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**Construction Site Management Practices and Their Influence on the Performance
of Local Contractors in Ghana**

by

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College of Art and Built Environment

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MASTER OF SCIENCE

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CERTIFICATION

I hereby declare that this submission is my own work towards the MSc Construction Management and that, to the best of my knowledge, it contains no materials previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made the text.

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ABSTRACT

The performance of large construction firms in any developing economy is key to the growth and survival of its construction industry. It is thus imperative that everything should be done to improve and enhance the performance of such firms. It is unfortunate to observe, however, that most of the “big” construction contracts in a developing country like Ghana are awarded to foreign contractors. Some researchers have attributed this to the notion that these foreign contractors are better organized and employ more efficient site management practices as compared to the local firms. Something ought to be done to reverse the situation and this study is a modest attempt to do that. The research study began by first identifying site management practices employed by local construction firms in Ghana. This was then followed by determining the relative influences of identified site management practices from literature on the performance of local construction companies. A quantitative research approach coupled with the use of questionnaire as main data collection instruments was employed. Cross tabulation and relative importance index analysis tools were employed for this study. With a response rate of 84%, results of the findings showed that practices such as documentation of site instructions, provision of safety signs at vantage points to educate and inform workers and visitors on site, timely delivery of materials, progress reporting and other site management practice had very high influence on the performance of construction companies in Ghana. It was suggested that contractors insist that consultants reduce their verbal instructions into written ones to avoid their claims being contested as well as enforcing health and safety rules governing construction projects they undertake in order to avoid site accidents. It is expected that lessons drawn from this study will help equip the large established local firms with efficient and effective ways of managing site activities so as to be able to contend with their foreign equals and perform better on construction projects they undertake.

TABLE OF CONTENTS

DECLARATION.....	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	viii
LIST OF FIGURES	ix
ACKNOWLEDGEMENTS	x
DEDICATION.....	xi
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background To Study	1
1.2 Problem Statement	3
1.3 Research Questions	3
1.4 Aim Of The Study	4
1.5 Objectives Of The Study	4
1.6 Scope	4
1.7 Methodology	4
1.8 Significance Of Study	5
1.9 Structure Of The Report.....	5
CHAPTER TWO: LITERATURE REVIEW	7
2.1 Introduction	7
2.2 The Nature And Classification Of Large Established Local Construction Firms (D1/K1 And D2/K2 Contractors) In Ghana	7
2.3 Construction Site Management Practices	9
2.4 An Assessment Of Construction Site Management Practices	11

2.4.1 Site Administration And Management	11
2.4.1.1 Site Correspondence	11
2.4.1.2 Instructions, Variation Orders And Drawings Register	11
2.4.1.3 Site Meetings And Progress Reporting	12
2.4.1.4 Supervision	13
2.4.1.5 Communication	13
2.4.2 Planning, Monitoring And Control	15
2.4.3 Commercial Management	17
2.4.3.1 Cash Flow And Work Measurements (Valuations)	17
2.4.3.2 Estimating	18
2.4.3.3 Subcontractor Management	18
2.4.4 Legal, Health And Safety Management	19
2.4.5 Materials Management.....	20
2.4.6 Plant Management	22
2.4.7 Construction Methods	23
CHAPTER THREE: RESEARCH METHODOLOGY	25
3.1 Introduction	25
3.2 Research Approach	25
3.3 Data Collection Method	26
3.3.1 Design And Scope Of Research Instrument	26
3.4 Population And Sample Size Determination	28
3.4.1 Sampling Technique	29
3.4.2 Distribution Of Questionnaires To Each Financial Class	29
3.5 Method Of Analysis	29
3.5.1 Data Preparation.....	29

3.5.2 Statistical Consideration	30
CHAPTER FOUR: RESULTS AND DISCUSSION	32
4.1 Introduction	32
4.2 Profile Of Respondents	32
4.2.1 Ownership Of The Firm	33
4.2.2 Type Of Client	33
4.2.3 Years Of Experience	34
4.2.4 Educational Background Of Respondents	35
4.3 Site Management Practices Employed By Local Construction Firms In Ghana .	36
4.3.1 Motivation Of The Labour Force	41
4.3.2 Cost Monitoring And Control Using Software	41
4.3.3 Training Of On-Site Site Staff On The Use Of Techniques And Software To Control Cost And Time	42
4.3.4 Time Monitoring And Control Using Techniques And Software	42
4.3.5 Information Technology In Materials Management On Site	42
4.4 Highly Influential Site Management Practices	43
4.4.1 Documentation Of Site Instructions (Variation Orders)	44
4.4.2 Provision Of Safety Signs At Vantage Points To Educate And Inform Workers And Visitors On Site Of Prevailing Conditions	45
4.4.3 Timely Delivery Of Materials	46
4.4.4 Progress Reporting	46
4.4.5 Health And Safety Education Of Various Work Trades	47
4.4.6 Inadequate Measurement By The Quantity Surveyors	47
4.4.7 Communication Between Client Representatives And Contractors	48
4.4.8 Accident Reporting And Maintenance Of Records	48
4.4.9 Compliance To Workers Wearing Safety Gear	49

4.4.10 Materials Waste By Workers	49
4.4.11 Delay In Payment For Work Done	50
CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS	51
5.1 Introduction	51
5.2 How The Objectives Were Addressed	51
5.2.1 Identifying Site Management Practices Employed By Local Construction Firms (Class D1/K1 And D2/K2 Contractors) In Ghana	51
5.2.2 Determining The Degree Of Influence Of Site Management Practices On The Performance Of Local Construction Firms In Ghana	52
5.3 Conclusions	53
5.4 Recommendations	53
5.3.2 To Project Stakeholders	55
REFERENCES	57
APPENDICES	61
APPENDIX 1	61
APPENDIX 2	69

LIST OF TABLES

Table 3.1: Distribution of Questionnaires to Each Financial Class	29
Table 4.1 Form of Ownership of the Firm	33
Table 4.2 Type of Client	34
Table 4.3 Years of experience	35
Table 4.4 Educational level of respondents	35
Table 4.5 Extent to which respondents employ Site Administration, Supervision and Management Practices	36
Table 4.6 Extent to which respondents employ Commercial Management Practices ...	37
Table 4.7 Extent to which respondents employ Planning, Monitoring and Control Practices	37
Table 4.8 Extent to which respondents employ Legal, Health and Safety Practices	38
Table 4.9 Extent to which respondents employ Materials Management Practices.....	39
Table 4.10 Extent to which respondents employ Plant Management Practices	39
Table 4.11 Extent to which respondents employ Construction Methods	40
Table 4.12 Ranking of Highly Influential Site Management Practices	44

