KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

A MODEL FOR PREDICTING THE PERFORMANCE OF PROJECT MANAGERS AT THE DESIGN PHASE OF MASS HOUSE BUILDING PROJECTS IN GHANA

BY

ISAAC SARKODIE-POKU

BSc. (Hons) Building Technology, MGhIS

A PROJECT REPORT PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR A DEGREE OF MASTER OF SCIENCE IN CONSTRUCTION MANAGEMENT FOR THE DEPARTMENT OF BUILDING TECHNOLOGY AT THE COLLEGE OF ARCHITECURE AND PLANNING.

JUNE, 2013

DECLARATION

I hereby declare that this work or any part thereof has not been submitted in any form to the university or to any other body whether for the purpose of assessment, publication or for any other purpose. Save for any express acknowledgement, reference and/or bibliographies cited in the work.

I confirm that the intellectual content of the work is the result of my own efforts and no other person.

Isaac Sarkodie-Poku ....

Student Signature Date

Certified by

Dr D.K Ahadzie ....

Supervisor Signature Date

ACKNOWLEDGEMENT

I am very grateful to the Almighty God for granting me strength and health during the duration of my studies.

I wish to express my sincere appreciation to my Supervisor Dr Divine Ahadzie for the immense assistance provided me in terms of guidance on topic selection, reference documents, suggestions and encouragement throughout this research process. I will forever remain grateful to him for enlightening me on research methods and writing skills during this brief period. I also want to acknowledge the support from Prof Joshua Ayarkwa and Dr B.K Baiden and indeed all the assistance of the rest of the staff of the Department of Building Technology-KNUST.

Many thanks to Mr Isaac Buckman for the assistance offered me in the administration of the questionnaires in Accra. I wish to also express my gratitude to Mr Kofi Agyekum of the Department of Building Technology for his assistance during the analysis of the data.

I am grateful to all respondents during the data collection and to Mr Coenraad Lotter of CWA (Ghana) for the assistance and suggestions toward this work. To the Isaac family, I say thank you for your encouragement and financial support during my studies.

I cannot afford to overlook the contribution of my course mates, Kwame Asumadu-Yeboah, Frederick Oppong, Esben Sekou, Samuel Donkor and Carl Sabah throughout the entire programme. The contribution of Kwame Asumadu-Yeboah, my class leader was particularly outstanding during this research.

Last but not the least; I say thank you to my beautiful wife Lady Carown and my son, Isaac Boama Sarkodie-Poku for their love, understanding and support throughout my studies.

DEDICATION

This work is dedicated to my father Mr Isaac Kofi Aboagye

ABSTRACT

The importance of assessing the performance of project managers (PMs) on projects in the recent times has been underscored by research. In this study, a competency-based multidimensional conceptual model has been adopted for mass house building projects (MHBPs). The model reflects both performance behaviours and outcome in predicting the performance of PMs at the conceptual, planning, design, tender, construction and operational phases of the project life cycle. This study is a follow up to previous studies on the development of the model for predicting the performance of project managers at the construction phase of MHBPs. In the study, data was obtained from GREDA, the umbrella body of housing providers in Ghana. The data was analysed using multiple regression (stepwise approach).

In this study on the design phase of the adopted conceptual model, research instrument was designed to elicit data from GREDA members again. Drawing from a broad spectrum of behavioural measures identified as independent variables, the findings suggests that best predictors of PMs' Performance in MHBPs at the design phase are: *Knowledge of mass house contract packaging, knowledge of performance characteristics of materials for the design of MHBPs, technical quality of strategies for managing the design process, knowledge of thermal comfort assessment and provisions in the design of MHBPs, knowledge of relevant design codes, legislation and regulation for MHBPs*. Statistical parameters like ANOVA, multicollinerity, Durban-Watson and residual analysis confirm the goodness of fit of the model.

The findings of this study provide further in-depth information on the competency profiles of PMs engaged in the implementation of MHBPs and in particular the design phase. The results provide the basis for Continuous Professional Development (CPD) agenda for project managers. It again provides for use by real estate developers towards human resource development in project management practice in MHBPs. These findings provide the PMs an understanding on

the profiles their superiors use in judging their performance at the design phase of the project life cycle and provides them an opportunity to improve their skills.

TABLE OF CONTENTS

CHAPTER THREE RESEARCH METHODOLOGY

LIST OF TABLES

LIST OF FIGURES

GENERAL INTRODUCTION

1.0 INTRODUCTION

This section gives a general survey of the study commenting on the background of the study and statement of the research problem. Research questions that the study attempts to address as well as the aim and objectives of the study are also presented. Summary of research methodology and scope of the study is commented on. The chapter ends with discussion on the organization of the study under the subsequent chapters.

1.1 BACKGROUND OF STUDY

Project management is a business process of producing product service or to gain result over the specific time limited, it is accomplished through the application and integration of project management process of operation (i.e. initiating, planning, executing, monitoring and controlling, and closing) The project manager is the person responsible for working with the project sponsor, project team and all other people involved in a project to meet the goals of the project (Schwalbe, 2009).

A project manager also according to, (Pheng and Chuan, 2006) is vital and indispensable in any project. The Association of Project Managers (APM, 2010) projects the project manager as the individual responsible for the successful delivery of the project. With this projection, the PM is seen as the focal point for the initiation and execution of a project under the project management discipline.

Thus the position of a project manager on a project structure makes its role very critical. Indeed the Project Management Institute (PMI, 2010) puts the role of the PM in project management in

the nutshell as the overall responsibility for successful planning, execution, monitoring, control and closure of a project. Within this context, several studies have been undertaken in an attempt in trying to improve the performance of PMs, so that their control on the management and success of projects can be efficient and effective (Ahadzie and Amoa-Mensah, 2010). Many of these studies have indeed led to an appreciable understanding of what constitute competency in many industries including the construction sector (see for example Dainty et al, 2004; 2005; Cheng et al, 2005).That is, improving the performance of PMs through the identification of their competency profiles have become the prima facie evidence for vouching for managerial capabilities within the human resource dynamics in recent times (Ahadzie, 2009).

Evidently, individual performance is a core concept within work and organizational psychology and it is for this reason that organizations need highly performing individuals in order to meet their goals, deliver the products and services they specialize in and to achieve a competitive advantage (Sonnetang and Frese, 2002). It is also for this reason that in a project-based industry such as construction, performance indicators are now firmly affirmed as a viable option for engendering superior performance levels of project managers (PMs) (Dainty et al, 2003). Ahadzie, (2007) also adds impetus to this thinking of performance indicators being the option for engendering superior performance by stating that "The identification and development of appropriate PMs' performance indicators could be an important step towards the advancement of improved HRM practices in the construction industry in many developing countries, especially given the increasingly important role that PMs are playing in project management practices in recent times" (Ahadzie, 2007). This position by Ahadzie (2007) further led to the development of a multidimensional competency-based conceptual model that could be used in isolating and understanding the competency profiles of PM is MHBPs throughout the project lifecycle, namely, conceptual phase, planning phase, design phase tender phase, construction and

operational phases (see for example Ahadzie et al, 2009). The argument is that since mass housing projects are quite unique in management style as compared to the many one-off projects, identification of the specific competency profiles is necessary to reflect this uniqueness (Ahadzie, 2009).

In this context, Ahadzie and Amoa-Mensah (2010) implied the PM as the individual with requisite authority and responsibility for the management of both design and construction of housing projects from inception to completion and works primarily in the interest of the client and/or promoter of the development.

Ahadzie et al (2008) in the development of his predictive model therefore underscored the significance of the findings to the management of MHBPs at the construction phase of the project life cycle. Out of the wide range of behavioral metrics analyzed, the findings suggested the best predictors of PMs' performances in MHBPs at the construction phase *as job knowledge in site layout techniques for repetitive construction works: dedication in helping works contractor achieve work schedule: job knowledge of appropriate technology transfer for repetitive construction works: effective time management practices on house units: ability to provide effective solution to conflicts whiles maintain good relationships: ease with which works contractor are able to approach the PM and volunteering to help works contractors solve personal problems*. More importantly observers have noted that this is an important research to the development of the competency movement and the study should be seen to its logical completion by addressing the competencies for all the phases identified (Edum –Fotwe and McCaffer, 2000).

This study on the design phase would therefore help to bring to focus the competency profile of another important phase of the PMs performance in the lifecycle of MHBPs.

1.2 PROBLEM STATEMENT

A key objective of performance indicators is to provide benchmarks toward engendering best practice improvement (Barber, 2004). It is however, argued that the construction industry needs to define more appropriate performance criteria for measuring the performance of PMs and encouraging their professional development. Dainty *et al*, (2003) acknowledged that we must redefine traditional success parameters to consider the knowledge, skills and behavioral inputs which contribute to superior performance.

The background to this study has revealed that performance indicators should also reflect the various phase of project life cycle. Given the speculative nature of MHBPs, PMs are normally expected to assist and coordinate in the activities within the various phases of these projects from inception to completion as well as facility management (Ahadzie, 2008a). It is therefore logical to assert that PMs will require different performance indicators at the various phases of the project life cycle towards engendering professional development.

The conceptual framework that guides the predictive model developed by Ahadzie (2007) reflects both the elements of performance behaviours and outcomes in predicting the performance of PMs at the concept, design, tender, procurement, construction and operational phases of the project life cycle. Of the phases of the project lifecycle identified in the conceptual model, the conceptual, design; tender; procurement; construction and operational phases, detailed work has been undertaken on only the construction phase culminating in a model developed for the phase. The need to undertake studies on the construction phase at that time was argued on the basis of the level of development in the management of MHBPs in Ghana and the management practices in the construction phase appeared to be of particular interest to professionals and practitioners.

The design phase of MHBPs is also a vital component of the project life cycle. The decision to focus on the design phase stems from the fact that the effectiveness of the design process in the building industry has a great influence on the success of subsequent processes in the construction of projects and also on the quality of the environment (Formosa *et al*, 1999). Again, Cornik (1991) argued that several studies have also pointed out that a large percentage of defects in building arise through decisions or actions taken in the design stages.

The design process therefore needs to be adequately planned and controlled more effectively, in order to minimize the effects of complexity and uncertainty. The study on the performance criteria for assessing PMs at the design phase of the MHBPs is therefore needful and as a follow up to previous study to previous research of the construction phase of MHBPs in Ghana.

1.3 AIM OF STUDY

Following from the previous study by Ahadzie (2007), the main aim of this study is to identify a model, which can be used to predict the performance of PMs at the design phase of MHBPs in Ghana.

1.4 RESEARCH QUESTIONS

The study and the setting of objectives are based on the following research questions:

- What are the roles of PMs at the design phase of MHBPs in Ghana?
- What are the appropriate performance indicators for assessing the performance of PMs at the design phase of MHBPs in Ghana?
- How should the performance indicators be incorporated at the design phase of the project life cycle?

1.5 OBJECTIVES OF STUDY

The specific objectives of the research are to:

1. Identify key performance variables of PMs for MHBPs.
2. Identify performance predictive models related to the area of study.
3. Identify the relevant variables for predicting the performance of PMs on MHBPs.
4. Use statistical tools to develop a model based the factors above.

1.6 RESEARCH METHODOLOGY

"In addressing the stated research questions, it was important to adopt the appropriate tool that will facilitate data collection, analysis and its interpretations. Competency-based measures are deep rooted in psychological constructs" Ahadzie (2007). The approach therefore was to adopt a working framework that highlights these constructs within the context of the study. In this vein, the methodology was supported by the organizational psychology theory of job performance. Borman and Motowidlo (1993) argued that in trying to understand the organizational job performance domain, the elements of behavioural competencies involved should be grouped into two main sectors: contextual performance behaviours and task performance behaviours (cited in Ahadzie et al, 2008).

On the most basic level, Borman and Motowidlo (1993) distinguish between task and contextual performance. Task performance refers to an individual's proficiency with which he or she performs activities which contribute to the organization's 'technical core'. This contribution can be both direct (e.g., in the case of production workers), or indirect (e.g., in the case of managers or staff personnel). Contextual performance refers to activities which do not contribute to the

technical core but which support the organizational, social, and psychological environment in which organizational goals are pursued (cited in Ahadzie et al, 2009).

The Ghana Real Estate Developers Association (GREDA) constituted the sampling frame for this study. GREDA is the umbrella body of house-building companies in the Ghanaian construction industry for which they are recognized by the Government of Ghana (Ahadzie, 2007). Among others, the key objective of GREDA is to assist in the reduction of housing deficit. A questionnaire survey was conducted to elicit from superiors of PMs, the performance indicators they use judging their performance at the design phase of MHBPs in Ghana. A pilot study was carried out to ensure the clarity and relevance of the questionnaire

In the main survey, managing directors (MDs) of the respective companies were respondents to the questionnaire as they are major stakeholders in the selection and appraisal of PMs in MHBPs.

Data from the respondents was analyzed using multiple regressions (stepwise approach) with the help of the Statistical Package for Social Sciences (SPSS) software.

1.7 ORGANISATION OF STUDY

The study was organized in five chapters.

Chapter one looked at the general overview of the research including background of study, problem statement, aim and objectives of research, research methodology, and organization of the study.

Chapter two was devoted to an extensive relevant literature on design management in construction project management.

Chapter three outlined the research methodology incorporating design of the research instrument, sampling procedure and the procedure for the collection of data.

Chapter four focused on the presentation of data, its analysis using the appropriate statistical tools as well as the discussion of the findings.

Chapter five gives the summary of the study, reviews the research objectives and make conclusions from the study.

1.8 SUMMARY

The background of the research as well as the problem statement has been presented. The aim and objectives of the study have also been highlighted. Research methodology and organization of the study have also been underscored. The next chapter two takes a look at literature review on the subject matter of the study.

REFERENCES

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. Ankrah, N. (2009) Towards developing competency-based measures for project managers in mass house building projects in developing countries, Construction Management and Economics, Vol. 27 (1), pp. 89-102

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2004), "Meeting housing delivery targets in developing countries: the contribution of project managers in Ghana", in Ogunlana et al. (Eds), Globalization and Construction in Developing Countries, *AIT Conference Centre, Bangkok, Thailand*, 17-19 November, pp. 620-30

Ahadzie, D. (2007), "A model for predicting the performance of project managers in mass house building projects in Ghana", PhD thesis, *University of Wolverhampton, Wolverhampton*

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008a), "Towards developing competency-based measures for construction project managers: should contextual performance behaviours be distinguished from task performance behaviours", *International Journal of Project Management*, Vol. 26 No. 6, pp. 631

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008b), "Model for predicting the performance of project managers at the construction phase of mass house building projects. *Journal of Construction Engineering and Management, ASCE* Vol. 134 No. 8, pp. 618-29.

Ahadzie, D.K., and Amoa-Mensah K (2010), "Management practices in the Ghanaian house building industry. *Journal of Science and Technology*, Vol. 30 No. 2, pp. 62-74.

Borman, W. and Motowidlo, S.J. (1993), "Expanding the criteria domain to include the elements of contextual performance", in Schmitt, N. and Borman, W.C. (Eds), Personnel Selection in Organizations, Jossey Bass, San Francisco, CA, pp. 71-98.

Cheng, M.I., Dainty A.R.J. and Moore, D.R (2005) What makes a good project manager?, *Human Resource Management Journal*, Vol. 15 (1), pp. 25-37.

Conway, J. M. (2000) Managerial Performance Development

Cornik, T. (1991), *Quality Management for Building Design*, Rushden, Butterworth, 1991, p. 218

Dainty, A.R.N., Cheng, M.I. and Moore, D.R. (2003), "Redefining performance measures for construction project managers: an empirical evaluation", *Construction Management and Economics*, Vol. 21, pp. 209-18.

Formosa, C. T., Tzotzopoulos, R., Jobim, M. S. S., and Liedtke, R., A Protocol for Managing the Design Process in the Building Industry in Brazil, In Ogunlana S.O. (Ed), *Profitable Partnering in Construction Procurement*, SPON, London, 1999

Edum –Fotwe, F. and McCaffer, R. (2000) Developing project management competency: perspectives from the construction industry. *International Journal of Project management,* Vol.18,pp. 111- 124.

