best style of leadership according to literature and this call for flexibility in their leadership. Since there are different types of project managers' leadership styles, the study recommended that the most appropriate leadership style for different kinds of projects should be adopted by professionals.

Keywords: Construction Professionals, Jerrell/Slevin Management Instrument, Leadership Styles, Project Management, Nigeria

* Corresponding author: emayok@gmail.com P. M. B. 704, Akure, Nigeria. +2348038060429, +2347056888977.

1. INTRODUCTION

The realization of construction projects brings together a diversity of individuals and organizations, variously forged into groups and teams, in which power is important in shaping leader/follower behaviour. In Nigeria, there is no special body that is responsible for project management of construction projects and this makes it possible for any of the Nigerian construction professionals to function as project managers. Fellow, Liu, and Miu Fong (2003) observed that Quantity surveyors, being primarily project cost consultants and procurement/contractual advisers, are employed both by the clients' and the contractors' organizations in their quest for value for their money and this undermine the reason for their choice as construction project managers.

Benator (2003a) observed that the project manager's responsibility is to manage the financial, technical and schedule requirements of the project in such a manner as to bring the project in on-time, within budget and with a technical quality that meets or exceeds the contractual performance specifications. The project manager is ultimately responsible for the productivity of the people in the project team; it is therefore the project manager's job to maintain cohesion in the project. Hence, the project manager must be a leader; one who can inspire and motivate people who have ties both to the project as well as to the functional organisation. Benator and Thumann (2003) observed that the project manager plays an important role in development of the overall estimate of the total costs of the project. In addition the project manager develops checkpoints to ensure the overall project is completed within budget. The project manager usually develops the budget in conjunction with a cost estimating department.

A project manager is often a client representative and has to determine and implement the exact needs of the client, based on knowledge of the firm they are representing (Chan, 2001). The ability to adapt to the various internal procedures of the contracting party, and to form close links with the nominated representatives, is essential in ensuring that the key issues of cost, time, quality and above all, client satisfaction, can be realized. Odusami, Iyagba, and Omirin (2003) observed that project management practice is still at infancy stage in Nigeria. Virtually all the Nigerian construction professionals— architects, builders, civil engineers, estate surveyors and quantity surveyors—practise project management as consultancy services along with their primary profession.

Leadership style as observed by Goleman (2002) is crucial to success of a project and construction project delivery. Leadership according to Benator (2003b) is a process and not a one-time, fire and forget evolution. To be an effective leader, there is a need for one to continually exercise good leadership skills. You don't need to be perfect, but you should always strive to apply sound leadership principles to your leadership efforts. Leadership involves influencing individuals or groups and good leaders are effective influencers of others because they know leaders can't do everything. Good leadership is designed to accomplish an organizational goal or mission, i.e. leading a project team and managing project to a high quality, on time and within budget conclusion with a customer who is happy with that conclusion.

Giritli and Oraz (2003) opined that different approaches to the subject have led to various classifications of leadership styles. Although behaviour categories may be labelled similarly, their conceptualization and operationalization may be totally different in most cases.

Leadership style according to Chan, Chan and Chan (2000) is in general of two types: the first one is the employee-centred type, described as democratic or participative, and the second one is the task-centred type, described as autocratic or authoritarian. Organizations have paid attention to leadership styles of their people who occupy managerial positions, holding the belief that leadership is an important factor in achieving business success (Giritli and Oraz 2003).

2. LITERATURE REVIEW

2.1. Project Management

Chartered Institute of Building (2008) defined project management as "the overall planning, control, co-ordination from inception to completion aimed at meeting a client's requirements and ensuring completion on time within cost and required quality and standard. In another opinion, Project Management Institute (2008) defines it as the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations which involves balancing competing demands among scope, time, cost and quality. The management of a construction project has unique features such as the relationship with the client and the inter-organization nature of the process. The project manager is usually in the position of leading contributors over whom he has limited authority. A significant outcome of this is that each contributor will be subject to leadership form of both the project manager and the manager of his employer's organization. Project managers will be leading a group of mature, experienced professionals, consequently, his leadership will tend to be democratic and rely on impulse and persuasion rather than authority.