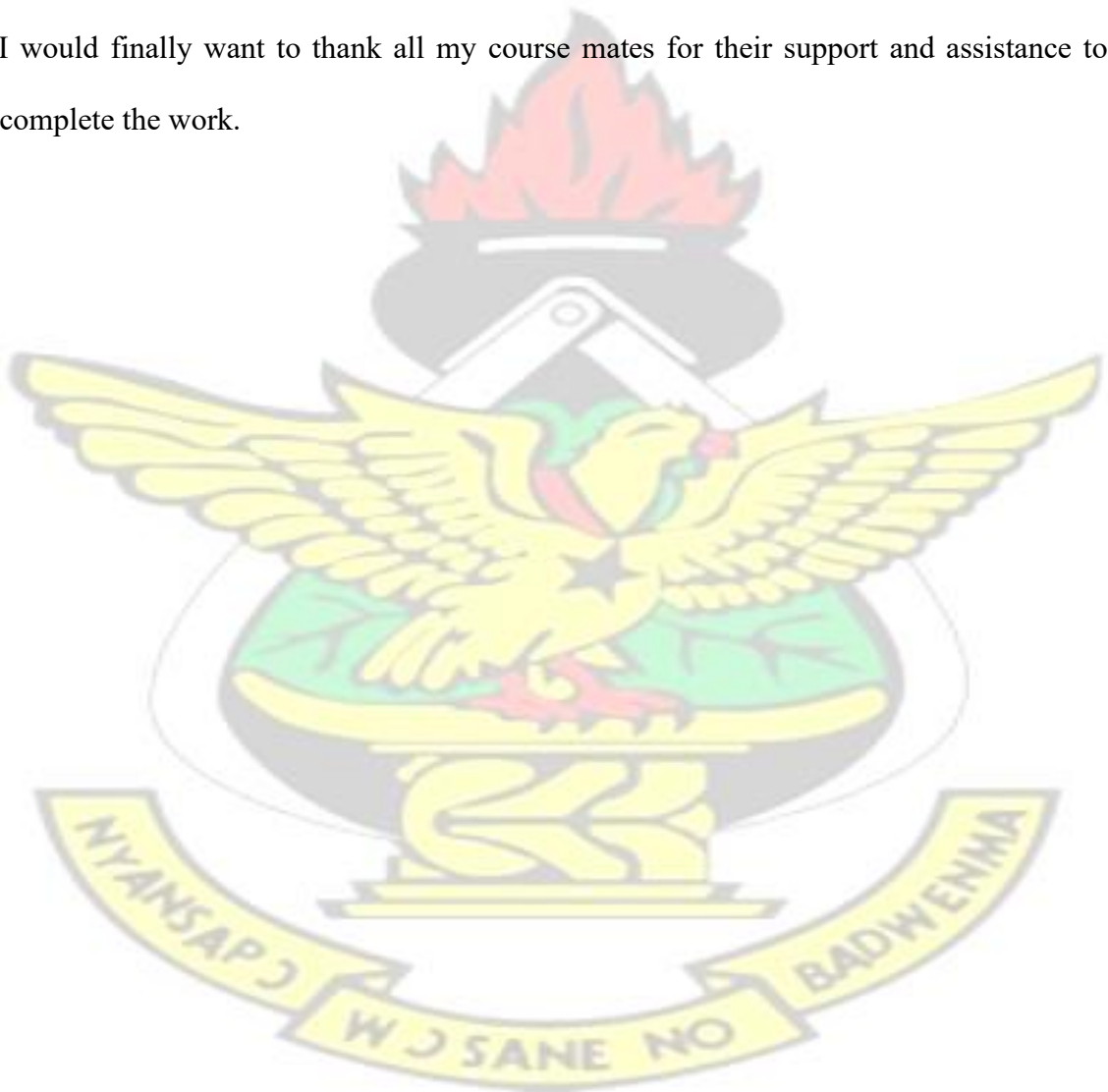
LIST OF FIGURES

Figure 2.1 Various Phases of Materials Management on Typical Construction Site	20
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DEDICATION

This Dissertation is dedicated to my Dad, George Asafo-Mireku, my mum, Jemima Hinson and the entire Building Technology Department.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO STUDY

The construction industry is considered the most challenging industry in the world with its complexities and uniqueness marked by the diverse skilled and unskilled as well as permanent and casual human resource of the industry (Prempeh, 2014). It is an industry that is regarded by many developing countries as one with enormous contributions to gross domestic product, provision of employment and many important infrastructure. Ofori (2012) stated that the various ways by which the construction industry contributes to the economies of most developing countries include the provision of physical buildings which are used in the production of goods and services. The acceleration of productive activity by permitting goods and services to be disseminated within and outside the country is also another contribution of the industry. The construction industry is considered one of the most important industries in both developed and developing countries. Spillane *et al* (2011) argued that with the incessant worldwide surge in population, it is important to develop and rejuvenate existing inner-city centers in the United Kingdom to house such population influxes. This is to affirm the fact that the construction industry will continue to play its role as one of the key sectors in the economies of many countries for years to come.

Though the industry contributes immensely to the development of any country, it is also faced with numerous challenges. Donkor (2011) revealed that the construction industry in Ghana though known to make up more than half of the national capital investment, gulps between 40% and 50% of the country's energy. Construction projects are usually carried out within confined areas or boundaries usually referred to as construction sites.

Construction sites are described as the factory for the construction project. The construction site is therefore observed as a significant area where money is earned or lost and where there is substantial prospect for enhancing efficacy, productivity and worth on construction projects (Jimoh, 2012). Site management is not only restricted to the practical technicalities of the construction project but also involves having an effective understanding of the complex relations that exist between the project team members. Site management is geared towards meeting the fundamental objectives of the project which are to convey construction projects to the obligatory standard more rapidly and enhance project performance. Regrettably, practice is not that simple as construction work has turn out to be more challenging technically and managerially. Thus, there are numerous thought-provoking engineering and management difficulties that occur on the site (Mohammed and Anumba, 2006). Construction IT (1996) as cited by Mohammed and Anumba (2006) explains site management as a blend of the varying practices or activities which turn basic resources into finished products. Site management practices play an important role in ensuring that construction firms meet their project objectives. Bamsile (2004) exposed that ‘the worth of running the construction production process cannot be economically obtained through the usage of force or pressure but by the conception of conditions that will self-motivate and stimulate team spirit which is geared towards efficient project execution.’ It is therefore important that construction firms invest in efficient site management practices so as to be able to perform better on construction projects.