Ogunlana, S., Siddiqui, Z., Yisa, S. and Olomolaiye, P. (2002), "Factors and procedures used for matching project managers to construction projects in Bangkok", *International Journal of Project Management*, Vol. 20, pp. 385-400

Pheng, L.S and Chuan, Q.T (2006) "Environmental factors and work performance of project managers in the construction industry" *International Journal of Project Management*, Vol 24, pp. 24–37

Schwalbe, K (2009) An Introduction to Project Management, *Course Technology- International Edition*

Sonnetang, S., and Frese, M., (2002) Performance Concepts and Performance Theory John *Wiley and Sons Ltd*

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter dwells extensively on the review of literature on the study. It begins with a look at the overview of housing development in Ghana. The concepts of project management and the project manager are reviewed. Mass House Building Projects (MHBPs) is also looked at. Finally, there is a cursory review of the design management in particular.

2.1 OVERVIEW OF HOUSING DEVELOPMENT IN GHANA

According to UN-HABITAT (2011), Ghana has a population of 24.2 million of whom just over half live in urban areas. After a long period of post-independence political uncertainty, Ghana has settled down into a long period of steady growth. Its GDP per capita in 2009 was US$716, with a real GDP growth per annum of 4.7 per cent in 2010. Even while it was a "Highly Indebted Poor Country", economic growth and inward remittances continued to rise. It is now classed as middle income. Its cities are growing rapidly; at 1.6 million and 1.2 million respectively, the cities of Accra and Kumasi are dominant, being five and four times as large as the next largest, Sekondi-Takoradi.

The housing stock in urban Ghana was 2.2 million dwelling units a housing deficit of 1.5million and average annual requirement is 130,000 but the delivery of 40,000 according to the 2000 census.

Ghana has a history of national economic planning but housing has never been a large component, usually being seen as part of the welfare sector. Interventions have tended to be piecemeal and part of internationally funded programmes. Within a current recognition of

housing's place as a driver of economic growth, a National Housing Policy is under preparation (UN-HABITAT, 2011).

The emphasis on developing the housing industry in Ghana probably commenced in the late fifties to early sixties as Ghana attained independence from colonial rule. As part of the 1960-65, National Development Plan, provision of housing was central as two main state bodies were formed to address housing issues: the State Housing Corporation (SHC) and the Tema Development Corporation (TDC). While TDC focused on providing residential housing in Tema, SHC worked in the regions across Ghana, providing real estate countrywide. Unfortunately, the resources allocated in the form of subventions, loans or grants for these ventures began to dwindle as Ghana's economic difficulties began to take a toll (Bank of Ghana, 2007)

By the late 1970s, speculative housing had been introduced into the Ghanaian market by some private and quasi-government institutions such as the Social Security and National Trust (SSNIT). According to Ahadzie and Amoa-Mensah (2010), since the late 1980s the Government of Ghana's policy direction has been to play a key role in the facilitation of housing delivery rather than the direct role of a provider.

In this respect the formation of Ghana Real Estate Developers Association (GREDA) was largely facilitated by the government. Its membership currently spans over 120 corporate bodies. It is a well known fact that most of GREDAs members developed most of the well planned communities in Accra, Tema, Takoradi and Kumasi. Over the years GREDA members have built several housing units across the country with very or no governmental support .Various experts, including GREDA and the Ministry of Water Resources, Works and Housing, put annual demand for home units at about 70,000 units. On the supply side, all efforts by developers put together hardly add up to 40,000 units annually on average, leaving an annual shortfall of about

30,000 units. Housing has become an even more pressing concern for the country since the collapse of the Ghana National Housing Project, which was to be undertaken by the South Korean firm STX. The project was scheduled to produce 200,000 units at a cost of $10bn.

2.2 PROJECT MANAGEMENT AND PROJECT MANAGER

According to the Chartered Institute of Building, "Project Management may be defined as the overall planning, coordination and control of a project from inception to completion aimed at meeting the client's requirement in order to produce a functionally and financially viable project that will be completed on time within authorised cost and to the required quality standards" On the other hand, Project Management Institute also defines Project Management as a set of processes that are applied to deliver a product or a service.

From the two definitions of project management, the role of the project manager (PM) could be deduced as pursing the client's objectives and requirements and coordinating the project team to ensure the project is soundly produced and fulfils the needs of the client in terms of quality, functions, utilities, aesthetics and within the agreeable cost and time limits throughout the whole project development process. Thomas and Mengel (2008) stated that in 1996, the Australian Institute of Project Management (AIPM) published its National Competency Standard for Project Managers which was adopted by the National Government as part of the country's qualification system. This was followed by the International Project Management Association (IPMA) that represents members of the various national organisations in Europe, Asia and Africa. The IPMA has developed its own standards and certification program which is comprised of the central framework and quality assurance of process in addition to national programmes developed by members.

Efficient project management is a very important key especially in the housing industry which is ranked high among other economic sectors in inter-sector linkages. The importance this sectors is enhanced by its ability to provide gainful employment to the teeming population. According to Barnes (2000) this is evidenced in the noticeable development and the aesthetic transformation of the environment which is predicated on the building industry.

2.3 THE DEVELOPMENT OF MHBPs IN GHANA

The term Mass House Building Project (MHBP) is used in the construction industry to describe mass production techniques of housing development projects. MHBPs should be defined for the purpose of the research as *"the design and construction of speculative standardized multiple house-units usually in the same location and at executed within the same project scheme"* (Ahadzie et al, 2006a). Such house-units could include: terrace, multi-storey or tower blocks, maisonettes, semidetached, and/or detached residences or any combination of them. This definition acknowledges the key concept of repetitive techniques in the production methods and also recognises the peculiar characteristics of the construction industry (Ahadzie et al, 2006c). For the purposes of this study four main points are worth noting in regard to the definition of MHBPs:

- They must be based on one or more standardized designs in the sense that the architectural design of all phases must be largely identical for the house-units. This is necessary to ensure the concept of repetition is met;
- They should involve the construction of domestic residences (whatever their form).
- They must be speculative in the sense that the acquisition of land, design of house-units and construction are made without reference to any specific customer in mind;

- They should as much as possible be located in the same area and be part of the same scheme or contract conditions.

The emphasis on developing the housing industry in Ghana probably commenced in the late fifties to early sixties as Ghana attained independence from colonial rule. As part of the 1960- 65 National Development Plan, provision of housing was central as two main state bodies were formed to address housing issues: the State Housing Corporation (SHC) and the Tema Development Corporation (TDC).While TDC focused on providing residential housing in Tema, SHC worked in the regions across Ghana, providing real estate countrywide (Bank of Ghana, 2007).

In 1986, a National Housing Policy Committee was formed by the Ministry of Works and Housing (MOWH) to examine the housing situation in Ghana. This was geared towards an appropriate Government Policy and Action Plan that seeks to provide adequate and decent housing units in order to improve the quality of life of people in urban and rural areas. The report culminated in a National Housing Policy and Action Plan covering the period 1987 through to 1990 (Konadu- Agyemang (2001).The First Medium-Term Development Plan of Ghana's Vision 2020, 1997–2000, targeted the provision of low-income housing units, which is affordable and within purview of the poor to improve their living conditions. Unfortunately, according to Bank of Ghana (2007), none of the housing strategies under the Medium-Term-Development-Plan were implemented due to lack of funds.

Consequently the housing sector of the Ghanaian construction industry according to Ahadzie (2007) is now characterized by private housing developers many of which have come together to

form the Ghana Real Estate Developers Association (GREDA). In the review of management practices in the Ghanaian building industry, Ahadzie and Amoa-Mensah (2010) contended that the review of project management practices in MHBPs is relevant to helping establish the appropriate best practices for the management of future projects.

2.4 THE ROLE OF THE PROJECT MANAGER IN MHBPs

Generally, the project manager is appointed to serve the needs of the client in managing the project as a whole and leading the project team in achieving the aspirations of the client. Bakar *et al* (2012) argues that the project manager that is well versed in the project management processes play a major link between the client and the project team eliminating disputes whiles enhancing team productivity and synergy.

According to Edum-Fotwe and MacCaffer (2000), project managers in construction are responsible for the overall success of delivering the owners physical development within the constraints of time, schedule, quality and safety requirements. As such they play a very crucial role in project management. Kloppenborg *et al* (2007) contend that whiles they are many who contribute to a give project; PMs often are considered the direct leadership component essential to project success. Goodwin (1993) affirms this assertion that indeed the fundamental concept on which project management is based is that a single individual that is the PM is accountable for the success of a project. In this regard, Ahadzie, 2007 posited that the PM could be described as the individual that has the authority and responsibility for the management of MHBPs from inception to completion and who works in the interest of the key stakeholder herein identified as the property developer.

According to Ahadzie and Amoa-Mensah (2010), Social Security and National Insurance Trust (SSNIT) appointed the first Project Manager on the construction of 300-single storey-housing

unit in 1989 in Sakumono in Greater Accra region of Ghana. On this project, the key contribution of the project manager was the ability to manage a team of small-scale contractors to successfully deliver on these MHBPs. The recognition of the perceived positive role of the PMs in the Ghanaian situation resulted in the successful integration into the operations of most emerging property developers including members of the GREDA (Ashley, 2003) cited in Ahadzie (2007). On the typical MHBP, the project manager is fully involved in the decision to build, help acquire the land including the associated feasibility studies, identification of procurement routes, supervision and the management of the physical design and construction (Ahadzie, 2007).

The role of the project manager on MHBPs is now acknowledged as the most critical factor towards the achieving effective performance in the management of MHBPs (see for instance Ahadzie and Amoa-Mensah, 2010).The identification of the appropriate PMs' performance measures should therefore serve as an important step for developing the skills of potentially competent PMs, who can promote the effective management of MHBPs in a relatively dynamic but increasingly difficult business environment (see for instance Ahadzie et al, 2004)

2.5 DESIGN MANAGEMENT IN HOUSING DEVELOPMENT

In 1975, the Design Management Institute was founded as an international organization that is dedicated to demonstrate the strategic role of design in business and to improving the management and utilization of design.

DMI (1998) summarizes the professionals' views of the definition of design management as initiating and ensuring the brand strategy to be consistently implemented in the design of all media used to provide the needed connection to the customer.

The facts have shown the high relevance and significant contribution of design management in other industries and the increasing needs for design management in building practice. This is supported by a survey by Bradley and Cavanagh (1994) showing that almost 80% of the British architects subscribe the necessity of a proper management in design project. Respectively, a number of researches have been carried out to develop architectural design management to become a well-defined discipline. In 1980, Paul Nicholson coined the concept of architectural management and extended the edges until the entire development process; encompassing the management of the design practice, the co-ordination role, construction project, and dispute resolution. Melhado *et al*, 2006 underscored that estate and construction firms are facing up to the challenge of taking into consideration strong environmental and performance demands in their building projects.

All attempts are directed to find the best way to manage design. However, current research in the area have resulted limited success. There have been many attempts to define what design is, however no single definition is able to describe design adequately. Lawson (1994) realizes that some definitions lead to a narrow and restricted view, while others seem too general and abstract. Having discussed many views from different writers, Lawson (1994) concludes that due to the complexity and uniqueness of design and the real differences between design situations, a single satisfactory definition will be farfetched. It is therefore assumed that a simple and single definition might not be necessary.

With respect to the design management, the focus could be to take design through certain aspects. Den Otter and Prins (2001) distinguish three main aspects, namely: the design object, process, and people. Similarly, Allinson (1997) calls these as the design content, the design process, and the design artistry. The 'content' or 'object' includes the design solutions to the design problems. The 'artistry' or 'people' comprises the individual and group competence and

creativity, approach, and actions of the designers. These aspects are inter-related and cannot be isolated from each other.

Gray and Hughes (2001) agree with Lawson (1990) that design problems cannot be comprehensively stated or statically formulated since design problems deal with subjective perceptions, prejudices, and interpretations of the designers, while the problems are always in dynamic tension with the solutions. Design problems are often both multidimensional, interconnecting all factors, and highly interactive. Design problems are more inscrutable and ill-defined, or ill-structured. They have no clear linkage because there are non-congruent values of stakeholders and non-congruent dynamics of the subsystems. Moreover, design problems can also be categorized as wicked problems, because they are not only ill-structured, but also complicated by goal and values conflict among the stakeholders (Barlow, 2000).

2.6 THE ROLE OF THE PROJECT MANAGER IN DESIGN MANAGEMENT

As indicated in the preceding sections of this chapter, the project manager is appointed to serve the needs of the client in managing the project as a whole and leading the project team in achieving the aspirations of the client. Granted that the PM is the client's liaison professional on the project, the role of the PM in design management is crucial.

One of the most important functions of the project manager is eliciting an accurate brief from the client (Chappell and Wills, 2000). It is the starting point for the generation of the design. The precision in taking a brief will reflect his/her ability to understand client's corporate objectives, forethought and consideration of users' requirements, thereby identifying and prioritizing project objectives, analyzing the design concepts and requirements and ensuring design conformance to owners requirements. Taylor and Hosker (1992) noted that design teams must give their clients

assurance in the quality of the service they provide. Compliance with the codes and standard should also be addressed early in the design phase (Arditi and Gunaydin, 1997). The project manager plays a major role in obtaining of necessary authority approval and checking that design is compliant with building codes.

Chappell and Wills (2000) again affirmed that project managers in design management must be excellent communicators. Achieving effective communication among the design team rests primarily on the project manager. This involves clarity, certainty, brevity and comprehensiveness of the design. Similarly, team-related issues such as team building, teamwork, team organization, and team turnover and team experience are often recognized as crucial factors for project performance.

Coordination is a fundamental element of design management. The project manager is tasked with the effective review and coordination of drawings and documents for cost effective and timely use in projects (Emmit, 1999). In addition the design must be reviewed to ensure that the project is constructible by those retained to build it.

2.7 LIFE CYCLE DESIGN MANAGEMENT

Projects pass through a succession of phases throughout their lives, each with their own characteristics and requiring different types of management. There is no complete agreement on the identification of these phases but they usually entail the following, as described by Morris (1983)

Conceptual phase – where projects are first identified and feasibility is established (financial, non-financial, and technical). This phase is subject to high-risk levels and should be examined before detailed planning. Consequently this stage includes the analysis of alternatives,

development of budgets, setting up of a preliminary organization, definition of size and location (facility site), and arrangement of preliminary financial and marketing contacts;

Design phase – when all work from the conceptual phase is detailed and produced further. All major contracts are defined, and prototypes may be built.

Execution/implementation phase – when plans developed in the previous phases are turned into reality. At this stage, the number of people and organizations involved would have increased, requiring a redefinition of the project organizational structure.

Estimation is replaced by performance monitoring. All construction works and major installation activities are completed; and

Handover and start-up phase – when installation is completed, final testing is done, and resources are released for the start of business operations.

At the end of each phase, the project can progress forward or backward (i.e. a recursive process) depending on the amount of information gathered, produced and utilized (PMBOK, 2008). Design professionals and project managers are involved in each phase of the project life cycle that entails distinct activities and skills. Failure to properly address the design issues and their underlying impacts over successive phases of the project life cycle can jeopardize the ultimate success of the project. Life cycle design management as Doloi (2007) puts it employs a holistic approach that encapsulates the lifecycle in design management.

2.8 COMMUNICATION IN DESIGN MANAGEMENT

In design and construction projects there are many different phases of interaction between the project participants. Architectural design is a collaborative act that relies on effective interaction between project actors and stakeholders. Gray and Huges (2002) tagged the design team as a loose collective team to describe the fact that the design process requires considerable input from a whole range of contributors.

Design teams for architectural projects can be defined as temporary, multidisciplinary and network based organizations. These groupings of specialist designers (Dainty et al, 2006) are managed by one of the design team members, usually the architect or a project manager delegated by the client. A specialist designer can be an individual, independent designer or the representative of a collaborating design organization.

Designers participate in various ways in the team and are depending on each other's' output. Many participate as individuals, working alone for crucial periods and then return to the network process (Dainty et al, 2006). Thus, term communication of a design team may be defined as the compilation of all processes for sending and receiving messages between team members individually and collectively, using all the available means of communication (Otter and Emmit, 2008) Sketches and images are the most important carriers of the design because they are commonly used to communicate design ideas and concepts (Bates, 2008). Otter and Emmit (2008) posited two main forms of communications in design management as design team meeting and design dialogue.