In a broader form, project management is the planning, control and co-ordination of a project from conception to completion (include commissioning) on behalf of a client; the identification of the clients objectives in terms of utility, function, quality, time and cost and the establishment of relationship between resources it is also concerned with the integration, monitoring and control of the contributors to the project and their output, and the evaluation and selection of alternatives in pursuit of the client satisfaction with the project outcome.

Lee-Kelley, Leong and Loong (2003) set out to find which Project Management Knowledge Areas are critical to project success and whether the project manager's leadership style influences his or her perception of control. It was discovered that project manager's leadership style influenced his or her perception of success on the project. They suggest: There is a significant relationship between the leader's perception of project success and his or her personality and contingent experiences. Thus the inner confidence and self-belief from personal knowledge and experience are likely to play an important role in a manager's ability to deliver a project successfully. It seems that the project manager's emotional intelligence has an impact on his or her perception of the success of the project. All four of those could impinge on a project manager's perception of success of the project:

1. How aware are they of their own performance on the project-not whether they thought the project was a success (i.e., it achieved its key performance indicators),

but whether they thought the project management was a success. Are they satisfied with how they managed the project?
2. That assessment may be influenced by how they felt they comported themselves
3. The satisfaction of the project team members may also affect their assessment of the project, regardless of how the project actually performed
4. The satisfaction of the other stakeholders, particularly the client, may also have an effect.

2.2. Nigerian Construction Professionals

Professionals in the building industry can be sub-divided into two groups i.e. professionals in the design of buildings and professionals in the actual construction of buildings (Oke, 2011). The architect is employed by the client to act as his agent according to Fadamiro and Ogunsemi (1996). He does a number of services to make the design and construction stages successful. The architect's job includes to interpret the client's requirements into a specific design or scheme; to recommend a suitable contractor to construct the building at the most competitive estimate available; to control and supervise the construction of the building so as to ensure that the building conforms to the drawings; and to keep the client informed of the progress of work and to advise where and when necessary. The quantity surveyor is the project accountant and works in co-operation with the site manager. He assists the client in controlling the cost of the project from the inception to the completion stage. He is expected to be intimately aware of the properties and cost of materials and components to be used in the building, may advise the architect in the choice of alternative components or materials on the basis of availability, durability and/or costs. He has the responsibility of providing a balanced cost plan and the production of periodic cost checks so as to maintain the balance of the plan (Seeley, 1998).

The engineers include the structural, services and environmental consultants. They are required to assist the architect in the design of the project within the scope of their specialization. They produce calculations or other relevant data that may assist the architect in his design, the quantity surveyor in his cost control and the local authority in its assessment of the suitability of the project with regard to the statutory regulations. A builder is a professional who posses the management skills needed to plan, organize, control, co-ordinate and direct the execution of new building projects and maintain existing buildings, including the economic utilization of materials, equipment and human resources (Odulami, 2002). He is therefore employed by the contractor to plan, monitor and supervise the running of a number of different contracts taking into consideration quality and time.

2.3. Project Management Leadership Styles

In considering leadership styles in construction industry, the first thing that needs to be determined is whether the construction industry is a special case (Giritli and Oraz, 2003). According to Harvey and Ashworth (1993), the construction industry has characteristics that separate it from all other industries. These characteristics that can have an impact on leadership styles in construction are: (a) project characteristics, (b) contractual arrangements,

(c) project life-cycle and (d) environmental factors. A construction project is composed of a multitude of organizations. Individuals or groups from several parent organizations are all drawn together for a short time related to a specific task. The project-based organization is disbanded upon the completion of that task. This project-based nature of construction industry with its temporary multi-organizations will almost certainly have an important influence on the managerial leadership styles of professionals working in the industry. Lee-Kelley and Loong (2003) observed that there is no definitive skill and style mix that is appropriate for handling different types of projects.

Liu, Fellows and Fang (2003) believed that styles of leadership emerged from the behavioural studies as analysis of the ways in which leaders execute the functions. Researchers have identified the major leadership styles as, laissez-faire, democratic, and autocratic (Halepota, 2005). It was further affirmed that democratic leadership style has achieved higher productivity and effectiveness from the perception of behavioural scientists. Chan and Chan (2005) adopted transformational and transactional leadership styles in a study. It was stated that Bass's transformational leadership theory, comprising transactional and transformational leadership styles, described the leader as one who helps to develop and maintain a sense of commitment, and raises aspirations and motivation among colleagues and followers. Transformational leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality while transactional leadership was described as simply contingent reinforcement.