1.2 PROBLEM STATEMENT

In Ghana and other developing countries, there seems to be a general consensus that the variables influencing the performance of local contractors can be attributed to two main underlining issues: the fiscal policies by the government and the managerial capacity on

the part of the contractors (Amoah *et al.*, 2011). The managerial capacity of local contractors in Ghana is greatly influenced by the efficiency of the site management practices they carry out on construction projects (Amoah *et al.*, 2011). Obiegbu (2012) emphasized this by encouraging builders to exhibit good site management practices that are imperative in upholding efficacy, fee effectiveness and control on projects. Careful review of literature and observations suggest that researchers have done a great deal of work on identifying the variants of site management practices employed in managing construction projects but have failed to identify amongst them the highly influential ones on the performance of local contractors in Ghana (Obiegbu, 2012). Thus, the need to undertake this study. It is imperative to note here that site management does not only consider the practical and technical expertise of the contractor during the construction phase of the project but also the complex set of responsibilities and relationships (administrative) that exist between the contractor and other project team members. This research seeks to assess site management practices by subjecting them to critical examination to allow for identification of their degree of influence on the performance of local contractors in Ghana.

1.3 RESEARCH QUESTIONS

1. What site management practices are employed by local construction firms (D1/K1 and D2/K2 contractors) in Ghana?
2. To what extent do site management practices influence the performance of local construction firms (D1/K1 and D2/K2 contractors) in Ghana?

1.4 AIM OF THE STUDY

To assess the influence of site management practices on the performance of local construction firms (class D1/K1 and D2/K2 contractors) in Ghana.

1.5 OBJECTIVES OF THE STUDY

1. To identify site management practices employed by local construction firms (class D1/K1 and D2/K2 contractors) in Ghana.
2. To determine the relative influences of the site management practices on the performance of local construction firms (class D1/K1 and D2/K2 contractors) in Ghana.

1.6 SCOPE

This research work was carried out in the Greater Accra region of Ghana where it is perceived that majority of the different class of contractors can be found. Ahadzie (2007) as cited by Donkor (2011) revealed that over seventy percent of Ghanaian contractors tend to operate formally in the Greater Accra and Ashanti regions and therefore contractors in any of these areas could be recommended for the research. The research population was limited to only D1/K1 and D2/K2 contractors in the Accra Metropolis of the Greater-Accra Region of Ghana. The choice of D1/K1 and D2/K2 contractors as main participants in this research is that they possess the needed financial, technical and managerial expertise to be able to compete with their foreign equals once they improve on the site management practices they employ.

1.7 METHODOLOGY

This section of the research presents the over-all tactic and techniques that was adopted to address the intentions of the research. It comprised the research approach, method of data collection, research instrument design, sample size determination and sampling technique. Considering the nature of the research topic, a quantitative research method or approach was employed. The main method of collecting data was issuing out structured questionnaires to prospective respondents who were gotten from the use of

appropriate sampling techniques. Cross tabulation analysis together with relative importance index analysis tools were employed for the study.

1.8 SIGNIFICANCE OF STUDY

This research seeks to cover most of the site management practices employed in the Ghanaian construction industry and subject them to critical examination to allow for identification of influential ones on the performance of local contractors in Ghana. It is also not a hidden fact that most of the complex construction projects in this country are being handled by foreign based construction firms. This is as a result of the notion that they have the ability to carry out projects in an efficient and organized fashion as compared to our local contractors. This research will help equip the large established local firms with efficient and effective ways of managing site activities so as to be able to compete with their overseas colleagues. By this, local firms will be able to perform better on construction projects they undertake.

1.9 STRUCTURE OF THE REPORT

CHAPTER 1: INTRODUCTION: This is a general introduction to the research topic. It gives some background information on the research topic, the problem statement, aim and objectives, the scope of the study, the limitation and justification for the research.

CHAPTER 2: LITERATURE REVIEW: This chapter was intended to deal with the relevant literature on the study. It discussed and reviewed existing literature on the topic which subsequently formed the basis for the analysis and interpretation of the research data.

CHAPTER 3: METHODOLOGY: This chapter dealt with the research methods employed in the study. It provided information on the research tools and techniques that were employed in collecting the data for the study.

CHAPTER 4: ANALYSIS AND DISCUSSION: The respondents' views and answers

concerning questions posed in the research were analyzed and subjected to discussion to ascertain whether they conform or deviate from previous results.

CHAPTER 5: CONCLUSION AND RECOMMENDATION: This chapter discussed appropriate recommendations for identified issues regarding this study.

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CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

A careful study of relevant literature as well as close observation of the operations of local contractors suggests that a considerable number of site management practices influence their performance. A considerable amount of work has been done on identifying the various site management practices in the construction industry. This literature review covers the nature and characteristics of large established local firms in Ghana. This is then followed by site management practices which literature identifies as being practiced by local construction firms in developing and developed countries.

2.2 THE NATURE AND CLASSIFICATION OF LARGE ESTABLISHED LOCAL CONSTRUCTION FIRMS (D1/K1 AND D2/K2 CONTRACTORS) IN GHANA

The Ministry of Water Resources, Works and Housing classifies building and civil engineering contractors in Ghana into financial class D1 to D4 and K1 to K4. Category 'D' represents general building contractors and category 'K' for civil works contractors. Class D3/K3 and D3/K4 contractors are commonly referred to as the small-scale contractors (SSBCs) and D1/K1 and D2/K2 are typically referred to as big firms (Amoah *et al.*, 2011). Contractors are grouped into the financial classes based on their practical and managerial expertise, financial standing, previous performance, and equipment and plant holding (Laryea 2010). Oppong (2013) reported that, the large and medium Ghanaian construction firms form about 10% of the total number of construction firms registered with the Ministry of Water Resources, Works and Housing. He further explained that the remaining 90% are the small scale contractors. Many of the smallscale contractors who have now matured into large established firms in Ghana were former tradespersons who either acted as labour-only subcontractors or suppliers

(N'dow, 1996). The International Labour Organization (ILO) as cited by N'dow (1996) indicated that some small-scale contractors' now big contractors evolved from the trade route. Such people had an all-encompassing grasp of the specifics of simple building work and also the ability to manage small labor force at the site level but lacked managerial skills to run businesses and schedule construction works. As time went on, small-scale contractors grew bigger in size and capacity. However, skilled professionals at that time were not available in sufficient numbers. This impacted negatively on the ability of local construction firms and the government took the initiative to institute a Department of Building Technology at the Kwame Nkrumah University of Science and Technology in Kumasi in 1965 to train specialists for the construction sector in Ghana (N'dow, 1996).

The structure of the construction industry in most developing countries is pyramidal in shape, and that of Ghana is no exception. In many construction economies like Ghana, there are very few large firms who are able to work in many topographical locations and on a wide range of projects (Amoah *et al.*, 2011). The United Nations Industrial Development Organization (UNIDO, 2002) also defines firms in terms of number of employees by giving different classifications for industrialized and developing countries. The definition for industrialized countries is given as follows:

1. Large - firms have 500 or more workers;
2. Medium - firms have 100-499 workers;
3. Small - firms have 99 or less workers.