Team meetings and dialogue can be used for several reasons. Team meetings allow for the planning, discussing and evaluating of progress. They are organized to advise the client about the design progress and the latest insights with regard to particular design problems (Emmitt and Gorse, 2007).Otter and Emmit (2008) concluded that dialogues and design meetings will serve as a 'glue' to maintain the collaborative nature of design teams if used effectively and deliberately by a design manager. Design managers should regard dialogues and group meetings as important instruments for improving team communication and encouraging socio-emotional interaction, with the aim of better understanding the design task

2.9 THE RELEVANCE OF DESIGN MANAGEMENT

The emergence of design management is encouraged by the growing complexity of building and processes in terms of functional and technical requirements. (Prins et al, 2001). According to Gray and Hughes (2001), one of the most important reasons behind the complexity is the increase of specialist knowledge and number of contributors to the design. The process of specialization and the economic and professional pressure often compound the need for many different disciplines to come together during the design process. In such situation, designers are being confronted with thousands of alternative combinations of possible sub-solutions at the beginning, but they are often left with too narrow solution space and too few options after the selection (Loon, 1998).

Having conducted contemporary research with empirical backing, Koskela et al (2002) indicates without exception that the management of design and engineering is poorly carried out in construction projects. One of the reasons is because appropriate managerial approaches and sound practices for large and complex building projects are fundamentally different from those for small and simple projects (Gunsteren and Van Loon, 2001).

However, such complexity should not be avoided, but it is a necessary part of a flexible and responsive industry. It is not the mere presence of complexity that is the challenge, but the inability of project managers to deal with it (Gray et al, 2001).

The general purpose of design management is to help designers and engineers to manage their own design process, as well as to help managers who have the task of managing a design team (Gray et al, 2001). It aims at creating values through design, more than just meeting the specified cost and time. The goal is realizing the design as the best solution to stakeholders' requirements

and the best value, by utilizing the means and resources effectively and efficiently (Prins et al, 2001).

2.10 DESIGN MANAGEMENT APPROACHES IN PROJECT MANAGEMENT

In their attempt to introduce design management approach, Allinson (1997) and Gray et al (2001) begin by analyzing the characteristics of architectural design, design organization, and the principles of management theory.

Allinson (1997) compares the paradigm of architectural design and project management, and the form of rationality and competence attached to most architects and project managers.

There are some contrasts between the concept of design and management, as design is often considered to be a 'wild card' in the project management pack because its values are poorly understood and its methods are difficult to explain, even by designers. However, in a building project, architects and managers have to meet on a shared vehicle of the ambition to realize the design. Allinson (1997) firmly believes that there is no contradiction between these two enthusiasms if the management applied is based on the right understanding of design and how designers work. Such management is required to optimize the design and shepherd the project through a critical period of exposure to risk to the successful completion

While Allinson (1997) discusses project and design management from the architect's viewpoint, Gray tends to explain the management techniques from the engineer's viewpoint. Gray directs the design management practice toward the management of tasks, planning, monitoring, control, and information and communication technology. Gray initially distinguishes building design into the architectural design and the engineering design, and then lists the possible design management actions in every phase, from business case until construction stage.

Having analyzed the existing design management approaches, it is observed that early approaches still essentially refer to project management methods and are largely of project management instruments. The current approaches to design management contain many interesting and seemingly effective new features, but they are fragmented and lack of solid conceptual foundation. These have been the reason behind the poor level of design management practice and have become the barrier to progress (Ballard et al, 1998).

Most attempts on managing design offer the criticism and analysis of the end design products, or the mechanism of the design process, while there is lack of concern given on how people generate the new and original design solutions through human creative activities.

Different parts and elements of architectural design management have been presented, but the body of knowledge is still missing. Because of this, there remains a gap between current approaches, and the principal purpose and the essence of design management.

In order to improve this situation, there is the need to redefine the framework of design management based on the precise understanding of the essence of architectural design and the principal purpose of architectural design management, upon sound fundamental theories.

Lawson (1990, 1994) and Hamel (1990) suggest utilizing psychological theories to learn how designers think Theories such as social and organizational psychology, group dynamics, organizational management and behavior are worth to study

2.11 DESIGN MANAGEMENT IN THE DOMAIN OF APPLIED PSYCHOLOGY

Lawson (1990) and Hamel (1990) show the importance of analyzing the designer's creativity through psychology, particularly using the theories of thinking and intelligence, as well as the cognitive behavior in design process. Hamel proposes a descriptive psychological model of the design process by the designers. The model intends to show how design actually design,

comprising the knowledge and information they use, the kinds of cognitive activities they perform, and the sequence of these activities.

As there are many players involved in the design process of any building project, cooperative design with an interactive function becomes a key issue. Cooperative design is based on teamwork and reflects the ad hoc structure of most creative organizations (Gray et al, 2001). It is a part of design management's function to facilitate individual invention to be more representative of group innovation. Design management practice should also aware of the possibility that creativity does not lie only on the inventor, but also includes all those who refine, develop, and realize the ideas (Lawson, 1990). In this sense, both the individual designers and the overall design team can be seen to exhibit group dynamics, comprising collective pattern of behavior and group norms.

Using the psychological approach and tracing the development of conceptual framework of group dynamics, Hohn (1999) looks for the conditions that a successful innovative team requires trust between the team members strongly affects the group performance and centers on levels of effort and reliability of commitments. Upon the successful development of the persons and the group concerning trust, authority, norms, and decision-making, more complex and more difficult tasks can be handled. Another conclusion is that the leadership of innovative and creative teams must alternate between generative and focusing modes to both stimulate and guide the level of freedom. The generative mode is the leadership behavior that encourages divergence, foster exploration and originality, which leads to new ideas, while the focusing mode encourages convergence and directs the process to perform the tasks within the given constraints.

Design management can thus learn from various methods available in the field of organizational behavior to assess the assumptions and beliefs of organizations. Since such methods are able to

measure the organizational creativity, it should be possible to better identify the factors that facilitate the process and perform more effective analysis of the dynamics of collaborative teams. The objective is to achieve deliberate success in collaboration by bringing together the right knowledge into an interaction of adequate complexity and creativity (Barlow, 2000b).

2.12 CONTEMPORAY MODELS OF PREDICTING THE PERFORMANCE OF PMs

Performance measures quantitatively tell us something important about products, services, and the processes that produce them. They are tools to help us understand, manage, and improve what our organizations do (Sonnetang and Frese, 2002). In organizational management, performance measurement and management play a major role in HRM. The results of performance measurement provide useful information for managers to help them in decision making process.

Across industries, this largely explains why researchers in the HRM domain have become increasingly committed towards identifying the relevant performance measures by focusing on appropriate predictive modelling (Conway, 2000; Dainty et al, 2005) cited in Ahadzie (2007).

In view of the importance of the effective HRM in organizations, Ahadzie (2007) underscored the need for the construction industry of developing countries to recognize the rewards to be gained in developing an understanding of the human resource (HR) dynamics in project oriented companies and sectors within the industry. Competency-based approaches are gradually gaining prominence in construction project management practice and research. In the construction industry, the genesis of a concerted research agenda towards improving PMs' competency appears relatively young (Fraser and Zakrada-Fraser, 2003; Crawford, 2005 cited in Ahadzie, 2007). Competencies are the summary of the knowledge, skills, abilities, attitudes and values necessary

for personal development and self-assertion. The competency model is always created in terms of the work for a given working role. It reflects the competency composition that is necessary for carrying out a particular type of work.

Muller and Turner (2006) proposed the importance of matching leadership style of project manager and the project type. They suggested that project success also receives the influence from the compatibility of project manager's leadership style and organization nature (i.e. working practice, culture, structure). In 2007 Chen and Lee proposed the model for evaluating the performance of managerial practice based on how project manager can elaborate 14 managerial practices of leadership behaviour. In 2008, Swartz proposed an idea on evaluation project manager performance. The contents of the paper indicate that project management's stability is also capable of reflecting project manager management skill.

There are useful lessons to be drawn from the literature cited. However, it is clear that they are not particularly appropriate for the conditions of developing countries such as Ghana. Ahadzie (2007) therefore advocated need for project-based organizations 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. In the light of the foregoing and in the context of this study, much reference is made to the works of Ahadzie (2007) which developed the model for predicting the performance of project managers' at the construction phase of MHBPs in Ghana.

2.13 SUMMARY

The key concepts for the study have been defined. Relevant literatures on the study have been reviewed. The next chapter is on the research methodology which takes a look at the theoretical underpinnings of the study, questionnaire design, data collection and statistical tools for the analysis of the data.

REFERENCES

Ahadzie, D. (2007), "A model for predicting the performance of project managers in mass house building projects in Ghana", PhD thesis, *University of Wolverhampton, Wolverhampton*

Ahadzie, D.K, Amoa-Mensah, K (2010), Management Practices in Ghanaian House Building Industry. Journal of Science and Technology Vol 30 No 2 pp 62-75

Allinson, K. (1997), Getting There by Design: An Architect's Guide to Design and Project Management, Oxford: Architectural Press

Anumba, C. and Evbuomwan, N. (eds.). *Concurrent Engineering in Construction Architectural Engineering and Design Management*, Vol. 4, pp. 121-129

Austin, S.A., Baldwin, A.N., Li, B., Waskett, P. (2000), Analytical Design Planning Technique (ADePT): A Dependency Matrix Tool to Schedule the Building Design Process, Construction Management and Economics, vol.18

Ballard, G. and Koskela, L. (1998), On the agenda of design management research, Proceedings of the 6th Annual Conference on Lean Construction, Guaruj_a, Sao Paulo.

Ballard, G., Koskela, L., (1998), On the Agenda of Design Management Research, Proceedings IGLC'98

Bank of Ghana (2007), The housing market in Ghana. A publication of the research department of the bank

Barber, P. R., Sheath, D. M., Walker, S., Graves, A. P. and Tomkins, C. R. (1998), A comparison of design management techniques in construction and the automotive industry, in Amor, editor, Product and Process Modelling, Building Research Establishment, Watford,

Barlow, C.M. (2000a), Creativity and Complexity in Cross Functional Teams, Proceedings IPC 2000

Barlow, C.M. (2000b), Deliberate Insight in Team Creativity, Journal of Creative Behavior, vol.34: 2

Barnes, M. (2000), Construction Project Management, International Journal of Project Management Vol 6 No 2.

Bates, N., 2008, 'Towards client-focused architectural representations as a facilitator for improved design decision-making process', in H.J.P. Timmermans and B. de Vries (eds), Proceedings 9th International Conference on Design and Decision Support Systems (DDSS), TU/e, Leende, June 2008, P09, 1–15.

BS 7000; Part 4 (1996) Design Management Systems – Guide to Managing design in construction

Chaaya, M. & Jaafari, A. (2000), Collaboration and integration of project life cycle design Chartered Institute of Building, Occasional Paper No. 40, 32 pp

Coles, E.J. (1990). *Design Management: A study of practice in the building industry*. The *Construction Engineering and Economics*, Vol. 10, pp. 479-487

Dainty, A., Moore, D. and Murray, M., 2006, Communication in Construction: Theory and Practice, Oxford, Taylor & Francis

Design Management Institute (1998), Executive Perspective: 18 Views on the Definition of Design Management, Management Journal, Summer 1998

Doloi, H. (2007). Developing an integrated management system for optimising project

Emmitt, S. and Gorse, C.A., 2007, Communication in Construction Teams, Oxford, Spon Research, Taylor & Francis

Graham, R. (1998), Managing the Project Management Process in Aerospace and Construction: A Comparative Approach, International Journal of Project Management, vol.17:1

Gray, C., Hughes, W. (2001), Building Design Management, Oxford: Butterworth-Heinemann

Gunsteren, L.A., Loon, P.P.van (2001), Open Design and Construct Management, Delft: Eburon*Information Technology*, pp. 277-291, 2000.

Information using IT systems, *Proceedings of International Conference on Construction*

Koskela, L. & Huovila, P. (1997), "On Foundations of Concurrent Engineering." in

Koskela, L., Huovila, P., Leinonen, J. (2002), Design Management in Building Construction: From Theory to Practice, Journal of Construction Research, vol.3:1

Konadu- Agyemang (2001): A survey of housing conditions &characteristics in Accra, an African city. *Habitat International*, Vol. 25, pp 15-34

Lahdenpera, P., Tanhuanpaa, V.P. (2000), Creation of a New Design Management System Based on Process Optimization and Proactive Strategy, Engineering, Construction, and Architectural Management, vol.7: 3

Lawson, B. (1990), How Designers Think: The Design Process Demystified, Oxford: Butterworth-Architecture

Lawson, B. (1994), Design in Mind, Oxford: Butterworth-Architecture

Loon, P.P.van (1998), Inter organisational Design, PhD Thesis: TU Delft

Mullins, L.J. (1996), Management and Organisational Behaviour, London: Pitman Publishing

Nicholson, M.P. & Naamani, Z. (1992), Managing architectural design – a recent survey,

Nicholson, M.P., Jepson, W.B. (1995), Design Management in a Complex World, The International Journal of Architectural Management Practice and Research, vol.10

options, *Journal of Enterprise Information Management*, Vol. 20, No. 4, pp. 465-486.

Otter, A and Emmit, S (2008) Design Team Communication and Task Complexity,

Otter, A.F.den, Prins, M. (2001), Fast-Tracking by High Performance Design Team, Proceedings CIB World Congress in Wellington

PMBOK (2008), A *Guide to the Project Management Body of Knowledge*, Project Management Institute, PA, USA.

Schön, D.A. (1991), the Reflective Practitioners: How Professionals Think in Action, Aldershot: Avebury

Sebastian, R. (2002a), Enhancing International Multi-Architect Collaborative Building Projects through Architectural Design Management, Proceedings 4th ISAIA

Sebastian, R. (2002b), A Critical Appraisal on Design Collaboration of "The Resident" as a Social Process, Working Paper: TU Delft

Sonnetang, S., and Frese, M., (2002) Performance Concepts and Performance Theory John *Wiley and Sons Ltd*

UN-HABITAT (2011), Ghana Housing Profile, United Nations Settlement Programme

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

Following the literature review presented in chapter 2.0, this chapter introduces and discusses the theoretical framework of the study. This is followed by the design of the questionnaire, the sampling framework and the administration of the questionnaires. The chapter concludes with the statistical tools employed for the analysis of data obtained.

3.1 THEORITICAL FRAMEWORK OF STUDY

This section discusses the underlying theoretical framework for the study. The theoretical framework dwells on applied psychology theory of job performance. "Performance is what the organization hires one to do, and do well" (Campbell et al., 1993,). Thus, performance is not defined by the action itself but by judgemental and evaluative processes (cf. Ilgen & Schneider, 1991). Performance is a multi-dimensional concept. On the most basic level, Borman and Motowidlo (1993) distinguish between task and contextual performance. Task performance refers to an individual's proficiency with which he or she performs activities which contribute to the organization's 'technical core'. This contribution can be both direct (e.g., in the case of production workers), or indirect (e.g., in the case of managers or staff personnel). Contextual performance refers to activities which do not contribute to the technical core but which support the organizational, social, and psychological environment in which organizational goals are pursued. Contextual performance includes not only behaviours such as helping co-workers or being a reliable member of the organization, but also making suggestions about how to improve work procedures.

Three basic assumptions are associated with the differentiation between task and contextual performance (Borman & Motowidlo, 1997; Motowidlo & Schmit, 1999):

(1) Activities relevant for task performance vary between jobs whereas contextual performance activities are relatively similar across jobs

(2) Task performance is related to ability, whereas contextual performance is related to personality and motivation;

(3) Task performance is more prescribed and constitutes in-role behaviour, whereas contextual performance is more discretionary and extra-role.

The theory of task performance states that the criteria for evaluating job performance are 'general mental ability', 'job knowledge', 'task proficiency', and 'job experience' (Schmidt etal, 1986).

The theory of contextual performance states that the criteria for evaluating job performance are 'interpersonal facilitation' and 'job dedication' (Borman and Motowidlo, 1993).

Based on these criteria, detailed attributes that may affect the performance of project managers at the design phase of Mass house building projects are operationalised.

Dwelling on applied psychology theory of job performance espoused, a multidimensional competency-based conceptual model developed by Ahadzie et al., 2008a was adopted. A significant contribution of the conceptual model is that, it reflects both the elements of performance behaviours and outcomes in predicting the performance of PMs at the concept, design, tender, procurement, construction and operational phases of the project life cycle (Ahadzie et al., 2008a, b).