In Love, Davis and Lopez (2007) opinion, two leadership styles dominate the construction management literature and they are charismatic and transformational. The former provide a vision that followers accept and believe in while the later tend to obtain followers compliance. Furthermore, construction professionals need different leadership styles in different phases of the project life cycle (Giritli and Oraz 2003). The style of leadership changes as the project progresses through its life cycle. During the different phases of the design process, styles may need to allow for more debates, fine-tuning and deliberation. Yet, during the construction phases, they may be more structured and dominant.

Four leadership styles were identified by Slevin and Pinto (1998) using Jerrell/Slevin measuring instrument and they are:

1. The Shareholder manager (D, I) (0–50, 0–50). This position means literally ''poor manager''. There is little or no information input and exchange between the leader and the group. The group has authority in the final decision
2. The Autocrat (D, I) (50–100, 0–50). Such managers solicit little or no information Input from their group. They make managerial decisions solely by themselves.
3. The Consensus manager (D, 1) (0–50, 50–100). This is purely consensus manager. He throws the problem opens to the group for discussion and also allows or encourages the group to make a relevant decision.
4. The Consultative autocrat (D, I) (50–100, 50–100). In this managerial style intensive information input is elicited from the members, but such formal leaders keep all substantive decision making authority to themselves.

3. RESEARCH METHODOLOGY

Leadership styles of leaders as perceived by their employees can be assessed according to Chan and Chan (2005) through the use of the Multifactor Leadership Questionnaire (MLQ), and Jerrell/Slevin management instrument which was claimed by Slevin and Pinto (1988) to have been used effectively with thousands of managers both in explaining the theory and providing them with a diagnostic on their particular style can also be employed. The employees are to assess their leaders using the MLQ while individuals were to assess themselves when Jerrell/Slevin instrument is to be employed.

Jerrell/Slevin management instrument and Mean internal Score were employed in the analysis for this study. Jerrell/Slevin instrument is such that respondents were asked 20 questions using 5 Likert scales rating of strongly disagree, disagree, neutral, agree and strongly agree (Slevin and Pinto, 1998). The first 10 questions were to determine the "D" (decision authority) value while the other 10 were meant for "I" (subordinate group's information input to decision) value. The mean for each category of respondents were determined and the raw score "D" and "I" were identified on a Jerrell/slevin management instrument table in order to determine their corresponding percentile score. These percentiles were plotted on the Bonoma-Slevin leadership model in order to determine the leadership style of Nigerian quantity surveyors using various criteria. The Bonoma-Slevin model identified 4 leadership styles i.e. Autocratic, consensus, shareholder and consultative autocratic and it is presented in form of a graph in which "D" is plotted on the X-axis and "I" on the Y-axis.

177 construction professionals that are eligible and competent to act as construction project managers were also involved in ranking Nigerian construction professionals with respect to identified 10 leadership styles. These professionals are architects, quantity surveyors, builders and engineers and the questionnaires were administered on a convenient sampling basis.