The classification given for developing countries is also as follows:

1. Large - firms have 100 or more workers;
2. Medium - firms have 20-99 workers;

3. Small - firms have 5-19 workers;
4. Micro - firms have less than 5 workers.

In terms of monetary figures, the large firms according to The Ministry of Water Resources Works and Housing are capable of undertaking projects of any value. Financial class 2 firms are capable of undertaking projects up to US\$500,000 or GH¢750,000.00, while financial class 3 firms are also capable of undertaking projects up to US\$200,000 or GH¢ 300,000.00 with financial class 4 firms undertaking projects from up to US\$75,000 or GH¢112,500.00 (Danso, 2010). Gareth's 2009 study (cited in Donkor, 2011) further enhanced the classification of contractors by revealing that first tier big construction firms generally employed over 50 permanent staff. Second tier thus Medium sized contractors employed 10 to 50 permanent staff. Third tier thus small general builders, specialist contractors and sub-contractors generally employed less than 10 permanent staff.

2.3 CONSTRUCTION SITE MANAGEMENT PRACTICES

A good understanding of the administrative, legal and technical framework in which the construction industry operates as well as efficient management of the project resources is essential in achieving a construction project that meets the client's objectives. Site management is a mixture of practices or activities which turn plain resources into a complete Product (Jimoh, 2012). Parks (2012) explains it further as management of construction activities during three phases of site development: preconstruction, construction, and post-development. Managing construction sites require the use of management practices to assist in the process. These management practices or principles are referred to as construction site management practices. The construction process is seen as one that involves the inputs of varying professionals hence a complex one. A building construction site can be considered as a provisional factory employing the

needed resources to fruitfully fulfill a contract (Chudley & Greeno, 2008). Construction projects can be viewed in two ways thus the technical view and as a complex set of roles and relationships that exist between project team members (Jimoh, 2012). The technical view of projects can be described as the construction methods employed on site relative to building materials such as cement, sand, gravels, chippings, steel, wood and pipes. The complex set of roles and relationship encompass administrative roles which include but not limited to how the project participants or team members interact with each other and how they determine knotty issues faced all through the course of the project (Mohammed & Anumba, 2006).

Construction IT (1996) as cited by Mohammed & Anumba (2006) divided site management practices into six sub-processes which includes;

1. Management, supervision, and administration of sites.
2. Commercial management.
3. Legal, health and safety.
4. Planning, monitoring and control
5. Delivery and materials' handling
6. Production on-site and off-site.

Site management practices when employed efficiently enable contractors to perform better on construction projects. Despite this, inefficient site management practices also have their consequences on construction performance and growth. The construction industry is disreputable for its poor safety record when related with other industries (Mohammed, 2002). This is further explained by the fact that accidents on site are not only caused by the carelessness of workers but by letdown in control, which eventually is the duty of management. Alwi, et al., n.d. revealed in one of their papers that inadequate

scheduling, materials managing, value control and quality assurance are chronic problems of contractor growth and performance on site.

2.4 AN ASSESSMENT OF CONSTRUCTION SITE MANAGEMENT PRACTICES

2.4.1 Site Administration and Management

Jimoh (2012) classifies site administration to include site correspondence, site meetings, labour allocations, payroll, progress reporting, communication, drawing register, and technical information. Site administration can be described as the management of the administrative functions particularly the contractor's affairs associated with a construction project on the site.

2.4.1.1 Site Correspondence

All incoming and departing information which may be in the form of emails, letters or documents concerning the project on site. Hackman (2015) suggests that it is not unusual to find on Ghanaian construction sites that letters or information in any form regarding the project are received but not documented or recorded. This can deny contractors of important information that could be used as evidence during disputes and for future reference.

2.4.1.2 Instructions, Variation Orders and Drawings Register

Site instructions and variation orders are of paramount importance as the majority of disputes and claims arise from them. Masahudu (2015) cited Carlsson *et al*, (2001) who posited that even though in a project setting, face to face communication is the suitable avenue for a timely exchange of info and rapid feedback, it appears to oppose the position in standard building contracts that instructions must be in writing. We must note that numerous issues may push an architect to issue verbal instructions on site with the promise to put them into writing at a latter period. These promised instructions are never

written and any time the contractor issues a claim it is opposed. If the engineer or architect realizes that his initial plan was an error, they may not want to put a rectification order to the contractor in writing and entice a claim from the employer when a claim is made (Wusua-Affare, 2012). Ssegawa *et al.*, (2002) as cited by Masahudu (2015) posits that any amount of change should be anticipated in any construction project because of the difficulty in operations involved which makes accurate advance determination very problematic and therefore acceptable provisions must be made to cater for any changes.

Most construction companies in Ghana are performing works based on verbal instructions without following due process. This may spark disputes at the end of the contract or during valuation periods where the contractor is unable to provide proof for the work carried out. The Drawing Register is also considered an essential tool in identifying changes to the contractual drawings and the date the changes were made. Close observations of the operations of contractors in Ghana indicate that an issue here is that some construction companies do not keep records on the drawings received. When there is change of personnel on projects, it becomes difficult for the new recruits to follow.

2.4.1.3 Site Meetings and Progress Reporting

Meetings are essential communication tools to ensure that everyone on the project team understands all aspects of the project and can perform effectively as a unit. Wusua-Affare (2012), adds to this assertion by positing that site meetings help discuss the effects and causes of delays arising from the project at hand. Site meetings on most Ghanaian Construction Sites are usually characterized with disagreements and show of positional power. Some even go to the extent of using their positions on the project to induce others to support their mischievous motives during meetings. Despite this, meetings serve as avenues where issues related to the project could be discussed and addressed

appropriately.

2.4.1.4 Supervision

The quality of site supervision has a key impact on the overall performance and effectiveness of construction projects. Inadequate supervision is thought to be one of the main causes of rework. It is therefore advised that experienced and well-trained supervisors have an important role in curtailing the amount of rework and ensuring adequate returns on investments (Alwi, et al., n.d.). Recruiting of labour or employees for any company is vital for the survival of that company. Here in Ghana, construction companies usually lack the requisite financial power to employ the required mix of skilled and unskilled personnel. This reduces the quality of work produced hence the probability of being recommended for projects reduced. For example when placing concrete, it must be accurately supervised to prevent reinforcements from being disturbed. If this is not checked concrete structures may wear out within the shortest possible time (Alwi, et al., n.d.). In spite of the fact that training institutions abound in Ghana, they rarely address the pertinent needs of their employees especially in the areas of construction (Laryea, 2010). The level of schooling and the attendance of management training courses is an important feature of a firm's key talents.