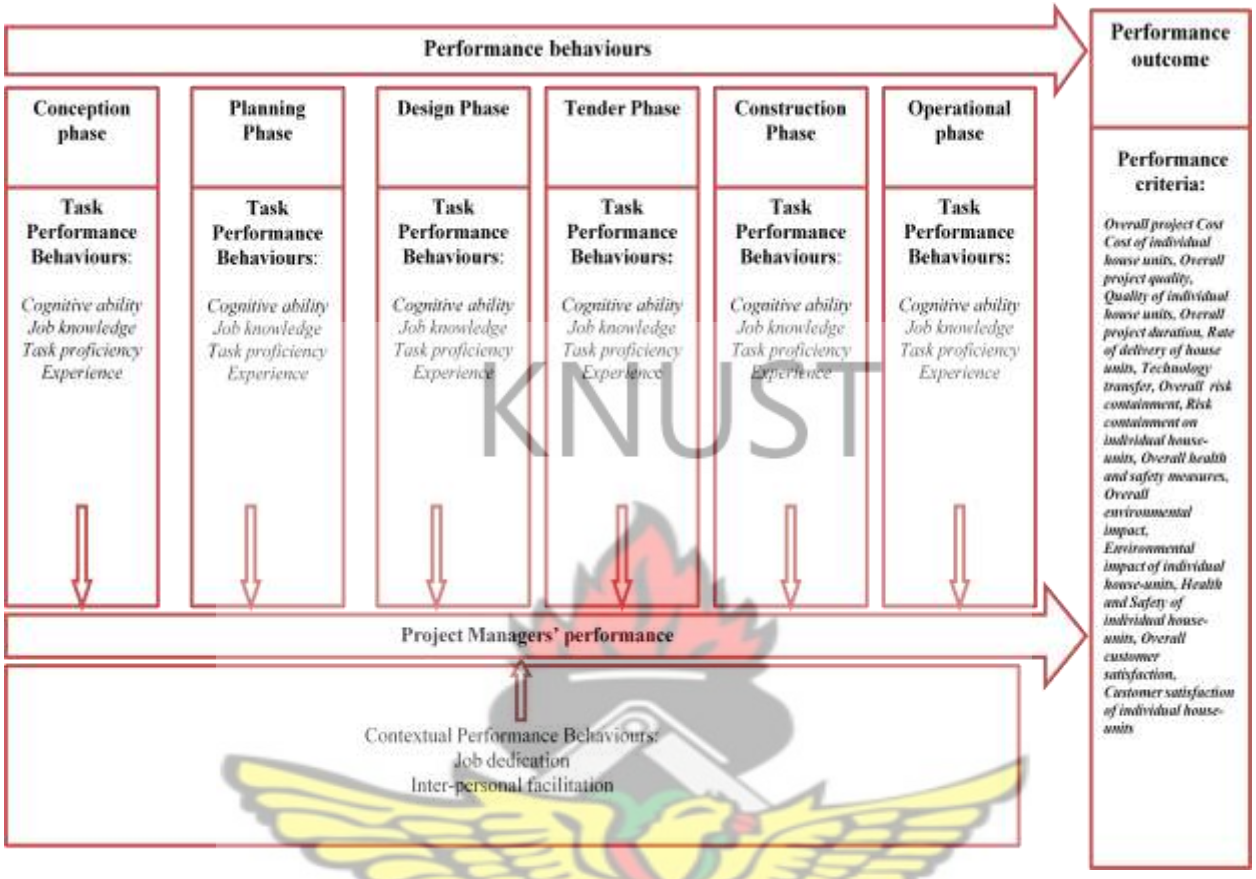

Fig 3.1: Conceptual Model (Ahadzie, 2007)

In the context of this study, a decision was taken to focus on the design phase of the conceptual model adopted. As noted earlier in chapter one, the decision to focus on the design phase stems from the fact that effectiveness of the design process in the building industry has a great influence on the success of subsequent processes in the construction of projects and also on the quality of the environment (Formosa *et al*, 1999). Granted that behavioural competencies are likely to develop and change as a project progresses, the model draws on the project lifecycle framework so that the potential behavioural performance of PMs can be predicted at the conception, planning, design, tender, construction and operational phases of the project lifecycle.

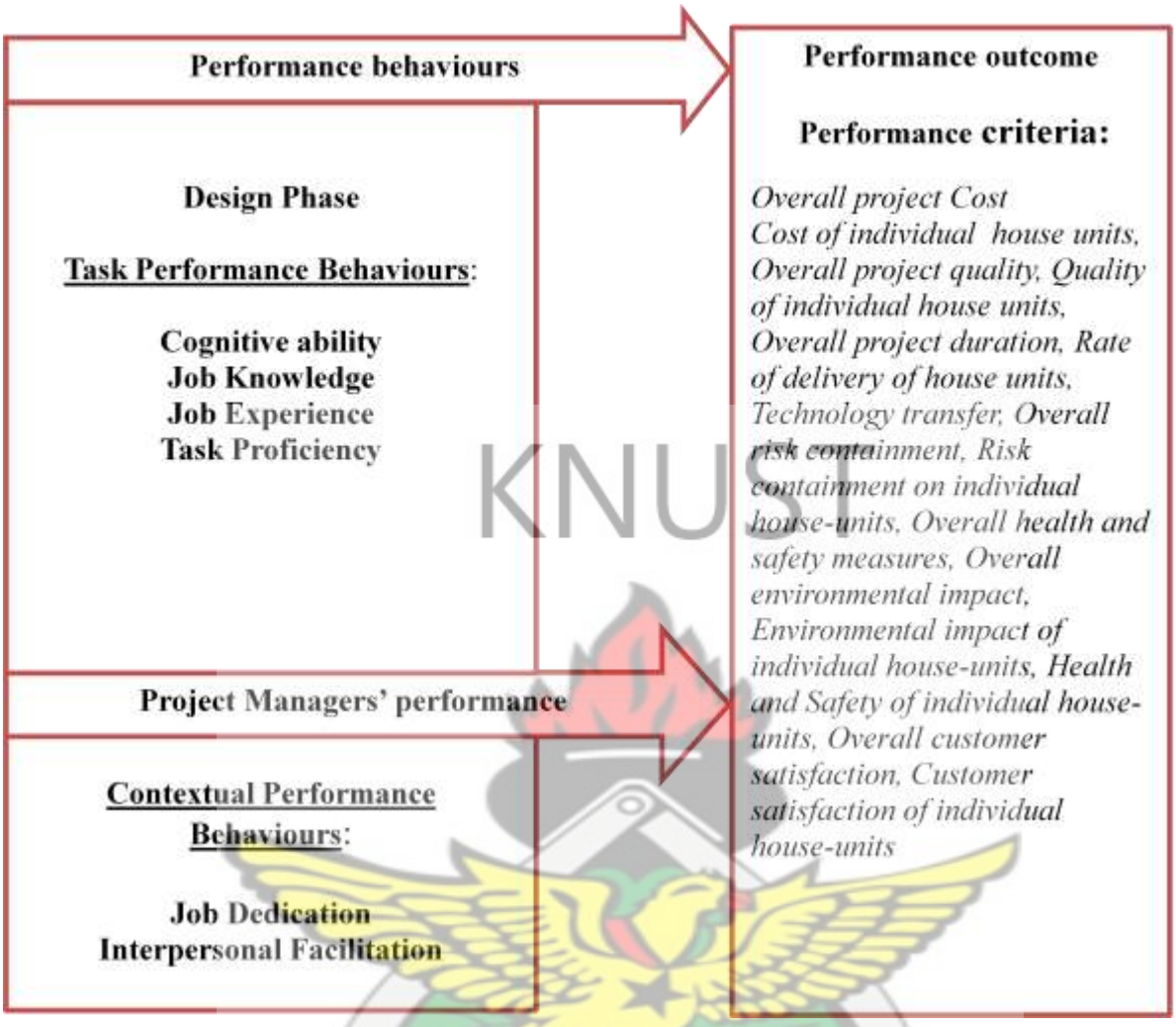

Figure 3.2: Abridge version of conceptual model at the design phase adapted from Ahadzie (2007)

Based on task – contextual performance criteria, detailed attributes that may affect the performance of project managers at the design phase of Mass house building projects are operationalised. This conceptual model gives the opportunity for the variables to be defined in bare behavioural terms. Granted that the conceptual model is underpinned by well-researched organisational applied psychology of job performance, it is potentially relevant for identifying appropriate management behaviours that will help encourage more superior performance throughout the whole lifecycle of MHBPs (Ahadzie, 2006c and 2006d).

Table 3.1 – Abridged version of the operational measures for questionnaire.

Dependent Variable	**Independent Variables**
Performance of Project Managers on MHBPs	**Contextual Performance Behaviours**
	Job Dedication • Commitment to the speedy production of design drawings. • Close attention to important design and construction details. • Commitment to the speedy procurement of statutory approvals. • Initiative to offer suggestions to improve buildability of the design • Persistence towards meeting overall design objectives • Enthusiasm in ensuring that design work conforms to specifications • Should be disposed in welcoming design and documentation options from other professionals
	Interpersonal Skills • Effective time management practice in the design process • Providing timely and unambiguous design information for designers • Smooth and cordial working relationship with designers • Display of good oral and written communication skills • Ability to arrive at effective solutions to conflict while maintaining good relationships • Being honest with designers on their performances • Ability to lead and coordinate the designers towards a common goal • Should accept corrections readily
	Task Performance Behaviours
	Job Experience • Experience in managing designs of mass house building projects • Number of years of practice in construction project management • Experience on attainment of success in management of mass house building projects
	Job Knowledge • Knowledge of relevant design codes, legislation and regulation of mass house building projects • Knowledge of economical designs for mass house building projects. • Knowledge of buildability of design for mass house building projects. • Knowledge of construction processes for design of mass house building projects. • Knowledge of thermal comfort assessment and provisions in the design of mass houses. • Knowledge of performance characteristics of materials for design of mass houses. • Knowledge of provision of neighbourhood facilities in the design of mass house building projects • Knowledge of environmental impact assessment for design of mass house building projects • Knowledge of contract administration in design of mass house building projects • Knowledge of security and fire engineering systems for design of mass house building projects • Knowledge of physical aspects of design quality standards in mass house building projects • Knowledge of the design of waste disposal systems for mass house building projects • Knowledge of building services design systems for mass house building projects • Knowledge of landscape road network design for mass house building projects • Knowledge of mass house contract packaging • Knowledge of performance-based serial contract package for mass housing.

Dependent Variable	Independent Variables
	Task Proficiency • Technical quality of the level of project brief for the design of the mass house units • Functional quality of the level of project brief for the design of the mass house units • Technical quality of strategies for managing the design process. • Functional quality of strategies for managing the design process • Technical quality of the design for the mass houses • Functional quality of the design for the mass houses • Technical quality of time schedule for delivery for the design process • Functional quality of time schedule for delivery for the design process • Technical quality of environmental assessment programme for the design of mass houses • Functional quality of environmental assessment programme for the design of mass houses

3.2 DESIGN OF QUESTIONNAIRE

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents Alasuutari (1998). In designing the questionnaire, the objectives of the study were established. This was done to help in determining what questions to ask and how to ask them.

3.2.1 Contextual Performance – Independent variables

In the pursuance of one of the objectives of designing an appropriate research instrument based on the conceptual model to collect the relevant data reflecting the competency profiles of PMs at the design phase of MHBPs, the behavioural measures identified from literature and operationalised were ere listed for respondents to rank them.

Based on the criteria, Likert rating scales was adopted to help extract the appropriate ratings. Subsequently, the criteria were to be ranked per their level of importance by the respondents on a five point Likert rating scale of 1-5 where,

1= not very important

2= not important

3= average

4= important

5= very important

The first part of the questionnaire dealt with contextual performance behaviours respondents considered important in accessing the performance of project managers at the design phase of MHBPs. Total of 15 independent variables were operationalised from *job dedication* and *interpersonal facilitation* constructs. Seven of these variables were identified under job dedication and eight under interpersonal facilitation.

These contextual performance behaviours were to assist in obtaining the relevant behavioural measures that are important towards enhancing the necessary environment within which technical and specific functions relating to MHBPs are carried out. According to Motowidlo and Schmit (1999), contextual behaviours contribute to the culture and climate of the organisation, in other words, the context within which transformation and maintenance activities are carried out. Volunteering for extra work, persisting with enthusiasm, helping and cooperating with others and defending and supporting the organisation at all times are some of the examples of contextual performance behaviours.

Ling (2002) highlighted that in practical terms, contextual performance factors also included leadership, initiative, commitment, social skills and controllability.

3.2.2 Task Performance – Independent variables

The second part of the questionnaire dealt with task performance behaviours respondents considered important in accessing the performance of project managers at the design phase of MHBPs. Total of 34 independent variables were identified under contextual task performance. Out the total, 3 were under *job experience* construct, 16 under *job knowledge*, 10 under *task proficiency* and 5 under *cognitive ability*.

3.2.3 Performance of Project Managers – Dependent variables

The final part of the questionnaire provided respondents the opportunity to give their perception of the performance of project managers on MHBPs in Ghana. The 15 potential success criteria identified for MHBPs in the conceptual model which has been adopted from Ahadzie (2007) formed the basis of the dependent variable for the study.

In the light of this, a research instrument was introduced to ascertain the perception of respondents on level of performance of project manager on MHBPs in Ghana. Table 3.2 shows a typical section of the question in this area.

Table 3.2 – Typical Section of Questionnaire – rating performance of project managers

General Perception on Performance of PMs	***Not Very Good***	***Not Good***	***Average***	***Good***	***Very Good***
How would you rate the performance of Projects Managers on Housing Projects in Ghana	*1*	*2*	*3*	*4*	*5*

Table 3.3 – Typical Section of Questionnaire – task performance behaviours

TASK PERFORMANCE BEHAVIOURS					
Could you please rate the importance of the following behavioural measures for predicting the performance of project managers at the design phase of mass house building projects in Ghana?					
Please circle (O) the appropriate number					
Job Experience	***Not Very Important***	***Not Important***	***Average***	***Important***	***Very Important***
Experience in managing designs of mass house building projects	*1*	*2*	*3*	*4*	*5*
Experience on attainment of success in management of mass house building projects	*1*	*2*	*3*	*4*	*5*
Job Knowledge					
Knowledge of relevant design codes, legislation and regulation of mass house building projects	*1*	*2*	*3*	*4*	*5*
Knowledge of economical designs for mass house building projects.	*1*	*2*	*3*	*4*	*5*

CONTEXTUAL PERFORMANCE BEHAVIOURS					
Could you please rate the importance of the following behavioural measures for predicting the performance of project managers at the design phase of mass house building projects in Ghana?					
Please circle (O) the appropriate number					
Job Dedication	***Not Very Important***	***Not Important***	***Average***	***Important***	***Very Important***
Commitment to the speedy production of design drawings.	*1*	*2*	*3*	*4*	*5*
Close attention to important design and construction details.	*1*	*2*	*3*	*4*	*5*
Commitment to the speedy procurement of statutory approvals.	*1*	*2*	*3*	*4*	*5*

3.2.4 Pre-Testing of Questionnaire

To check the accuracy of the questionnaire in capturing the intended information, the author undertook pre-testing of the questionnaire among a smaller subset of the target respondents before the main questionnaire administration. Using purposive sampling, ten managing directors and academicians were initially contacted to brief them on the aims and objectives of the study and also to seek their consent to be part of the pre-testing of the questionnaire. The objective of the pre-testing was to appraise the questions and obtain feedback as to its relevance, length and time for completing as well as suggestions for improvement.

The pre-testing was undertaken personally by the author and it must be mentioned that it was very successful. Three key people that participated in the pilot survey were Mr K Amoa-Mensah (*former Director of Building and Road Research Institute - BRRI*), Prof Joshua Ayarkwa (*Head, Department of Building Technology-KNUST*) and Dr Ayowa Afrifa-Taylor *(CEO of Soroma Capital, Real Estate Developers*). Mr Amoa-Mensah recommended for inclusion of *Knowledge of mass house serial packaging and knowledge of performance-based serial contract package for mass housing project* as important measures under job knowledge construct of task performance behaviours of PMs. Dr Afrifa-Taylor also recommended the addition of *disposition in welcoming*

design and documentation options from other professionals as a very important measure for consideration under job dedication construct of contextual performance behaviours of PMs. These recommendations were therefore included in the final questionnaire.

3.3 SAMPLING FRAMEWORK

The sampling frame for the study was obtained from the list of registered members of Ghana Real Estate Developers Association (GREDA). GREDA is the umbrella association of real estate developers in Ghana duly recognised by the Government of Ghana.

As primary property developers in Ghana, members of GREDA are better disposed to have detailed knowledge of the sector based on their experience and should be able to evaluate the jobs and behaviours relevant to PMs' performance in MHBPs. As major stakeholders in the Ghanaian construction industry with regards to property industry, they perceptions of these senior managers are very helpful to especially PMs to have a clearer understanding of what superiors, who are also potential employers, expects of them in defining managerial excellence.