4. FINDINGS AND DISCUSSION

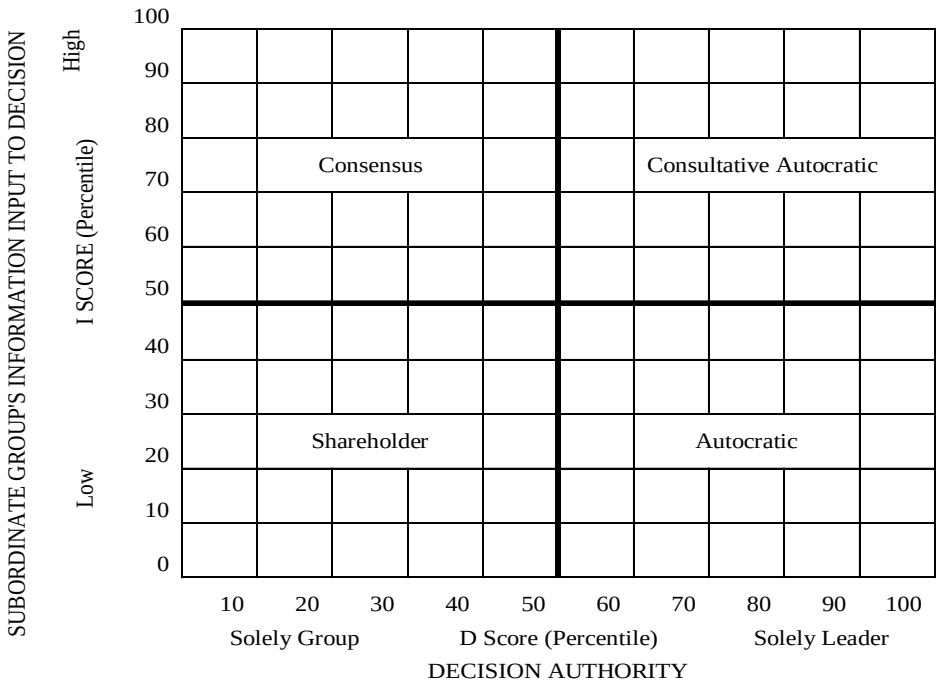
4.1. Background of Respondents

Table 1 on the profession of the respondent shows that about 25% were quantity surveyors, 22% were Architects, 18% were builders and 35% were engineers. The analysis in this study was based on this number of respondents.

4.2. Leadership Styles Using Jerrell/Slevin Instrument

Using Jerrell/Slevin management instrument, table 2 shows that quantity surveyors exhibit autocratic leadership style while those that has between 16-20 number of experience and associate members exhibit shareholder style. More so, based on the projects handled, those that had handled between 21 and 30 projects exhibit consensus style of project managers' leadership style. Architects exhibit shareholder project managers' leadership style

except those in consulting firm, respondents with 11-15 number of years of experience and those that had handled above 31 projects.



Source: Slevin and Pinto (1988).

Figure 1. Jerrell/Slevin Management instrument.

Table 1. Respondents' professions

Profession	Frequency	Percent
Quantity surveyor	45	25.42
Architect	39	22.03
Builders	31	17.51
Engineers	62	35.03
Total	177	100.0

Generally, engineers exhibit consensus project managers' leadership style while those in contracting firms, with 6-10 years of experience and 11-15 projects handled exhibit shareholder project managers' leadership style. More so, those that had 16-20 years of experience, associate, fellow, 6-10, 31 and above project handled exhibit autocratic project mangers' leadership style. All builders exhibit autocratic project managers' leadership style.

4.3. Leadership Styles from Respondents' Opinion

On the general opinions of respondents, Nigerian construction project managers do exihibit autocratic leadership style followed by task oriented as observed in table 3. It could

be observed that Laissez- Faires and servant leadership style are least exihibited with respect to overall and individual rating of the professionals. Archtects exhibit autocratic leadership style followed by task oriented whereas quantity surveyors mostly exhibit task oriented leadership style followed by bureaucratic. Engineers exhibit task oriented leadership style the most followed by autocratic while Builders exhibit autocratic leadership style followed by Charismatic.

Table 2. Leadership styles of construction project managers in Nigeria

Categorization	Quantity Surveyor	Architect	Builder	Engineer
Overall	Autocratic	Shareholder	Autocratic	Shareholder
Type of organisation				
Consulting	Autocratic	Autocratic	Autocratic	Consensus
Contracting	Autocratic	Shareholder	Autocratic	Shareholder
Government establishment	Autocratic	Shareholder	Autocratic	Consensus
Years of experience				
1 - 5	Autocratic	Shareholder	Shareholder	Shareholder
6 - 10	Autocratic	Shareholder	Autocratic	Shareholder
11 - 15	Autocratic	Autocratic	Autocratic	Shareholder
16 - 20	Shareholder	Shareholder	Autocratic	Autocratic
21 - 30	Autocratic	Shareholder	Autocratic	Shareholder
31 and above	Autocratic	Shareholder	Shareholder	Shareholder
Membership type				
Probationer	Shareholder	Shareholder	Autocratic	Consensus
Graduate	Autocratic	Shareholder	Autocratic	Shareholder
Associate	Autocratic	Shareholder	Autocratic	Autocratic
Fellow	Autocratic	Shareholder	Autocratic	Autocratic
No of projects handled				
1 – 5	Autocratic	Shareholder	Autocratic	Consensus
6 – 10	Autocratic	Autocratic	Autocratic	Autocratic
11 – 15	Autocratic	Shareholder	Autocratic	Shareholder
16 – 20	Autocratic	Shareholder	Autocratic	Shareholder
21 – 30	Consensus	Shareholder	Autocratic	Shareholder
31 and above	Autocratic	Autocratic	Autocratic	Autocratic