2.4.1.5 Communication

Communication here is concerned with how consultants relate to contractors and how the contractors' on site team relate with each other. It is clear that the construction industry consist of different professionals with varying backgrounds. Communication may not be only by spoken word but may also be through instruments such as emails letters and reports (Hackman, 2015). Although a vast majority of information is bartered verbally and passed on, standard building contracts ensure that this is documented or made in writing (Wusua-Affare, 2012). The details of construction and the range of work in the

industry are communicated by means of drawings, specifications and contract documents. Unfortunately, poor communication is a common happening on the construction site where work is handed down from one entity to another. The systems and methods of communication popular in the industry as posited by Mehra (2009) may include;

1. Formal writing- this takes the form of reports, specifications and plans.
2. Formal verbal- this takes the form of presentations and speeches.
3. Informal writing- this takes the form of memos, mails and notes.
4. Informal verbal- this takes the form of meetings and conversations.
5. Non-verbal messages- this takes the form of facial expressions and body postures.
6. Para-verbial messages- this form of communication takes the form of the tone, pitch and pacing of our voice.

Wusua-Affare (2012) cites strut (1992) who posits that, the type of communication system and the rapidity with which it works are to a large extent is a function of the scope of the organization. Thus the smaller the company, the faster information will be dispersed. With large established firms, a communication management model has to be developed to ensure that information needed for decision making gets to the right authority. The construction site is regarded a place where toils made by the design team in envisioning the client's requirements are appreciated. Communication on the construction site is vital to the attainment of project objectives as well as residual growth on investments made by the contractor. According to strut (1992) as cited by WusuaAffare (2012), aside meetings which ensure effective communication on site, weekly reports on daily happenings on the site also play a vital role.

Issues with communication on site may include; workers not being encouraged to discuss their problems with their supervisors and consultants not communicating their ideas and

intentions properly to contractors. An example is when architects provide contractors with scanty drawings which makes it difficult for implementation. Others are the distorted flow of opinion and ideas from on-site team members to head office staff within the contractors outfit.

2.4.2 Planning, Monitoring and Control

This covers all activities associated with project planning, monitoring and control thus the production of Gantt charts, network analyses, method statements, resource levelling, progress reports and exception reports (Jimoh, 2012). Site management practices here are solely concerned with the monitoring and control of activities on site against a predetermined project baseline. Project monitoring is concerned with observing or keeping track of what is actually happening on site and comparing it to the project baseline plan. Project control on the other hand is concerned with taking corrective actions whenever there are deviations to the originally planned work. Most projects in Ghana today face cost and time over-runs which increases with increasing complexity of the project involved (Agyei 2015). There are several methods commonly used for managing time on construction projects. They may include:

1. Gantt bar chart
2. Critical path method
3. Milestone date programming technique
4. Program Evaluation and Review Technique
5. Line of balance

Agyei (2015) revealed that two main approaches that have been used for planning, scheduling and controlling construction projects in terms of time over the years have been the Critical Path Method and the Project Evaluation and Review Technique. These schedule and control techniques monitor the progress of work at each stage of a

construction project so that the project is completed within the deadline. These methods specify the part of the project that are decisive and which if deferred beyond the normal time would increase the completion time of the project. A good understanding of the scheduling and control tools is paramount to the success of projects and this is what most contractors lack in the construction industry. Some site managers are unable to use the scheduling tools properly to efficiently return projects on track when deviations occur. The other issue is with the technical know-how on software that is used to monitor the progress of works.

Cost controlling is a clear objective of every construction firm but it should be noted that no amount of paperwork achieves this control. Cost control systems in use currently may include:

1. Overall profit and loss system
2. Profit and loss on each valuation date
3. Unit costing
4. Systems based on the principles of standard costing
5. Performance Evaluation and Review Technique Cost system
6. Earned value analysis, which is considered as both a cost control and project performance tool.

Cost control systems are very important in providing information on the performance of projects but however comes with it associated costs (Hardy, 1970).

2.4.3 Commercial Management

This site management practice covers estimating, valuations, sub-contracting, payment, variations, day works, cost-value reconciliation, final accounts, and cash flow management (Jimoh, 2012).

2.4.3.1 Cash Flow and Work Measurements (Valuations)

A study conducted by Hohuabu (2005) cited in Buerthey and Adjei-kumi (2012) revealed that only 17% of contractors questioned practice cash flow prediction. 41.5 % of respondents in this same research indicated that they hardly practice cash flow prediction with another 41.5% stating that they never practiced cash flow prediction in Ghana. Profit is a vital pointer of the performance of a business but the accumulation of profit does not necessarily warranty the survival of the firm. It is expected that each project executed by a firm, has its assessments of amounts and timing of the cash flow resulting from the investment carefully analysed throughout the life span of the project (Pandey, 2002). A poor cash flow projection can lead to the inability of the contractor to fund the project. Cash flow forecasts developed from reliable project implementation plans become the fundamentals of project controls. It is not unusual for contractors in Ghana to receive payments for work done more than 30 days after the cost was actually incurred and this is not helping. Interim valuations are a characteristic of all major forms of contract and the valuation mechanism represents only the source of revenue to the contractor for that particular project.

Measurements of works on construction site have residual influence on a contractors' cash flow. Over-measurement and under-measurement during valuation periods have an effect on the capital lockup and the contractor's return on investments made. Over measurement is a situation whereby the amount of work certified in the contract is greater than the amount of work done. This improves cash flow in the early stages of the project and reduces capital lock up. Under-measurement on the other hand is a situation where the amount of work certified is less than that actually done thereby increasing the capital lock up of contractors.

2.4.3.2 Estimating

Longman (1997) explains estimating as the technical method of forecasting the cost of a construction project. A contractors estimating department is critical for the survival of the organization. For small firms, an estimator may be required to carry out quantity surveying duties as well as procuring materials and services whilst large companies have supporting administrative and estimating assistants aside the main estimator who checks calculations, prepare letters and enter data in computer aided estimating systems (Brook 2004). In order to cut down on head office expenses and improve on company profits, companies particularly large firms rather employ site supervisors with little experience in estimating and procuring materials instead of employing more estimators which could improve the efficiency in the department. The main issue with estimating has to do with the experience of the estimator and the adequacy of records possessed by companies on previous works done (Adjei-Kumi, 2015).

(C) Subcontractor Management

Any contract or agreement to perform work on behalf of a prime contractor could be explained as sub-contracting (Kakande, 2015). Over the years, the proportion of work being carried out by sub-contractors has increased considerably. Sub-contractors on construction projects in Ghana are either classified as domestic or nominated. The issue here is the adherence of sub-contractors to the time lines being given to them to perform their duties and how main or prime contractors ensure this. The coordination and control of various subcontractors on a particular project can be a daunting task. Communication in subcontractor management is very important. Davies (1997) alludes to the fact that poor communication amongst subcontractors working on a construction project is the leading cause of conflicts. In spite of this subcontractors are beneficial to the main contractors in so many ways as they reduce overall burden and risks associated with construction projects carried out by prime or main contractors (Kakande, 2015).