Out of the 402 registered GREDA members nationwide, a decision was taken to limit the survey to Greater Accra region. This was due to the following reasons

a) From the registered list of GREDA members, it was observed that over 95% were based in the Greater Accra region.
b) Although the scope of the study is the whole of Ghana, it was imperative to focus on the most representative samples of the intended population to obtain responses relevant to the study.
c) Again, Accra, in the Greater Accra region is the administrative capital and a commercial centre of Ghana where majority of property development is concentrated.

3.3.1 Determination of Sample Size

Israel (1992) noted that, there are several approaches used in determining the sample size. These, include using a census for small populations, imitating a sample size of similar studies, using published tables, and lastly applying formulas to calculate a sample size. In this context, the author settled on using formula to arrive at the sample size.

The total number of registered GREDA members in Greater Accra region was fixed at 369 after removing those whose telephone numbers were not available .

The sample size was determined using the formula (Kish, 1965).

The sample is given by:

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

where n = sample size

$n' = s^2/v^2$

With **s** referring to maximum standard deviation of the population sample, calculated as $s^2 = p(1-p)$; P being the proportion belonging to the specified category (in this case p = 50% in applying the simple majority rule).

Therefore s^2 = 0.5 x (1 - 0.5) =0.25

v is standard error of sampling distributions

(Here, v=0.05 for a confidence level of 95%).

This implies that n' = 0.25/0.0025

= 100

N is the total population = 369 (List of registered members of GREDA based in Accra obtained from GREDA secretariat, Accra)

n = 100/1+ (100/369)

= 79

Assuming a return rate of 40%, the sample size was increased to 110. Using purposive sampling, active members of GREDA which had their location and contacts updated online were selected as respondents (www.gredaghana.org).

3.4 QUESTIONNAIRE ADMINISTRATION

In view of the fact that the method employed in pre-testing of the questionnaire was successful and reliable, the same method was replicated in the questionnaire administration. A period of five weeks was allowed for the administration of the questionnaire. The data collection commence in the middle of February 2011. All completed questionnaires were retrieved at the end of the five weeks. In other to increase the response rate an additional week was allowed to retrieve the rest of the questionnaire. At the end of the additional week, all questionnaires that have not been retrieved were considered non-responsive. The data collection therefore ended in the last week of March 2011.

In administering the questionnaire, one national service personnel was engaged to assist in the distribution. The 110 GREDA members earmarked for the survey were contacted via telephone and email to brief them on the objectives of the study. However, the administration of the questionnaire was not without problems. Some of the problems encountered were difficulties in locating physical addresses of the respondents. Again, some of the respondents later declined to answer the questionnaire even though they had accepted to be part of it when the author communicated with them. Notwithstanding these challenges some real estate providers sent completed questionnaire via email to the author. The persistent calls and visit to the offices of the respondents yield good results in the retrieval of completed questionnaires.

A total of 110 questionnaires were administered to Managing directors and senior managers of real estate companies registered with GREDA in the Greater Accra region.

A total of 61 questionnaires representing 55.4% of the total administered were returned.

3.5 STATISTICAL TOOL EMPLOYED - REGRESSION ANALYSIS

Regression analysis is the estimation of the linear relationship between a dependent variable and one or more independent variables or covariates. In regression analysis, we fit a predictive model to our data to predict values of the dependent variable from one or more independent variables (Field, 2005).

Single regression seeks to predict an outcome variable from single predictor variable whilst multiple regressions seek to predict an outcome variable from several predictor variables.

In regression, the model we fit is a linear model. Linear model is a model based on a straight line. There are various forms of techniques in regression. These include logistic regression, artificial neural networks, and errors in variable analysis and weighted least square analysis.

Dwelling on explanation from (Brace *et al*, 2003), multiple regressions was chosen instead of other tools due to the following reasons;

1. The sample is representative of the population for the inference prediction.
2. The independent variables are measured with no error
3. The predictors are linearly independent
4. The intention of the analysis is prediction

3.5.1 Multiple Regression Analysis

Multiple regression is a statistical technique that allows us to predict someone's score on one variable on the basis of their score on several other variables (Brace *et al*, 2003). It is a flexible method of data analysis that may be appropriate whenever a quantitative variable (the dependent or criterion variable) is to be examined in relationship to any other factors (expressed as independent or predictor variables). Relationships may be nonlinear, independent variables may be quantitative or qualitative, and one can examine the effects of a single variable or multiple variables with or without the effects of other variables taken into account (Cohen et al, 2003)

The purpose of multiple regressions is to analyse the relationship between different independent variables and dependent variable. If there is a relationship, using the information in the independent variables will improve the accuracy in predicting the values in the dependent variable. In multiple regressions, the term *independent variable* to identify those variables that researchers think will influence some other *dependent variable*. These independent variables are often referred to as predictor variables and dependent variables also as criterion variables.

In a classic linear regression model, the relationship between the predicted outcome yp, and the predictor variables, x1, x2…..xk is defined as:

$$yp = \alpha + \beta 1x1 + \beta 2x2 + \ldots \beta KxK + c \quad \ldots\ldots 3.1$$

Where

α is constant on the y-axis - geometrically, it represents the value of E(Y) where the regression surface (or plane) crosses the y- axis. Substantively, it is the expected value of y when all others are equal

β1 to βK are coefficients - partial slope coefficient (also called partial regression coefficient, metric coefficient). It represents the change in yp associated with a one-unit increase in x1 when all others are held constant.

c is error of the random variable - this error term may be conceived as representing the effects on Y of variables not explicitly included in the equation, and a residual random element in the dependent variable.

K is number of independent variables

To apply the equation, each x_j score for an individual case is multiplied by the corresponding β_j value, the products are added together, and the constant α is added to the sum. The result is yp, the predicted Y value for the case.

For a given set of data, the values for α and the β_js are determined mathematically to minimize the sum of squared deviations between predicted yp′ and the actual Y scores. Once a multiple regression equation has been constructed, its predictive ability can be checked by examining the coefficient of determination (R^2). Multiple R and R^2 measure the strength of the relationship between the set of independent variables and the dependent variable. The closer R_2 is to 1, the better is the model and its prediction.

The appropriateness of a multiple regression model as a whole can be tested by the F-test in the ANOVA (Analysis of Variance) table. An F test is used to determine if the relationship can be generalized to the population represented by the sample. A significant F indicates a linear relationship between Y and at least one of the x's. *www.experiment-resources.com/multiple-regression-analysis*.

3.5.2 Multiple Regression - Stepwise Approaches

Stepwise regression is designed to find the most parsimonious set of predictors that are most effective in predicting the dependent variable. Variables are added to the regression equation one at a time, using the statistical criterion of maximizing the R^2 of the included variables. The process of adding more variables stops when all of the available variables have been included or when it is not possible to make a statistically significant improvement in R^2 using any of the variables not yet included.

Since variables will not be added to the regression equation unless they make a statistically significant addition to the analysis, all of the independent variable selected for inclusion will have a statistically significant relationship to the dependent variable.

3.5.3 Multiple Regression and SPSS

In most statistical software, multiple regression analysis is available. In using the SPSS to perform the regression analysis, the following procedure was followed:

Starting the Procedure

- Click on SPSS 16 icon from the start menu
- Click on analyse
- Point to regression
- Point to linear

Selecting Variables

- Choose the variables for analysis from the list in the variable box.
- Move independent variables to the box labelled **independent(s)** by clicking on the arrow.
- Repeat the procedure for all **independent** variables.

- Move the dependent variable to the box labelled **dependent** by clicking on the arrow.

Requesting Statistics

- Request descriptive statistics by clicking on button labelled **statistics**
- From the statistics dialogue box, click the checkbox for **Descriptive**
- Statistics for **Model fit** and **Estimates for Regression Coefficients** will be produced by default

Requesting Plots

- To request plots click on the **Plots** button.
- In the box click the check box for **Histogram** and **Normal probability plot**

Methods of Variable Entry

- The independent variables can be entered into the analysis using different methods.
- Click on the drop-down arrow for method.
- Point to **stepwise** and click
- Click on the **OK** button to run the multiple linear regression procedure.

3.6 SUMMARY

This chapter has introduced some essential information with regards to the research methodology for the study. The survey features including the sample framework, the sample size, questionnaire administration and statistical method for the analysis of the data have been espoused. The next chapter now dwells on the analysis and interpretation of data elicited from managing directors belonging to GREDA herein referred to as respondents.

REFERENCES

Ahadzie, D. (2007), "A model for predicting the performance of project managers in mass house building projects in Ghana", PhD thesis, *University of Wolverhampton, Wolverhampton*

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008a), "Towards developing competency-based measures for construction project managers: should contextual performance behaviours be distinguished from task performance behaviours", *International Journal of Project Management*, Vol. 26 No. 6, pp. 631

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008b), "Model for predicting the performance of project managers at the construction phase of mass house building projects. *Journal of Construction Engineering and Management, ASCE* Vol. 134 No. 8, pp. 618-29.

Alasuutari, P. (1998), *an invitation to social research*. Thousand Oaks, CA: Sage

Borman, W. C., & Motowidlo, S. J. (1993), expand the criterion domain to include elements of contextual performance, In N. Schmitt & W. Borman (Eds.), *Personnel selection in organizations* (pp. 71–98). New York: Jossey-Bass

Borman, W. C., & Motowidlo, S. J. (1997), Task performance and contextual performance: The meaning for personnel selection research. *Human Performance*, **10**, 99–109.

Brace, N., Kemp, R. and Snelgar, R. (2003) SPSS for Psychologists.

A Guide to Data Analysis Using SPSS for Windows

Campbell, J. P., McCloy, R. A., Oppler, S. H., & Sager, C. E. (1993), A theory of performance. In E. Schmitt, W. C. Borman, & Associates (Eds.) *Personnel selection in organizations* (pp. 35–70), San Francisco: Jossey-Bass.

Ilgen, D. R., & Schneider, J. (1991). Performance measurement: A multi-discipline view. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational Psychology* (Vol. 6, pp. 71–108), Chichester: Wiley.

Israel, Glenn D. (1992) *Sampling the Evidence of Extension Program Impact.* Program Evaluation and Organisational Development, IFAS University of Florida,. PEOD-5. October

Ling, Y.Y. (2003) A Conceptual Model for the Selection of Architects by Project Managers in Singapore, *International Journal of Project Management*, Vol.21, pp.135- 144

Motowidlo, S. J., & Schmit, M. J. (1999), Performance assessment in unique jobs, In D. R. Ilgen & E. D. Pulakos (Eds.), *the changing nature of job performance: Implications for staffing, motivation, and development* (pp. 56–86). San Francisco, CA: Jossey-Bass

Schmidt, F. L., Hunter, J. E., & Outerbridge, A. N. (1986), Impact of job experience and ability on job knowledge,work sample performance, and supervisory ratings of job performance. *Journal of Applied Psychology*, **71**, 432–439.

http://www.gredaghana.org/greda/members.asp accessed on 9th February 2012

CHAPTER FOUR

ANALYSIS AND INTERPRETATION OF DATA

4.0 INTRODUCTION

This chapter is mainly devoted to the analysis of the data collected and comments on the findings. The first part deals with the general perception of respondents on the performance of PMs on MHBPs. The second part deals with the multiple regression analysis on the dataset obtained from respondents in SPSS using the stepwise selection method. The third and final part deals with the discussion on the results of the analysis.

4.1 ANALYSIS OF DEMOGRAPHIC DATA

Tables 4.1 to 4.6 show the results of the descriptive analysis. Knowing the background of the respondents should help generate confidence in the credibility of data collected.

Table 4.1 shows the period of membership of respondents with GREDA. Indeed from the results, 87% of the respondents have been members of GREDA for over 10years.This indicate an appreciable experience of these GREDA members. From Table 4.2, the findings show that 59% of respondents belong to GREDA membership class of A1. Class A1 members have a minimum of USD 500,000 turnover per annum and 59% are class A2 representing 30% of the respondents.

Table 4.3 gives the period of experience in the implementation of MHBPs by respondents. From the results, 62% of the respondents have been involved in the implementation of the MHBPs for over 10years. This findings show that the respondents are quite experienced in the implementation of the MHBPs.

A cursory look at Table 4.4 on the value of MHBPs undertaken in the last 5years show that 21% of the MHBPs undertaken were valued over GHC20million. 30% of them value between GHC11million and GHC20million with 49% being less than GHC10million.

Table 4.5 indicates from the survey that 30% of the respondents often undertake semi-detached units with 51% of them undertaking detached units. Table 4.6 shows that 70% of the respondents deliver up to 40units of houses per year.

Table 4.1 Period of GREDA Membership

Years	**Up to 5years**	**6 – 10years**	**11 – 15years**	**15 – 20years**	**Over 20years**
Response	2	6	23	17	13
Percentage	3%	10%	38%	28%	21%

Table 4.2 Categories of GREDA Membership

Class	**Class A1**	**Class A2**	**Class A3**	**Class A4**
Response	36	18	5	2
Percentage	59%	30%	8%	3%

Table 4.3 Period of Implementation of MHBPs

Years	**Up to 5years**	**6 – 10years**	**11 – 15years**	**15 – 20years**	**Over 20years**
Response	6	17	22	10	6
Percentage	10%	28%	36%	16%	10%

Table 4.4 Total value of MHBPs over the last 5years

Turnover	**Over GH¢20m**	**GH¢11m -20m**	**Up to GH¢10m**
Response	13	18	30
Percentage	21%	30%	49%

Table 4.5 Type of MHBPs often undertaken

Type	**Multi-storey**	**Terrace**	**Semi-Detached**	**Detached**	**Combinations**
Response	7	2	18	31	3
Percentage	11%	3%	30%	51%	5%

Table 4.6 Average Quantity of house-units delivered per year

House-Units	Up to 20	21 – 40	41 – 60	61 – 80	81 - 100	Over 100
Response	30	13	7	5	4	2
Percentage	49%	21%	12%	8%	7%	3%

4.2 GENERAL PERCEPTION ON THE PERFORMANCE OF PMs ON MHBP

As part of the data collection, the perceptions of respondents were sought on the performance of project managers on MHBPs in Ghana. It was noted that the knowledge of the performance of project managers from the respondents would provide some insights as to how respondents currently see the performance of PMs on MHBPs in Ghana. The respondents were therefore asked to rate the performance of PMs from not very good to very good, where Not very good represent a percentage of 10-29%, not good=30-49%, average=50-69%, good=70-90% and very good over 90%. It is worth noting that the respondents generally perceive the performance of project managers engaged in MHBPs in Ghana as fairly good as over 60% of the respondents agreed. In Ahadzie et al (2007), 70% of the respondents rated performance of project managers as being average (50-69). Table 4.7 represents the summary of the results.

Table 4.7 General Perception on the Performance of PMs on MHBPs in Ghana

Performance Level	Percentage	Response	Percentage
Not Very Good	10 – 29%	0	0
Not Good	30 – 49%	6	10
Average	50 – 69%	16	26
Good	70 – 90%	39	64
Very Good	Over 90%	0	0
Total		**61**	**100**

4.3 MULTIPLE REGRESSION ANALYSIS

Multiple regression analysis was the tool selected for developing the predictive model

It was chosen in place of other methods due to the following reasons

1. It is by far the most widely used multivariate tool to analyze the relationship between several independent variables and a single dependent variable
2. It offers a rare opportunity to examine what proportion of the variance in the outcome variable is explained by each predictor variable and its combined effect. (Brace et al, 2003)

In a classic linear regression model, the relationship between the predicted outcome yp, and the predictor variables, x1, x2…..xk is defined as:

$yp = \alpha + \beta 1x1 + \beta 2x2 + \ldots \beta KxK + c$.....4.1

Where α is constant on the y-axis

β1 to βK are coefficients

c is error of the random variable

K is number of independent variables

In this study, the independent variables (predictor variables) were represented by the 49 operationalized measures identified for both contextual and task performance behaviours and the dependent variable (criterion variable) is defined as the measure of the PM's performance outcome.

4.3.1 STEPWISE SELECTION APPROACH

Stepwise selection, which is a technique in multiple regressions, is used for this analysis. The stepwise selection approach was used rather than other approaches such as forward selection, backward elimination, forced entry and block wise entry.

The stepwise selection ensures model ends with the subset of independent variables that have strong relationship with the dependent variable. In stepwise regression each variable is entered in sequence and its value assessed. If adding to the variable contributes to the model then it is retained. The stepwise method ensures that analysis ends up with the smallest possible set of predictor variables (Field, 2005). The sequential nature leads to development of models at each stage.