Table 3. Perception of construction professionals to their leadership styles

Styles	Overall		Architects		QS		Engineers		Builders	
	Mean	R	Mean	R	Mean	R	Mean	R	Mean	R
Autocratic	3.89	1	4.26	1	3.58	4	3.73	2	3.91	1
Task oriented	3.84	2	3.88	2	3.84	1	3.80	1	3.73	3
Transactional	3.64	3	3.50	4	3.67	3	3.61	3	3.44	6
Charismatic	3.63	4	3.40	6	3.53	6	3.42	5	3.75	2
Transformational	3.52	5	3.53	3	3.41	7	3.55	4	3.48	5
Democratic	3.47	6	3.33	7	3.58	4	3.34	6	3.49	4
Bureaucratic	3.39	7	3.42	5	3.72	2	3.32	7	3.33	7
People oriented	3.00	8	3.14	8	3.33	8	3.14	8	3.02	9
Servant leadership	2.81	9	2.66	9	2.80	9	2.80	9	3.30	8
Laissez-Faires	2.63	10	2.46	10	2.56	10	2.50	10	2.64	10

Note: QS-Quantity surveyors, R-Rank.

4.4. Discussion of Findings

Professionals acting as project managers should posses the ability to adapt different leadership styles depending on situation at hand. Halepota (2005) affirmed that democratic leadership style has achieved higher productivity and effectiveness from the perception of behavioural scientists. This style was ranked 6th according to the opinion of the respondents and it could be observed that none of the identified categories of professionals exhibit this leadership style.

Using Jerrell/Slevin instrument, Archtects and Engineers exhibit shareholder project managers' leadership style while Quantity surveyors and Builders exhibit Autocratic project managers' leadership style. Goleman (2002) identified other project managers leadership styles namely:Bureaucratic leadership, charismatic leadership, Democratic /participative leadership, Laisses-faier leadership style. This observation is also in agreement with earlier study by Slevin (1989). The clients or the eventual asset-holders, on the other hand, are supposed to be only interested in the "output" of the system. The importance of long-term building quality, life-cycle performance and maintainability of the "physical product" of a project beyond the project duration are already well appreciated by facility managers. The longer time-frame also means the longer duration that the project system will be exposed to the external environmental factors. These according to Chan and Chan (2005) may include changing objectives of the client, macro-economic and political environment, the funding environment and many more. If one accepts that the consideration of a much longer time frame is indeed important in ensuring the success of projects, one should not ignore the long-term facility management approach needed to meet the asset holder's requirements. Based on respondent opinion, it could be observed that there is significant relationship between project managers' leadership style, project team and time performance.

CONCLUSION AND RECOMMENDATION

Nigerian construction professionals are more autocratic in their project management leadership as observed using Jerrell/Slevin management instrument. They were also found to be task oriented, transactional and charismatic in exhibiting their leadership role. The study revealed that Archtects and Builders exhibit Autocratic project managers' leadership style while Quantity surveyors and Engineers exhibit Task oriented project managers' leadership style. More so, Nigerian construction professionals were found to be more transactional than transformational and this study recommend a need for improved transformational style since the style is more participatory and allowed suggestions from followers without fear.

Based on the findings, it was recommended that since there are different types of project managers' leadership styles, the most appropriate leadership style for different kinds of projects should be adopted. The democratic or cooperative style is the best style of leadership according to literature. It motivates the employee to work properly. By this style, an employee feels that he has some importance in the industry and he increases his efficiency, therefore, thi should be an important focus for selecting and training project managers. More so, in order to choose an appropriate project manager for a project, the project managers' leadership styles should be matched to the needs of the project stakeholders. In addition, doing so should increase the likelihood of the project being successful.

REFERENCES

Benator, B (2003a). Overview of project management. In Benator, B and Thumann, A. (Ed.). *Project management and leadership skills for engineering and construction projects*, Indian, The Fairmont Press, Pp 11-22.