2.4.4 Legal, Health and Safety Management

The construction industry of many developed and developing countries is characterized by accidents and disputes. Knowledge of the law concerning the construction industry is therefore very paramount even to ensuring that project objectives are achieved in peace. This site management practice considers management of health and safety and building regulations employed on site by large construction firms in Ghana. Buildings and construction systems and processes are regulated by Building Codes which seek to harmonise best practices, materials and methods to achieve structures and societies that enhance the quality of life for humanity (CASA Association 2012, P. 6). It is important to note that the Building codes are not intended to unnecessarily restrict the usage of new materials, products methods or development philosophies nor increase the cost of providing building services. It is the usual practice that a construction firm in our traditional Ghanaian system of contracts is not charged with the responsibility of obtaining building permits but it is important that as professionals they are equipped with considerable knowledge on the procedures and how they can work on site within the confines of the code.

The poor safety performance of the construction industry continues to give worldwide cause for concern (Haslam *et al.*, 2005). A developed country like Great Britain is said to possess a construction industry with international standards of safety but the industry still accounts for one third of all work fatalities (HSC, 2003). Health and Safety (H&S) is the duty of every one at work and construction companies have to be aware that they are accountable for managing and refining issues related to H&S on construction sites (Mthalande, 2008). Contractors are faced with numerous problems when they undertake a construction contract. These problems range from organizational to legal issues (Resse and Eidons, 2006). Danso (2010) cited Fugar (2009) who discovered that majority of the construction firms do not have health and safety personnel to deal with safety issues on

site. Kheni (2008) revealed that lack of inadequate government support for regulatory institutions and inefficiency in institutional framework are the cause of the poor safety performance. In spite of this, safety on construction sites is very important and has enormous benefits.

2.4.5 Materials Management

Materials Management can be explained as an organizational process which organizes, oversees and implements the tasks associated with the flow of materials to, through and out of an organization in an integrated fashion to provide client service in line with corporate goals (Adjei-kumi, 2011). For materials management on construction sites to be efficient there is the need for participation of all persons, parties and stakeholders involved with the project. Manteau (2007) gives a brief description of the various phases of materials management on a typical construction site.

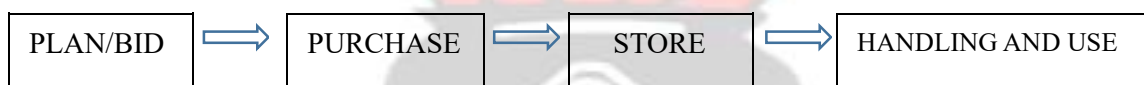


Figure 2.1 Various Phases of Materials Management on Typical Construction Site (Adopted from Manteau 2007)

In construction, the function of planning is to ensure that materials and other agreed on components demanded by the clients are supplied against a predetermined production programme. Scheduling is very essential in the planning phase of material management. Material identification and take off are key in making materials requisitions at any time during the construction phase of projects. This is usually carried out by the site manager or supervisor depending on the policies of the firm one is working for. Large established firms with materials management departments may allow personnel in the department to undertake this role. To start with, the Ghanaian construction industry is characterized with large construction firms not having a materials management department or a separate department to solely deal with the management of materials on construction projects.

Purchasing is the next stage in a materials management system where requisitions received are processed. A purchasing department in a typical construction firm is usually responsible for receiving the requisitions, selecting the source of supplier and placing orders. The purchasing department is held liable for any defective purchases made and they are to follow up to ensure that goods are delivered to site in a complete form. Once the materials are brought to site, the stores team take over where they receive the material at one end, store them and with time issue out to the assembly center. The other issue here is most of the stores on construction sites lack personnel with adequate skills as well as proper documentation to allow for adequate monitoring of materials. Materials handling is a joint function of both the site overseer and the stores manager to ensure judicious use of materials and avoid double handling. The use of materials on Ghanaian construction sites is characterized by double handling and material waste. Effective management of waste is also an essential factor in materials management as it eliminates reduction in daily output of a firm (Thomas *et al.*, 2005). Procurement of materials is always a source of delay. It is the usual practice in Ghana that all the phases of materials management on site may be entrusted into the hands of a single individual. This poses a great source of worry in the industry. When proper materials management practices are employed on site the contractor seeks to reduce the overall cost of materials through better handling of materials and a better management of cash flow.

2.4.6 Plant Management

The Ghanaian construction industry employs the use of varying plants and equipment on construction sites (Badu and Owusu Manu, 2011). These equipment may include:

1. Earthmoving and Excavating Equipment
2. Materials Handling and Transport Equipment
3. Concrete Technology Equipment
4. Small Tools and Equipment

To start with Ghanaian sites are not well organized to allow for efficient use of the plant and equipment employed by large construction firms. A safe and organized construction site is one that implements a good traffic management plan (Badu and Owusu-Manu, 2011). Some contractors are of the view that investing into the training needs of a machine operator can be described as a costly and time-consuming process. Their argument is based on the fact that though a machine or equipment is as good as the one operating it, operator training may not always appear to yield the required results in terms of desired operator performance and ability (Edwards, *et al.*, 2003). In addition, the low rates of operator pay received coupled with the cyclical nature of the industrial economy has partly created a transient plant operative workforce that migrates between industries in order to secure a continuance of increased financial reward. An observed fact also is that most of the construction companies are going in for equipment which cost so much but can be used to perform only one kind of operation as compared to equipment with multiple uses. Maintenance of construction equipment by construction firms is also one of the key areas in managing plant on construction sites. Maintenance can be explained as an activity that seeks to preserve or promptly restore the safety and performance of plant systems and components with the aim of ensuring greater performance of their intended functions (Badu and Owusu-Manu, 2011). Many construction companies view maintenance as a costly activity ignoring its enormous benefits. To achieve project objectives, it is ideal that one uses the right plant and equipment acquisition method having in mind the nature and complexity of the project.