4.4 SUMMARY OF RESULTS FOR THE REGRESSION ANALYSIS

4.4.1 Model Summary

The table 4.8 Model summary shows 5 models with Model number 5 being the optimum model as it included the smallest set of predictor variables.

In the development of the model, the stepwise selection criterion on the addition of a variable assesses its impact. The addition and elimination of variables in the development of this model led to the identification of the set of predictor variables obtained in Table 4.8.

The model numbers are shown in the first column. It shows the minimum number of variables extracted. R represents a measure of correlation between the observed value and predicted value of the dependent variable. R square is a measure of how good a prediction of the overall performance outcome can be made by knowing the predictor variables (Field, 2005).

The adjusted R^2 gives the indication of how much variance in the performance outcome is accounted for in the population from which the sample was chosen (Brace et al, 2003).

Table 4.8 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.569[a]	.324	.313	.938	.324	28.299	1	59	.000	
2	.666[b]	.444	.425	.858	.120	12.477	1	58	.001	
3	.699[c]	.489	.462	.830	.045	5.006	1	57	.029	
4	.731[d]	.535	.502	.798	.046	5.563	1	56	.022	
5	.754[e]	.568	.529	.776	.033	4.216	1	55	.045	2.100

a. Predictors: (Constant), Knowledge of mass house contract packaging

b. Predictors: (Constant), Knowledge of mass house contract packaging, Knowledge of performance characteristics of materials for design of MHBP

c. Predictors: (Constant), Knowledge of mass house contract packaging, Knowledge of performance characteristics of materials for design of MHBP, Technical quality of strategies for managing the design process.

d. Predictors: (Constant), Knowledge of mass house contract packaging, Knowledge of performance characteristics of materials for design of MHBP, Technical quality of strategies for managing the design process., Knowledge of thermal comfort assessment and provisions in the design of MHBP

e. Predictors: (Constant), Knowledge of mass house contract packaging, Knowledge of performance characteristics of materials for design of MHBP, Technical quality of strategies for managing the design process., Knowledge of thermal comfort assessment and provisions in the design of MHBP, Knowledge of relevant design codes, legislation and regulation of MHBP

f. Dependent Variable: Performance of PMs

4.4.2 Analysis of Variance (ANOVA)

Using the adjusted R^2 table 4.8 and the analysis of variance (ANOVA) table 4.9, the following statistical information is extracted.

Adjusted $R^2 = 52.9$; $F_{5, 55}=14.46$, $p<0.005$.....4.2

Given that p value is less than 0.0005, the report indicates that the model number 5 which accounted for five variables out of the total tested accounting for over 53% of the variance in the performance outcome.

The p-value which assesses the overall significance of the model gives a value of less than 0.0005 confirms that the model is significant (Table 4.8).

The Durbin-Watson test which test the correlation between errors, also gave a reasonable value of 2.10. The Durbin-Watson statistic ranges in value from 0 to 4. A value near 2 indicates non-autocorrelation; a value toward 0 indicates positive autocorrelation; a value toward 4 indicates negative autocorrelation (Field, 2005). This shows that residual errors in the model are independent of each other.

Table 4.9 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
5	Regression	43.598	5	8.720	14.465	.000[e]
	Residual	33.156	55	.603		
	Total	76.754	60			

The evolved model indicates that 53% of the variance in the PMs Performance outcome can be explained by the five variables namely: *Knowledge of mass house contract packaging, knowledge of performance characteristics of materials for design of MHBPs, technical quality of strategies for managing the design process, knowledge of thermal comfort assessment and*

provisions in design of MHBPs, knowledge of relevant design codes, legislation and regulation for MHBPs.

Table 4.10 Coefficients and Collinearity Statistics for the Optimum Regression Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
5	(Constant)	-.401	.563		-.712	.480		
	Knowledge of mass house contract packaging	.428	.103	.399	4.158	.000	.852	1.173
	Knowledge of performance characteristics of materials for design of MHBP	.251	.083	.288	3.026	.004	.868	1.153
	Technical quality of strategies for managing the design process.	.340	.125	.265	2.713	.009	.826	1.211
	Knowledge of thermal comfort assessment and provisions in the design of MHBP	.270	.096	.262	2.817	.007	.910	1.099
	Knowledge of relevant design codes, legislation and regulation of MHBP	-.165	.080	-.191	-2.053	.045	.905	1.105

4.4.3 Coefficients of Optimum Regression Model

Table 4.10 shows the coefficients of the optimum regression model. The estimated regression coefficient (beta-value) is a measure of how strongly each of the predictor variable influences the criterion variable in the model. Subsequently, the model equation using the respective coefficient is derived as

Yp = 0.401 + 0.428(Knowledge of mass house contract packaging)

+0.251(knowledge of performance characteristics of materials for design of MHBPs)

+0.340(technical quality of strategies for managing the design process)

+0.270(knowledge of thermal comfort assessment and provisions in design of MHBPs)

-0.165(knowledge of relevant design codes, legislation and regulation for MHBPs)

R2 adjusted = 52.9……..4.3

The reason behind equation 4.3 is that, the independent variables identified (with the exception of (*Knowledge of relevant design codes, legislation and regulation for MHBPs)* have positive relationship with the performance outcome identified as the performance of PMs at the design phase of MHBPs. This suggests that to improve on their performance, PMs should among others things seek to add to their knowledge in these key areas.

The negative regression co-efficient of the variable '*knowledge of relevant design codes, legislation and regulation for MHBPs'* indicates that it has a negative impact on performance outcome

4.4.4 Collinearity Diagnostics

When the independent variables are highly correlated, it is difficult to come up with reliable estimates of their individual regression coefficients. When two variables are highly correlated, they are basically measuring the same construct. In other words, when two variables are highly correlated, they both convey essentially the same information. To check this multicollinearity among the variables, diagnostic test were also conducted on the model. Tolerance and variance inflation factor (VIP) were undertaken to check whether high correlations exist among the set of the predictor variables in the regression model (Table 4.11)

The tolerance values can vary between 0 and 1. The closer to zero the tolerance value is for the variable, the stronger the relationship between this and the other predictor variables (Brace et al, 2003). From Table 4.10 shows the tolerance values of less than 1.

There is no formal VIF value for determining presence of multicollinearity. Values of VIF that exceed 10 are often regarded as indicating multicollinearity (Field, 2005).

From the Table 4.10, the average VIP value is closer to 1. These test statistics confirms the absence of multicollinearity in model.

Table 4.11 Collinearity Diagnostics

Model		Eigen value	Condition Index	Variance Proportions					
				(Constant)	Knowledge of mass house contract packaging	Knowledge of performance characteristics of materials for design of MHBP	Technical quality of strategies for managing the design process.	Knowledge of thermal comfort assessment and provisions in the design of MHBP	Knowledge of relevant design codes, legislation and regulation of MHBP
5	1	5.619	1.000	.00	.00	.00	.00	.00	.00
	2	.152	6.085	.00	.01	.32	.01	.06	.33
	3	.088	7.981	.00	.04	.07	.01	.52	.50
	4	.068	9.070	.00	.55	.36	.05	.23	.02
	5	.048	10.812	.04	.39	.20	.59	.00	.12
	6	.025	15.055	.96	.02	.05	.34	.19	.04

a. Dependent Variable: Performance of PMs

4.4.5 Residual Analysis

Residual analysis was taken to confirm the goodness of fit of the model. The residual analysis outputs thus the histogram of the residuals and plot of standardized residuals are also presented. Figure 4.1 shows a histogram of the residuals with a normal curve superimposed. The residuals look close to normal. Figure 4.1 is a plot of the residuals versus predicted Y. The pattern show here indicates it reasonably appears close to normal. This is in tandem with the assumption that the residuals are normally distributed at each level of Y and constant in variance across levels of Y

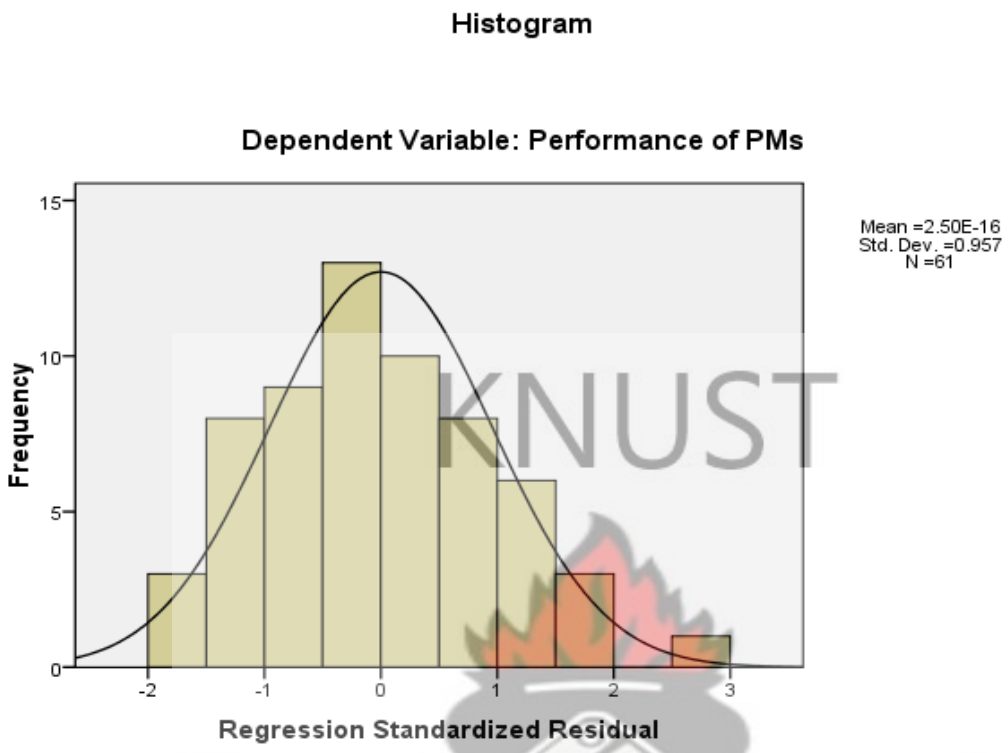

Fig 4.1- Histogram of Frequency against regression standardized residual

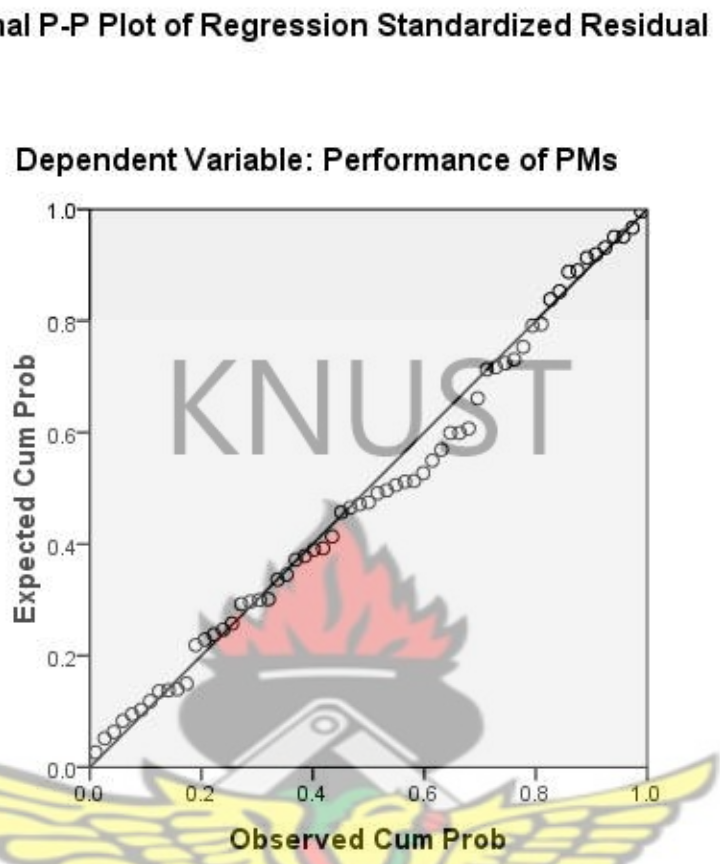

Fig 4.2 – Normal probability plot of regression standardized residual

Figure 4.2 which show the normal probability plot indicates that the points are lie close to a straight line and this suggests that the residuals are close to normal distribution.

4.5 DISCUSSION OF THE RESULTS

In the preceding sections of this chapter, optimum model for predicting the performance of PMs at the design phase of MHBPs has been described. This model has been evolved through regression analysis using the stepwise method. The motivation for the development of the model stems from the fact that project managers play a very vital role in the implementation of MHBPs in the construction industry most especially at the design phase which has been the focus of this as noted earlier.

4.5.1 Concurrence of research findings with the Adopted Theoretical Framework

For the discussion of the results of the study, the independent variables have been regrouped into the contextual and task performance behaviours (Table 4.12).

Table 4.12 shows the independent variables accounted for in the optimum regression model.

Table 4.12 Independent variables accounted for in the optimum regression model

Performance Domain	Variables Included	% variance of variables	Total % variance accounted
Contextual Performance behaviours			0.00%
Job dedication	Nill		
Interpersonal facilitation	Nill		
Task Performance behaviours			56.80%
Job knowledge	Knowledge of mass house contract packaging	32.40%	
	Knowledge of the performance characteristics of materials for the design of MHBPs	12.00%	
	Knowledge of thermal comfort assessment and provisions in design of MHBPs	4.60%	
	knowledge of relevant design codes, legislation and regulation for MHBPs	3.30%	
Job experience	Nill		
Task proficiency	Technical quality of strategies for managing the design process of MHBPs	4.50%	
Cognitive ability	Nill		

A critical review of Table 4.12 which is reproduced from the regression modal summary shows that contextual performance behaviour did not any variance in the model. This result however is not supported by Borman and Motowidlo (1993) and Conway (1996) who asserted that contextual behaviours could be accounting for 30% of the variance.

Ahadzie (2007) recorded variance of about 24% for contextual performance behaviours. Indeed, according to Neal and Griffin (1999), contextual performance is typically conceptualized under motivational control of the individual and less constrained by work characteristics like task performance. It is generally assumed that individuals can engage in contextual activities if they wish and this choice reflects the individual differences in motivation. However, individuals do not always have the opportunity to engage in discretionary activities. As task demands increase, the opportunity for engaging in contextual activities may decrease since individuals are likely to devote an increasing proportion of available resources to task performance.

However, from Table 4.12 again, the task performance behaviours recorded a total variance of over 56%. This compares with 52% by Ahadzie (2007) and conforms to the over 50% variance for task performance domain in the model posited by Borman and Motowidlo (1993) and Conway (1996).

On the task performance behaviours accounted for in the model, aspects of *job knowledge* only accounted for about 52% and *task proficiency* also accounted for about 4%. From Table 4.12, it is revealing to note that *job experience* did not register in the findings. Ahadzie (2007) agreed that although the level of experience of the PM might be important, eventually, it is how the relevant experience is translated into job knowledge on a task that might be crucial in judging their current performance. *Cognitive ability* also did not register in the model. Indeed Ahadzie (2007) argued that although antecedents of cognitive ability are expected to predict task performance behaviours, the evidence suggests their effect on job performance is mediated by other variables such as job knowledge.

4.5.2 Relevance of the findings at the Design Phase in the Implementation of MHBPs

The findings from the analysis provide very valuable insights worth considering at the design phase in the implementation of MHBPs in Ghana. These variables identified among other things can be used to predict the performance of PMs at the design phase of MHBPs.

4.5.2.1 Knowledge of mass house contract packaging

Knowledge of mass house contract package registered strongly in the model. As a performance construct under job knowledge in the task performance domain, knowledge of mass house contract package is crucial to the successful implementation of MHBPs. Indeed, Ahadzie and Amoa-Mensah (2010) advocated serial contract package for MHBPs in Ghana. With serial contract, a clause forming the basis of succeeding contracts in the form of formula is inserted in the contract for updating the previous contract sum. Essentially, the main advantage of serial contract allows parties to benefit from continuity of works.

4.5.2.2 Knowledge of the performance characteristics of materials for the design of MHBPs

Knowledge of the performance of materials in the design of MHBPs as a project manager is a great asset. Indeed, Harmathy (1988) summarised the knowledge of three groups of materials as vital for designers of building projects.

Group L (load-bearing materials): materials designed to carry high stresses and are usually in tension. For this group of materials, mechanical properties related to their behaviour in tension are of principal interest to the designer.