Benator, B (2003b). Leadership Fundamentals. In Benator, B and Thumann, A. (Ed.). *Project management and leadership skills for engineering and construction projects*, Indian, The Fairmont Press, Pp 111-150.

Benator, B and Thumann, A. (2003). *Project management and leadership skills for engineering and construction projects*, Indian, The Fairmont Press.

Chan, A. T., and Chan, E. H., (2005). Impact of Perceived Leadership Styles on Work Outcomes: Case of Building Professionals. *Journal of Construction Engineering and Management*, 131 (4), Pp 413 – 422.

Chan, E. H., Chan, M. W., and Chan, A. T. (2000). Disintegrating professional boundaries: A case with the building professions in Hong Kong, *International Project Manager*, 19(2), 127-135.

Chan, P. (2001). Leaders in UK construction: the importance of leadership as an emergent process, *The Leadership Quarterly*, 13(6), 643-671.

Chartered Institute of Building (2008). Project management. Retrieved May 12, 2008 from http://www.ciob.org.uk/

Fadamiro, J. A., and Ogunsemi, D. R. (1996). *Fundamentals of building: Designs, construction and materials*. Ile-Ife: Fancy publication Ltd.

Fellow, R., Liu, A., and Miu Fong, C. (2003). Leadership style and power relations in quantity surveying in Hong Kong. *Construction Management and Economics* 21, 809–818.

Giritli, H., and Oraz, G. T. (2003). Leadership styles: some evidence from the Turkish construction industry. *Construction Management and Economics* 21, 253–256.

Goleman, D. (2002). *Primal leadership*. Retrieved December 1, 2008, from http://www. 12 manage.com/methods_goleman_leadership_styles.html.

Halepota, H. A. (2005). Motivational theories and their application in construction. *Cost engineering.* March, 2005.

Harvey, R. C. and Ashworth, A. (1993). *The construction industry of Great Britain*, United kingdom, Butterworth-Heinemann publisher.

Lee-Kelley, L. and Loong, K. (2003). Turner's five-functions of project-based management and situational leadership in IT services projects. *International Journal of Project Management* 21, 583–591.

Liu, A., Fellows, R., and Fang, Z. (2003). The power paradigm of project leadership. *Construction Management and Economics* 21, 819–829.

Love, P. E., Davis, P. R., and Lopez, R. (2007). Prometheus and bob: Understanding, measurement and implications of emotional intelligence. In Egbu, C. O. and Tong, M. K. (Ed.), Proceeding of the 3rd Scottish conference for postgraduate researchers of the built and natural environment, held 22-27 November, 2007 at Glasgow Caledonian University, UK.

Odulami, A. A. (2002). Building materials specification and enforcement on site. In D. R. Ogunsemi (Ed.), Building Collapse: Causes, prevention and remedies (pp. 22-27). The Nigerian Institute of Building, Ondo State.

Odusami, K. T., Iyagba, R. R., and Omirin, M. M. (2003). The relationship between project leadership, team composition and construction project performance in Nigeria. *International Journal of Project Management* 21, 519–527.

Oke, A. E. (2011) An examination of the causes and effects of building collapse in Nigeria, *Journal of Design and Environmental Management*, 9, 37-47.

Project Management Institute (2008). Project management. Retrieved May 12, 2008 from http://www.pmi.org/

Seeley, I. (1998). *Building quantities explained*. London: Macmillan Press Limited.

Slevin, D. P., and Pinto J. K. (1988). Leadership, motivation and the project manager. In: Cleland, D. O. and King, W. R.(Ed.) *Project management handbook*. New York: Van Nostrand Reinhold, Pp 739–770.

AUTHOR'S BIO

Mr Ayodeji Emmanuel Oke is an experienced Quantity Surveyor with exceptional project costing capabilities. He is a first class graduate from the Department of Quantity Surveying, Federal University of Technology, Akure, Nigeria and currently an Assistant Lecturer in the same department. He holds a Master of Technology degree in Quantity Surveying and currently working on his PhD. He is a member of the following professional organizations;

- Nigerian Institute of Quantity Surveyors
- Quantity Surveyors Registration Board of Nigeria
- Nigerian Institute of Management

INDEX

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y