2.4.7 Construction Methods

There are various construction methods available for carrying out each activity on site. Each of these methods comes with its advantages and disadvantages. Construction IT (1996) refers to them as on-site production methods. Construction methods and for that matter building construction methods refer to the varying methods of constructing the

numerous components of a building. Most of our buildings here in Ghana are made of contemporary masonry or block construction. Timber construction is also another method of construction which is very popular in the UK and other developed countries but has not gained grounds here in Ghana. Modern methods of construction have come about as a result of the growing demands of customers as well as increase in technology, manufacturing and construction ideas. Sarden and Engstrom (2010) revealed that modern methods of construction tend to address more effectively the uncertainties that construction commonly presents to clients and contractors. Every component of a building regardless of the method of construction employed comes with its specific or commonly acceptable ways by which they could be constructed. Construction methods have varying influence on the performance of contractors. An example could be cited where if the foundations of a building have been badly designed or constructed then they may not be suitable for the ground conditions in the proposed area. Foundations are designed according to the purpose they are to serve. It is not unusual to observe that on Ghanaian construction sites, contractors sometimes do not construct the foundations according to specifications with motives of saving materials by using specifications that would demand less materials. Blocks and bricks are joined by mortar. It is important that ideally mortar should be made or manufactured in a way that it possess certain properties to serve its intended purpose but unfortunately the methods employed by some contractors do not ensure this, which Laryea (2010) attributed to either poorly designed mix by consultants or inexperience on the part of builders. It is also interesting to know that no matter how blameless the materials, the workmanship and management, the unforeseen may still affect a building. We have instances where latent defects such as woodworm emerging from untreated timber, cracks developing on walls due to poorly constructed foundations and other scenarios (Chudley & Greeno, 2008). One of the major consequences of bad construction methods is the element of rework. Contractors are

usually unaware of the extent of rework on budgets. According to Alwi, et al., (n.d.), cost of rework could be as high as 15% of total budgets for a construction project. It is important that professionals in the industry supervise or ensure that the acceptable practices geared towards achieving a construction product that will meet its intended purpose are fulfilled.

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CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter presents the general approach and techniques that was adopted to address the objectives of the research. It encompasses the research approach, data collection method, design and scope of survey instruments, population, sample size determination and sampling technique.

3.2 RESEARCH APPROACH

Research approach can be defined as a way in which the research objectives can be interrogated. One of the important areas to consider in achieving the aim of a study is the kind of approach that is adopted (Naoum, 2001). Creswell (2003) suggests that one of the major considerations that is factored into deciding on a research method to be employed is the objectives of the study, the kind of data needed for the study and analysis envisaged. Data methods based on their degree of prearranged nature, their use of closedended versus open-ended questioning and their focus for numeric versus non-numeric data analysis are key in coming out with an appropriate research method. There are basically three approaches or strategies thus the quantitative, qualitative and mixed research approach. Quantitative research is defined by Creswell (2003) as an enquiry into social or human problem based on testing a theory made up of variables, measured with numbers and analysed with statistical procedures. Quantitative research is objective in nature. Qualitative research on the other hand is subjective in nature and mainly concentrates on opinions and perceptions rather than hard measurable data. Creswell (2003) also revealed that diagnosing that all methods have limitations, researchers felt that biases inherent in any single method could defuse or cancel the biases of other methods hence the need and competitive advantage in developing the mixed research

approach. For the purpose of this research the quantitative research approach was employed.

3.3 DATA COLLECTION METHOD

Data collection can be explained as a process of attaining data from either primary or secondary data sources that assist in making decisions about important issues and to pass the information on to others for future research purposes. The main data collection instrument that was used is questionnaires. Questionnaires were chosen as main data collection technique because it provides some level of privacy for the respondents to come out with accurate information when sensitive questions are asked (Awal, 2010). It is also less expensive and saves time as compared to other data collection techniques. Preliminary discussions were held with prospective contractors and industry players on the field to evaluate and modify the contents of the questionnaire as a measure for validity of the study. This enabled relevant changes to be made to the questions formulated in order to avoid ambiguity and repetitions of questions. The data collection method was used to collect mainly primary data. Primary data may be explained as original data collected from the respondents directly for a specific research goal whereas secondary data is classified as data that has been collected earlier by other researchers which could be archived and made available to the general research community (Hennie & Joop, 2005)

3.3.1 Design and Scope of Research Instrument

Questionnaires were designed based on the objectives of the study and distributed to D1/K1 and D2/K2 contractors within the Accra metropolis. Closed-ended questions were mainly used in the questionnaire. Glasow (2005) indicates that close-ended questions are simple for respondents to answer and it also helps researchers to scrutinize their data easily. The varying site management practices employed by local construction firms were

defined through a comprehensive literature review. They were then translated into questions of simple, clear nature and void of unnecessary expressions to help minimize potential errors from respondents.

The questionnaire was divided into three main areas. The first part of the questionnaire basically enquired information about the respondents' background or characteristics. The second part of the questionnaire sought to address the first objective of this study by helping respondents identify which of the site management practices revealed by literature they employed. Here respondents were given the opportunity to tick on a fivepoint response scale whether they either employed the practices "never" (1), "rarely" (2), "sometimes" (3), "often" (4) or "very often" (5) in managing their sites. The third part dealt with the respondents' opinion and experience in the industry on the degree of influence the various site management practices had on their companies' performance. This part of the questionnaire sought to address the second objective of this study. A fivepoint response scale (Likert scale) was employed and it measured the degree of influence of the identified site management practices on the performance of contractors. The outcome of the respondents ranking of the answers were totaled to measure respondents' attitude or perception about the identified variables.

The conventional five-points of Likert scaling used include:

5. Very high influence
4. High influence
3. Moderate influence
2. Low influence
1. Very low influence

For the purpose of this research, the likert scale type was used in the design of the questionnaires. The likert scale is described as a method of ascribing quantitative value to qualitative data to make it amenable to statistical analysis

(www.businessdictionary.com). A numerical value is assigned to each potential choice and a mean figure for all responses is computed at the end of the evaluation survey. Aside from the fact that the questionnaire was to assist in obtaining information from the respondents, it was also to validate the findings of the literature review. The developed questionnaires were personally distributed and retrieved from active construction sites in person.

3.4 POPULATION AND SAMPLE SIZE DETERMINATION

The research population was limited to only D1/K1 and D2/K2 contractors in the Accra Metropolis of the Greater-Accra Region of Ghana. Donkor (2011) revealed that over seventy percent of Ghanaian contractors tend to operate officially in the Greater Accra and Ashanti region and therefore contractors in any of these two areas could be considered for the research.

A list of registered local contractors with the Association of Building Contractors and Civil Engineering Contractors of Ghana was obtained and used for the research. The list obtained had a total of one hundred and twenty-five contractors in good standing registered with the association in the Accra metropolis. Out of this, thirteen were D1/K1 contractors, twenty-four were D2/K2 contractors and the remaining eighty eight were D3/K3 and D4/K4 contractors. Due to the size of the target population, the sampling approach or strategy that was employed was the census sampling. This is a sampling technique where the entire population is used for the study. It is usually attractive for small populations e.g., 200 or less. According to Kothari (1990), census sampling has the advantage of having a high accuracy since there is no element of chance. A census

sampling method also eradicates sampling error and makes available data on all individuals in the population.

3.4.1 Sampling Technique

There are two basic sampling methods. These are the probability and non-probability sampling methods. In probability sampling, each member of the population has a probability of being selected. It is also an ideal sampling method where a list of target population is available. This is not the case for non-probability sampling. According to Doherty (1994) non probability sampling methods are seen as biased sampling methods that involve some element of judgment and may be used when there is no suitable list of target population. For the purpose of this study, a census study approach was employed where the entire target population was used for the study. This is different from a sample study where a careful sample has to be chosen to represent the population. This informed the decision not to employ other sampling methods to further select individuals in the population.