Group UI (load-bearing and insulating materials): materials designed to carry moderate stresses and, in fire to provide insulation group to materials. For this group material, both the mechanical properties (related mainly to behaviour in compression) and the thermal properties are of interest to the designer

Group I (insulating materials): materials not designed to carry load. Their role in fire is to resist heat transmission through building element sand/or to provide insulation to group L materials. For group I materials, only the thermal properties are of interest.

The number of building materials has been increasing over the period and the PMs Knowledge of these characteristics of materials is priceless in the management of MHBPs

4.5.2.3 Knowledge of thermal comfort assessment and provisions in design of MHBPs

Thermal comfort is defined in British Standard BS EN ISO 7730 as:

'That condition of mind which expresses satisfaction with the thermal environment.

Creating a thermally comfortable environment is one of the most important criteria to be considered when designing residential buildings. Due to this lack of optimal design of buildings according to the energy efficient standards in different climates, especially tropical regions, there is a need for architects to find optimal ways for designing buildings (Feriadi et al. 2004). In fact, recent trends have shown a heavy usage of mechanical ventilation devices for effective distribution of air in securing thermal comfort in tropical countries. These days, because of the increase in usage of mechanical ventilation devices, it has been observed that energy consumption with the aim of achieving comfortable environment is getting higher and therefore costlier. As a result, most of the occupants prefer to use natural ventilation to reduce the running cost in buildings (Wong et al. 2002).

4.5.2.4 Knowledge of relevant design codes, legislation and regulation for MHBPs

In Ghana, the National Building Regulations (NBR) 1996 provides the necessary information on the relevant codes, legislation and regulations for the building industry and by extension MHBPs. The knowledge of these regulations by the PM at the design phase of MHBPs facilitates the acquisition of the necessary permits at the design stages of the implementation of the project.

The National Building Regulation of 1996 provides the relevant information on plot development, site preparation and landscape, material for the building and structural stability, fire precautions, air movement and ventilation, thermal insulation, drainage and sanitary conveniences, refuse and waste disposal, water supply, lighting and electrical installations. Additionally, taking cognisance of the fact that the granting of permits for planning of developments and developments permits are vested in the hands of local authorities, the knowledge of the Local Government Act 462 (1993) is very imperative for the PM at the design phase of the MHBPs.The knowledge of the PM in these regulations and codes should provide strong knowledge base of the PM at the design phase of MHBPs according to the respondents is closely linked with successful management of MHBPs.

4.5.2.5 Technical quality of strategies for managing the design process of MHBPs

Designers make their design solely on the basis of their technical knowledge and information contained in the project proposals, with the benefit of contextual knowledge. Strategies for the management of the design process of MHBPs involves improved and intense cooperation between the design team with the objective of combining all possibilities of the client requirements in one integrated planning process (Al-Momani, 2000).

4.6 SUMMARY

This chapter has so far presented an analysis of the data elicited from the respondents. Multiple regressions have been discussed and all the relevant results obtained from the SPSS output have been presented. Discussion of the results from the analysis has also been presented. The next and final chapter takes a look at conclusions from the study and makes relevant recommendations.

REFERENCES

Ahadzie, D. (2007), "A model for predicting the performance of project managers in mass house building projects in Ghana", PhD thesis, *University of Wolverhampton, Wolverhampton*

Ahadzie, D. and Amoa-Mensah K. (2010), Management practices in the Ghanaian House Building Industry. *Journal of Science and Technology,* Vol 30 No 2(2010) pp 62-75

Al-Momani A.H. (2000) Structuring information on residential building: a model of preference, *Engineering Construction and Architectural Management*, Vol.2, pp.179-190

Borman, W. C., & Motowidlo, S. J. (1997), Task performance and contextual performance: The meaning for personnel selection research. *Human Performance,* 10, 99–109.

Brace, N., Kemp, R. and Snelgar, R. (2003) SPSS for Psychologists.

BS EN ISO 7730 (1995) Moderate thermal environments, Determination of the PMV and PPD indices and specification of the conditions for thermal comfort

A Guide to Data Analysis Using SPSS for Windows

Field, A. (2005) Discovering Statistics, Using SPSS for Windows,

Sage Publications, London

Feriadi, Henry, and Nyuk Hien Wong (2004)., Thermal comfort for naturally ventilated houses in Indonesia. Energy and Buildings, pp 614-626

Harmathy T.Z. (1988) Properties of Building Materials, Appeared in the SFPE Handbook of Fire Protection Engineering 1988 Section 1, Chapter 26 p378 -391(IRC Paper No. 1580) NRCC

Ling, Y.Y. (2003) A Conceptual Model for the Selection of Architects by Project Managers in Singapore, *International Journal of Project Management*, Vol.21, pp.135- 144

National Building Regulations (NBR) 1996 Ghana LI 1630

Neal, A. & Griffin, M. A. (1999) Developing a theory of performance for human resource management, *Asia Pacific Journal of Human Resources,, 37,* 44- 60.

Oyedele, L. O. & Tham, K. W. (2005) Examining architects' performance in Nigerian private

and public sectors building projects. *Engineering, Construction and Architectural Management, 12*, 52- 68.

Wada, Y., Okumato T and Wada N (2007) Evaluating Waste Disposal Systems *Journal of Material Cycles and Waste Management, 10*, 173- 187

Wong, N.H, H Feriadi, P.Y Lim, K.W Tham, C Sekhar, and CheongK.W (2002), Thermal comfort evaluation of naturally ventilated public housing in Singapore.

Building and Environment,Vol. 37, pp 1267–127

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 INTRODUCTION

The preceding chapters have so far presented the aim, objectives and the problem statement of the study, a review of literature on design management in the project management process, the research methodology employed and the analysis of the data. This chapter basically presents the recap of the research questions; review of the objectives of the study, conclusions of the study is also drawn. The chapter concludes with recommendations from the study.

5.1 RESEARCH QUESTIONS

In the furtherance of this study, three main research questions were set forth namely

- What are the roles of PMs at the design phase of MHBPs in Ghana?
- What are the appropriate performance indicators for assessing the performance of PMs at the design phase of MHBPs in Ghana?
- How should the performance indicators be incorporated at the design phase of the project life cycle?

5.2 REVIEW OF OBJECTIVES

The foremost aim of this study as stated in the introductory chapter of this study was to identify a model, which can be used to predict the performance of PMs at the design phase of MHBPs in Ghana.

In working towards this aim of the study, specific objectives were set to assist in the realisation of this aim. Consequently, the objectives of this study are recapped to see the extent to which they were achieved in the course of undertaking the study.

Objective 1: Identify key performance variables of PMs for MHBPs

The identification of key performance variables of PMs for MHBPs has been underscored in this study. Chapters 3 and 4 have sufficiently espoused the key performance variables of PMs for the implementation of MHBPs.

Objective 2: Identify performance predictive models related to the area of study. Contemporary models for project manager in the construction industry have been noted. It is acknowledged that competency-based approaches are gradually gaining prominence in construction project management practice and research. Extensive review of recent developments in project management in developing countries has also been looked at. In this respect, project management practices in the Ghanaian construction industry were also discussed with reference to the contribution of PMs on housing projects in Ghana under GREDA.

Objective 3: Identify the relevant variables for predicting the performance of PMs on MHBPs

This objective was largely achieved in the number of performance measures identified for the design phase in the contextual-task performance construct in applied psychology domain from which the conceptual model design for the management of MHBPs was adopted. Indeed in the contextual-task performance construct, 49 variables were identified with 15 and 34 representing contextual and task performance behaviours respectively. Out of the 15 variables identified for contextual performance behaviours, *7 represented variables from job dedication* section and *8*

for the interpersonal facilitations. In the same vein, out of the 34 variables identified for task performance behaviours, *3 represented job experience, 16 for job knowledge, 10 for task proficiency and 5 for cognitive ability*.

Objective 4: Use statistical tools to develop a model based the factors above.

In pursuance of this objective, multiple regression analysis was employed in the development of the model as seen in chapter four. Multiple regressions were chosen instead of other tools because the data sample was representative of the population for the inference prediction.

The independent variables are measured with no error and the predictors are linearly independent and finally the intention of the analysis is prediction. The stepwise approach was used in the analysis and the statistical parameters like ANOVA, multi-Collinearity, Durban-Watson's test and residual analysis confirm the goodness of fit of the model.

5.3 CONCLUSIONS

The main conclusions of the study are summarised as follows:

- The best predictors of the project managers performance in the design phase of MHBPs are: ***knowledge of mass house contract packaging, knowledge of performance characteristics of materials for design of MHBPs, technical quality of strategies for managing the design process, knowledge of thermal comfort assessment and provisions in design of MHBPs, knowledge of relevant design codes, legislation and regulation for MHBPs.***

- The evolved model indicates that 53% of the variance in the PMs Performance outcome at the design phase of MHBPs can be explained by the five variables.

- It is worth noting from the observed findings of the study that, over 56% of the total variance is accounted for by aspects of task performance behaviours alone and those aspects of contextual performance behaviours did not register in the model.

5.4 LIMITATIONS OF THE STUDY

This study was not undertaken without limitations. The main limitation was the physical address location of housing developers in Ghana. Most of them on the list of GREDA are not active and very difficult to locate. Additionally, the relatively small size of the sample for the respondents of the study must be noted. The strength of the model demonstrated by statistic parameters affords reasonable degree of normality in the data obtained.

5.5 RECOMMENDATIONS FOR INDUSTRY

The findings of the study provide very useful information for application in the implementation and management of MHBPs. The behaviours that have been identified are what Managing Directors of Housing companies in Ghana expect their project managers to have towards achieving commanding levels of performance. It therefore, provides the practical platform on which project managers in the Ghanaian housing sector can draw to improve their knowledge and skills in the key performance traits identified.

5.5.1 Recruitment and Selection of Project Managers

Appointments of PMs in project based sectors such as the MHBPs by construction executives have always been a difficult task given that any mismatch is a recipe for conflict of interest which can result in differences behaviours and results (Ogunlana *et al*, 2002).

It is acknowledged that one of the major problems often faced by panellists in many project based organisations during interviews is to have an objective framework on which to make informed and uniform decisions (Roberts, 1998; Lyons, 2003). These findings could be used as the basis for modelling a checklist for interviewing by the Ghanaian housing sector so that in the selection process for PMs on MHBPs, the interviewing panel can have a working framework against which questions could be asked for the PM with appropriate skills.

5.5.2 Job matching and Team deployment

It is recognised that an individual's competency profile can be used to reconcile the competency profile of a job position so that the degree of fit can be established Dainty *et al* (2003) cited in Ahadzie *et al* (2008). Admittedly, these competency measures could be used to appropriate competency profiles for managerial positions in MHBPs. In this regard, the findings of this study would help housing firms who would want to deploy other categories of staff who demonstrate some level of understanding of the relevant knowledge and skills to assist the PMs on the MHBPs. This also provides the basis for succession in leadership of MHBPs.

5.5.3 Curriculum Development for Training of Project Managers

With the growing need for housing in Ghana, and particularly MHBPs, there is the need for adequate emphasis on the training of project management professionals both formal and informal. Currently, in Ghana, construction project management training is generic and offers little room for promoting the professional development of PMs in specific project – based sectors such as the MHBPs (Ahadzie, 2008). The findings of this research among other things could form a foundation for the development of future training in MHBPs.

5.5.4 Continuous Professional Development for Project Managers

According to Construction Industry Council (CIC-UK), CPD is about learning and development that enhances the participant's effectiveness in their professional role. This should maintain and enhance existing competences as well as developing new knowledge and skills. CPD includes a wide variety of activities such as open learning, private study, work experience and many more. Arguably, given the enormous benefits of the competency-based model for facilitating the training needs, the findings of this study could be used as a vital tool for the CPD agenda for PMs in the MHBPs in Ghana and in particular at the Design phase. For the PM who is already employed and engaged in the implementation of MHBPs, the findings provide a rare opportunity for their professional development in the key areas.

The GREDA, the umbrella organisation of the real estate organisations in Ghana can based on this study partner training institutions to run refresher courses and training programmes modelled after the key profiles identified to further upgrade the knowledge of their PMs.

Professional bodies like the Ghana Institute of Architects (GIA), Ghana Institution of Engineers (GhIE) and the Ghana Institution of Surveyors (GhIS) could also as part of their CPD programmes factor these findings into seminars and training to deepen the knowledge base of its members. Ahadzie et al (2008a) concluded that there is a ground for advocating further development of these competencies as part of any CPD agenda in the management of MHBPs in Ghana.

5.6 RECOMMENDATION FOR FURTHUR STUDIES

This study is a follow-up to previous studies on the implementation and management of MHBPs in Ghana. The adopted theoretical framework that underpins this study was developed for all the phases of the MHBPs namely the conception, planning, design, tender, construction and operational phases. The complete of each phase of the framework would provide a compendium

of very useful information for the housing industry in Ghana. With the completion of study on the construction phase and currently the design phase, it is recommended that further studies should be taken for the development of models at each phase of the implementation of MHBPs.

5.7 SUMMARY

In this chapter, the research questions and the research objectives have been recapped. The conclusions of the study have been presented and the limitations of the study have be recognized. Recommendations for project managers and housing developers as well as the call for for further studies have been proposed.

To sum it up, this research has reinforced the model for predicting the performance of project managers in MHBPs and more specifically at the design phase. This could be of much help to practicing project managers involved in the implementation of MHBPs as it enriches the CPD agenda towards their professional development. Property developers will also find this model very useful in the recruitment, retaining and development of their project managers for the design phase of MHBPs in Ghana.

REFERENCES

Ahadzie, D. (2007), "A model for predicting the performance of project managers in mass house building projects in Ghana", PhD thesis, University of Wolverhampton, Wolverhampton

Ahadzie, D. and Amoa-Mensah K. (2010), Management practices in the Ghanaian House Building Industry. Journal of Science and Technology, Vol 30 No 2(2010) pp 62-75

Al-Momani A.H. (2000) Structuring information on residential building: a model of preference, Engineering Construction and Architectural Management, Vol.2, pp.179-190

Borman, W. C., & Motowidlo, S. J. (1997), Task performance and contextual performance: The meaning for personnel selection research. Human Performance, 10, 99–109.

Brace, N., Kemp, R. and Snelgar, R. (2003) SPSS for Psychologists.

BS EN ISO 7730 (1995) Moderate thermal environments, Determination of the PMV and PPD indices and specification of the conditions for thermal comfort

Feriadi, Henry, and Nyuk Hien Wong (2004)., Thermal comfort for naturally ventilated houses in Indonesia. Energy and Buildings, pp 614-626

Harmathy T.Z. (1988) Properties of Building Materials, Appeared in the SFPE Handbook of Fire Protection Engineering 1988 Section 1, Chapter 26 p378 -391(IRC Paper No. 1580) NRCC

Ling, Y.Y. (2003) A Conceptual Model for the Selection of Architects by Project Managers in Singapore, International Journal of Project Management, Vol.21, pp.135- 144

National Building Regulations (NBR) 1996 Ghana LI 1630

Oyedele, L. O. & Tham, K. W. (2005), Examining architects' performance in Nigerian privateand public sectors building projects. Engineering, Construction and Architectural Management, 12, 52- 68

Wada, Y., Okumato T and Wada N (2007) Evaluating Waste Disposal Systems Journal of Material Cycles and Waste Management, 10, 173- 187

Wong, N.H, H Feriadi, P.Y Lim, K.W Tham, C Sekhar, and CheongK.W (2002), Thermal comfort evaluation of naturally ventilated public housing in Singapore.

Building and Environment, Vol. 37, pp 1267–127

BIBLIOGRAHY

A Guide to Data Analysis Using SPSS for Windows

Ahadzie, D. (2007), "A model for predicting the performance of project managers in mass house building projects in Ghana", PhD thesis, University of Wolverhampton, Wolverhampton

Ahadzie, D.K, Amoa-Mensah, K(2010) Management Practices in Ghanaian House Building Industry. Journal of Science and Technology Vol 30 No 2 pp 62-75.

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2004), "Meeting housing delivery targets in developing countries: the contribution of project managers in Ghana", in Ogunlana et al. (Eds), Globalization and Construction in Developing Countries, AIT Conference Centre, Bangkok, Thailand, 17-19 November, pp. 620-30

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008a), "Towards developing competency-based measures for construction project managers: should contextual performance behaviours be distinguished from task performance behaviours", International Journal of Project Management, Vol. 26 No. 6, pp. 631

Ahadzie, D.K., Proverbs, D.G. and Olomolaiye, P. (2008b), "Model for predicting the performance of project managers at the construction phase of mass house building projects. Journal of Construction Engineering and Management, ASCE Vol. 134 No. 8, pp. 618-29.

Allinson, K. (1997), Getting There by Design: An Architect's Guide to Design and Project Management, Oxford: Architectural Press

Al-Momani A.H. (2000) Structuring information on residential building: a model of preference, Engineering Construction and Architectural Management, Vol.2, pp.179-190

Austin, S.A., Baldwin, A.N., Li, B., Waskett, P. (2000), Analytical Design Planning Technique (ADePT): A Dependency Matrix Tool to Schedule the Building Design Process, Construction Management and Economics, vol.18

Ballard, G. and Koskela, L. (1998), On the agenda of design management research, Proceedings of the 6th Annual Conference on Lean Construction, Guaruj_a, Sao Paulo.

Bank of Ghana (2007), The housing market in Ghana. A publication of the research department of the bank

Barber, P. R., Sheath, D. M., Walker, S., Graves, A. P. and Tomkins, C. R. (1998), A comparison of design management techniques in construction and the automotive industry, in Amor, editor, Product and Process Modelling, Building Research Establishment, Watford,

Barlow, C.M. (2000a), Creativity and Complexity in Cross Functional Teams, Proceedings IPC 2000

Barlow, C.M. (2000b), Deliberate Insight in Team Creativity, Journal of Creative Behavior, vol.34: 2

Barnes, M. (2000), Construction Project Management. International Journal of Project Management Vol 6 No 2.

Bates, N., 2008, 'Towards client-focused architectural representations as a facilitator for improved design decision-making process', in H.J.P. Timmermans and B. de Vries (eds), Proceedings 9th International Conference on Design and Decision Support Systems (DDSS), TU/e, Leende, June 2008, P09, 1–15.

Borman, W. and Motowidlo, S.J. (1993), "Expanding the criteria domain to include the elements of contextual performance", in Schmitt, N. and Borman, W.C. (Eds), Personnel Selection in Organizations, Jossey Bass, San Francisco, CA, pp. 71-98..

Borman, W. C., & Motowidlo, S. J. (1997). Task performance and contextual performance: The meaning for personnel selection research. Human Performance, 10, 99–109.

Brace, N., Kemp, R. and Snelgar, R. (2003) SPSS for Psychologists.

BS 7000; Part 4 (1996) Design Management Systems – Guide to Managing design in construction

BS EN ISO 7730 (1995) Moderate thermal environments, Determination of the PMV and PPD indices and specification of the conditions for thermal comfort Building and Environment,Vol. 37, pp 1267–127

C. L. Cooper & I. T. Robertson (Eds.), International review of industrial and organizational Campbell, J. P., McCloy, R. A., Oppler, S. H., & Sager, C. E. (1993). A theory of performance. In E. Schmitt, W. C. Borman, & Associates (Eds.), Personnel selection in organizations(pp. 35–70). San Francisco: Jossey-Bass.

Chaaya, M. & Jaafari, A. (2000). Collaboration and integration of project life cycle design Chartered Institute of Building, Occasional Paper No. 40, 32 pp

Coles, E.J. (1990). Design Management: A study of practice in the building industry. The Construction Engineering and Economics, Vol. 10, pp. 479-487

Conway, J. M. (2000) Managerial Performance Development

Cornik, T., Quality Management for Building Design, Rushden, Butterworth, 1991, p. 218

Dainty, A., Moore, D. and Murray, M., 2006, Communication in Construction: Theory and Practice, Oxford, Taylor & Francis

Dainty, A.R.N., Cheng, M.I. and Moore, D.R. (2003), "Redefining performance measures for construction project managers: an empirical evaluation", Construction Management and Economics, Vol. 21, pp. 209-18.

Design Management Institute (1998), Executive Perspective: 18 Views on the Definition of Design Management, Management Journal, Summer 1998

Doloi, H. (2007). Developing an integrated management system for optimising project

Emmitt, S. and Gorse, C.A., 2007, Communication in Construction Teams, Oxford, Spon Research, Taylor & Francis

Feriadi, Henry, and Nyuk Hien Wong (2004), Thermal comfort for naturally ventilated houses in Indonesia. Energy and Buildings, pp 614-626

Field, A. (2005) Discovering Statistics, Using SPSS for Windows,

Formosa, C. T., Tzotzopoulos, R., Jobim, M. S. S., and Liedtke, R., A Protocol for Managing the Design Process in the Building Industry in Brazil, In Ogunlana S.O. (Ed), Profitable Partnering in Construction Procurement, SPON, London, 1999

Graham, R. (1998), Managing the Project Management Process in Aerospace and Construction: A Comparative Approach, International Journal of Project Management, vol.17:1

Gray, C., Hughes, W. (2001), Building Design Management, Oxford: Butterworth-Heinemann

Gunsteren, L.A., Loon, P.P.van (2001), Open Design and Construct Management, Delft: EburonInformation Technology, pp. 277-291, 2000.

Harmathy T.Z. (1988) Properties of Building Materials, Appeared in the SFPE Handbook of Fire Protection Engineering 1988 Section 1, Chapter 26 p378 -391(IRC Paper No. 1580) NRCC

http://en.wikipedia.org/wiki/Questionnaire accessed on 15th March, 2011

http://www.gredaghana.org/greda/members.asp accessed on 9th February, 2011

Ilgen & E. D. Pulakos (Eds.), The changing nature of job performance: Implications for

Ilgen, D. R., & Schneider, J. (1991). Performance measurement: A multi-discipline view. In information using IT systems, Proceedings of International Conference on Construction

Israel, Glenn D. (1992) Sampling the Evidence of Extension Program Impact. Program Evaluation and Organisational Development, IFAS University of Florida. PEOD-5. October

Koskela, L. & Huovila, P. (1997). "On Foundations of Concurrent Engineering." in

Koskela, L., Huovila, P., Leinonen, J. (2002), Design Management in Building Construction: From Theory to Practice, Journal of Construction Research, vol.3:1

Lahdenpera, P., Tanhuanpaa, V.P. (2000), Creation of a New Design Management System Based on Process Optimization and Proactive Strategy, Enginering, Construction, and Architectural Management, vol.7: 3

Larson, R.J. and Buss, D.M. (2005), Personality Psychology; Domains of Knowledge about Human Nature, McGraw-Hill International Edition, New York, NY

Lawson, B. (1990), How Designers Think: The Design Process Demystified, Oxford: Butterworth-Architecture

Lawson, B. (1994), Design in Mind, Oxford: Butterworth-Architecture

Ling, Y.Y. (2003) A Conceptual Model for the Selection of Architects by Project Managers in Singapore, International Journal of Project Management, Vol.21, pp.135- 144

Ling, Y.Y. (2003) A Conceptual Model for the Selection of Architects by Project Managers in Singapore, International Journal of Project Management, Vol.21, pp.135- 144

Loon, P.P.van (1998), Inter organisational Design, PhD Thesis: TU Delft

Management, 12, 52- 68.

Motowidlo, S. J., & Schmit, M. J. (1999). Performance assessment in unique jobs. In D. R.

Mullins, L.J. (1996), Management and Organisational Behaviour, London: Pitman Publishing

National Building Regulations (NBR) 1996 Ghana LI 1630

Nicholson, M.P. & Naamani, Z. (1992). Managing architectural design – a recent survey,

Nicholson, M.P., Jepson, W.B. (1995), Design Management in a Complex World, The International Journal of Architectural Management Practice and Research, vol.10

Ogunlana, S., Siddiqui, Z., Yisa, S. and Olomolaiye, P. (2002), "Factors and procedures used for matching project managers to construction projects in Bangkok", International Journal of Project Management, Vol. 20, pp. 385-400

options, Journal of Enterprise Information Management, Vol. 20, No. 4, pp. 465-486.

Otter, A and Emmit, S (2008) Design Team Communication and Task Complexity,

Otter, A.F.den, Prins, M. (2001), Fast-Tracking by High Performance Design Team, Proceedings CIB World Congress in Wellington

Oyedele, L. O. & Tham, K. W. (2005) Examining architects' performance in Nigerian private

Pheng, L.S and Chuan, Q.T (2006) "Environmental factors and work performance of project managers in the construction industry" International Journal of Project Management, Vol 24, pp. 24–37

PMBOK (2008), A Guide to the Project Management Body of Knowledge, Project Management Institute, PA, USA.

Schmidt, F. L., Hunter, J. E., & Outerbridge, A. N. (1986). Impact of job experience and ability on job knowledge,work sample performance, and supervisory ratings of job performance. Journal of Applied Psychology, 71, 432–439.

Schön, D.A. (1991), the Reflective Practitioners: How Professionals Think in Action, Aldershot: Avebury

Schwalbe, K (2009) An Introduction to Project Management, Course Technology- International Edition

Sebastian, R. (2002a), Enhancing International Multi-Architect Collaborative Building Projects through Architectural Design Management, Proceedings 4th ISAIA

Sebastian, R. (2002b), A Critical Appraisal on Design Collaboration of "The Resident" as a Social Process, Working Paper: TU Delft

Sonnetang, S., and Frese, M., (2002) Performance Concepts and Performance Theory John Wiley and Sons Ltd

SPSS 16.0 Brief Guide

UN-HABITAT(2011), Ghana Housing Profile, United Nations Settlement Programme

Wada, Y., Okumato T and Wada N (2007) Evaluating Waste Disposal Systems Journal of Material Cycles and Waste Management, 10, 173- 187

Wong, N.H, H Feriadi, P.Y Lim, K.W Tham, C Sekhar, and CheongK.W (2002), Thermal comfort evaluation of naturally ventilated public housing in Singapore.

Cheng, M.I., Dainty A.R.J. and Moore, D.R (2005) What makes a good project manager?, *Human Resource Management Journal*, Vol. 15 (1), pp. 25-37.

Edum –Fotwe, F. and McCaffer, R. (2000) Developing project management competency: perspectives from the construction industry. *International Journal of Project management*, Vol.18,pp. 111- 124

Alasuutari, P. (1998). *An invitation to social research*. Thousand Oaks, CA: Sage

APPENDIX - QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY - KUMASI

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

QUESTIONNAIRE TO MANAGING DIRECTORS AND SENIOR MANAGERS OF REAL ESTATE COMPANIES IN GHANA

Project Topic: ***Model for Predicting the Performance of Project Managers at the Design Phase of Mass House Building Projects in Ghana***

INTRODUCTION

This questionnaire forms part of an MSc. (Construction Management) dissertation being undertaken by Mr Isaac Sarkodie-Poku at the Department of Building Technology, KNUST. The essence of this questionnaire is to identify in order of importance, the indicators that can be used to accessing the performance of project managers at the design phase of Mass House Building Projects in Ghana.

OBJECTIVES OF STUDY

- Identify critical factors that influence the performance of PMs at the design phase of MHBPs in Ghana

- Develop, verify and validate the indicators for assessing performance of project managers at design stage of MHBPs in Ghana

RESEARCH FINDINGS

The expected outcome of the research is to help provide a comprehensive data for *project managers* to have a clear idea of what managing directors/senior managers of real estate companies expect of them in the management of MHBPs. Subsequently, those who lack the appropriate skills would be inspired to acquire the relevant training towards best practice improvement.

We shall therefore be very grateful if you would spare some time to complete the attached questionnaire. We assure you that all answers provided will be treated with the strictest confidentiality.

We appreciate that the questionnaire is going to take up some of your valuable time, however, we urge you to try and participate, as your contribution is very important towards the success of the research.

To this end, we wish to take this opportunity to thank you in advance for your cooperation.

Isaac Sarkodie-Poku
Department of Building Technology
KNUST
0244 642965 – sarkpoku@yahoo.com

	CONTEXTUAL PERFORMANCE BEHAVIOURS					
	Could you please rate the *importance* of the following behavioural measures for predicting the performance of project managers at the design phase of mass house building projects in Ghana?					
	Please circle* (O) *the appropriate number					
	Job Dedication	**Not Very Important**	**Not Important**	**Average**	**Important**	**Very Important**
1	Commitment to the speedy production of design drawings.	1	2	3	4	5
2	Close attention to important design and construction details.	1	2	3	4	5
3	Commitment to the speedy procurement of statutory approvals.	1	2	3	4	5
4	Initiative to offer suggestions to improve buildability of the design	1	2	3	4	5
5	Persistence towards meeting overall design objectives	1	2	3	4	5
6	Enthusiasm in ensuring that design work conforms to specifications	1	2	3	4	5
7	Should be disposed in welcoming design and documentation options from other professionals	1	2	3	4	5
		Not Very Important	**Not Important**	**Average**	**Important**	**Very Important**
	Interpersonal Skills					
1	Effective time management practice in the design process	1	2	3	4	5
2	Providing timely and unambiguous design information for designers	1	2	3	4	5
3	Smooth and cordial working relationship with designers	1	2	3	4	5
4	Display of good oral and written communication skills	1	2	3	4	5
5	Ability to arrive at effective solutions to conflict while maintaining good relationships	1	2	3	4	5
6	Being honest with designers on their performances	1	2	3	4	5
7	Ability to lead and coordinate the designers towards a common goal	1	2	3	4	5
8	Should accept corrections readily	1	2	3	4	5

	TASK PERFORMANCE BEHAVIOURS					
	Could you please rate the *importance* of the following behavioural measures for predicting the performance of project managers at the design phase of mass house building projects in Ghana?					
	Please circle* (O) *the appropriate number	**Not Very Important**	**Not Important**	**Average**	**Important**	**Very Important**
	Job Experience					
1	Experience in managing designs of mass house building projects	1	2	3	4	5
2	Number of years of practice in construction project management	1	2	3	4	5
3	Experience on attainment of success in management of mass house building projects	1	2	3	4	5
	Job Knowledge					
1	Knowledge of relevant design codes, legislation and regulation of mass house building projects	1	2	3	4	5
2	Knowledge of economical designs for mass house building projects.	1	2	3	4	5
3	Knowledge of buildability of design for mass house building projects.	1	2	3	4	5
4	Knowledge of construction processes for design of mass house building projects.	1	2	3	4	5
5	Knowledge of thermal comfort assessment and provisions in the design of mass houses.	1	2	3	4	5
6	Knowledge of performance characteristics of materials for design of mass houses.	1	2	3	4	5
7	Knowledge of provision of neighborhood facilities in the design of mass house building projects	1	2	3	4	5
8	Knowledge of environmental impact assessment for design of mass house building projects	1	2	3	4	5
9	Knowledge of contract administration in design of mass house building projects	1	2	3	4	5
10	Knowledge of security and fire engineering systems for design of mass house building projects	1	2	3	4	5
11	Knowledge of physical aspects of design quality standards in mass house building projects	1	2	3	4	5
12	Knowledge of the design of waste disposal systems for mass house building projects	1	2	3	4	5
13	Knowledge of building services design systems for mass house building projects	1	2	3	4	5
14	Knowledge of landscape road network design for mass house building projects	1	2	3	4	5
15	Knowledge of mass house contract packaging	1	2	3	4	5
16	Knowledge of performance-based serial contract package for mass housing.	1	2	3	4	5

		Not Very Important	Not Important	Average	Important	Very Important
	Task Proficiency					
1	Technical quality of the level of project brief for the design of the mass house units	1	2	3	4	5
2	Functional quality of the level of project brief for the design of the mass house units	1	2	3	4	5
3	Technical quality of strategies for managing the design process.	1	2	3	4	5
4	Functional quality of strategies for managing the design process.	1	2	3	4	5
5	Technical quality of the design for the mass houses	1	2	3	4	5
6	Functional quality of the design for the mass houses	1	2	3	4	5
7	Technical quality of time schedule for delivery for the design process	1	2	3	4	5
8	Functional quality of time schedule for delivery for the design process	1	2	3	4	5
9	Technical quality of environmental assessment programme for the design for mass houses	1	2	3	4	5
10	Functional quality of environmental assessment programme for the design for mass houses	1	2	3	4	5
	Cognitive Ability					
1	Being mentally alert to managing the design process	1	2	3	4	5
2	Having strong memory of the project brief	1	2	3	4	5
3	Being mentally quick to pointing out design problems	1	2	3	4	5
4	Being creative and innovative in making suggestions for solving design problems	1	2	3	4	5
5	Being proactive of the potential customer expectation of design quality	1	2	3	4	5

		Not Very Good	Not Good	Average	Good	Very Good
	General Perception on Performance of PMs					
	How would you rate the performance of Projects Managers on Housing Projects in Ghana	1	2	3	4	5