3.4.2 Distribution of Questionnaires to Each Financial Class

Table 3.1: Distribution of Questionnaires to Each Financial Class

TOTAL SAMPLE	D1/K1	D2/K2
37	13	24
RESPONDENTS		
31	9	22

Out of the total of thirty-seven (37) targeted contractors, thirty-one questionnaires representing a response rate of 84% were obtained and used for the analysis accordingly

3.5 METHOD OF ANALYSIS

3.5.1 Data Preparation

The raw data was collected and processed to be put into a more suitable form for analysis.

A test procedure was defined for the statistical tool thus the statistical package for social

science (SPSS) and used for the analysis. Microsoft excel was also used to give a clearer presentation of results.

3.5.2 Statistical Consideration

The following statistical methods were used in this report.

1. Cross Tabulation

Questions 3, 4, 5 and 6 were cross tabulated with question 1 as indicated on the survey questions. No scoring was used since these questions consist of broad statistics related to the respondents companies.

2. Development of Relative Importance Index and Rankings for all the respondent's views.

Respondents were first asked to identify the extent to which they employ the various site management practices. They were to indicate whether they “never”, “rarely”, “sometimes”, “often” or “very often” employed the site management practice identified from literature. Respondents were again asked to rate the relative influences of the site management practices on the performance of their construction company based on their personal experience in the construction industry. The rating involved the contractors deciding whether a site management practice had “very low influence,” “low influence,” “moderate influence,” “high influence” or “very high influence” on the performance of construction firms. Respondents' attitudes were measured on a five-point Likert-type scale and the resulting data were analysed using the relative importance index (RII) method. RII is computed as:

$$RII = \frac{\sum W}{A * N}$$

Where: W – the weight given to each factor by the respondents which is computed by multiplying each frequency by the likert scale factor which ranges from 1 to 5;

A – the highest response integer (5); and N – the total number of respondents.

The relative importance index for a variable is computed as follows:

eg: Documentation of site instructions

EW (sum of weighting) = $ax_1+bx_2+cx_3+dx_4+ex_5$ where a, b, c, d and e are the frequencies for a particular site practice. Using the formula we have;

$$EW = 0x_1+2x_2+5x_3+12x_4+14x_5=137$$

$$A=5, N=31$$

The RII for Documentation of site instructions = **0.88**



CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter is the realization of the proposed methodology of this research and it displays and discusses the results obtained. The analysis consists of the profile of the respondents, development of a relative importance index to first identify the extent to which local contractors employ the numerous site management practices and then to ascertain the degree of influence of the identified site management practices from literature on the performance of contractors. A critical review of literature identified seven (7) main construction site management practices. These were site administration, supervision and management, legal, health and safety practices, materials management, plant management, construction methods, commercial management and planning, monitoring and control. The next step was to determine which of the site management practices identified in the literature were employed by local construction companies in Ghana. Finally, the degree of influence each site management practice had on the performance of local contractors was determined using the development of a relative importance index.

4.2 PROFILE OF RESPONDENTS

This aspect of the questionnaire attempts to provide a comprehensive knowledge concerning the background or profile of the respondents. It describes the characteristics of the respondent firms that were involved in the survey. Six (6) main business characteristics were of paramount interest which included the financial class of the contractor, form of ownership, type of client they work for, number of years in business, how long the respondent has been in the industry and educational level of the respondent.

Questions 3, 4, 5, 6, were cross tabulated with question one. The cross tabulation was used to provide a comprehensive set of a two-dimensional liaison between each of the categories of contractors and the business characteristics identified. The results are discussed below.

4.2.1 Ownership of the Firm

Responses on the form of ownership of the firms in Table 4.1 indicates that 61.29% of the contractors are private limited companies, 22.58% of them operate as partnership firms, 16.13% of them are sole proprietors and none of them public limited companies. These statistics confirm earlier discoveries of Badu and Owusu-manu (2013) who revealed that the private limited companies are the most dominant form of legal status in this country. It also goes to strengthen the earlier assertion made by Cassar (2004) that the private sector is central to the economic growth and prosperity of many economics.

Table 4.1 Form of Ownership of the Firm

FORM OF OWNERSHIP OF THE FIRM					
	PRIVATE LIMITED COMPANY	PARTNERSHIP FIRMS	SOLE PROPRIETOR	PUBLIC LIMITED COMPANY	Total
D1/K1 contractors	5	2	2	-	9
D2/K2 contractors	14	5	3	-	22
Total	19	7	5	-	31
% of total	61.29%	22.58%	16.13%	-	100%

4.2.2 Type of Client

Clients are very important participants in the construction industry. They employ most of these contractors and hence it is necessary to identify the type of client most of them work with. The result presented in Table 4.2, illustrates that 58.07% of the total respondents work with both the private and public/government. 22.58% of the contractors work with public/government only and 19.35% work with private clients only. It can therefore be deduced that 80.65% of the contractors work with public/government clients. This however means that the public/government of Ghana is the leading employer in the

construction division and this is reinforced by Donkor (2011) who also confirmed in his research study that the government is the major client for construction works in Ghana.

Table 4.2 Type of Client

TYPE OF CLIENT				
	PRIVATE CLIENTS	PUBLIC/GOVERNMENT CLIENTS	BOTH PRIVATE AND PUBLIC CLIENTS	TOTAL
D1/K1 contractors	3	1	5	9
D2/K2 contractors	3	6	13	22
Total	6	7	18	31
% of total	19.35%	22.58%	58.07%	100%

4.2.3 Years of Experience

Experience of the respondents is very necessary to the reliability of the outcome of this survey. Table 4.3 below depicts that 29.03% of the contractors have less than 5 years working experience, 54.84% of the respondents have 5-10 years' experience in the construction field, 9.67% of them have 10 – 15 years of working experience and 6.45% of them have an experience between 15 to 20 years. The findings indicate that 70.96% of the respondents have more than 5 years working experience. The long working experience of the respondents gives the results of this research more reliability, since this implies that they are competent, experienced and capable of executing good judgement. Consequently, their responses to the degree of influence site management practices has on their performance would also reflect the prevailing situations in the construction industry.

Table 4.3 Years of experience

YEARS OF EXPERIENCE					
	LESS THAN 5 YEARS	5-10 YEARS	10-15 YEARS	15-20 YEARS	Total

D1/K1 contractors	5	2	1	1	9
D2/K2 contractors	4	15	2	1	22
Total	9	17	3	2	31
% of total	29.03%	54.84%	9.67%	6.45%	100%

4.2.4 Educational Background of Respondents

Table 4.4 depicts the educational level of the respondents and the indications are that 64.52% represent respondents with BSc qualifications, 21.58% with MSc qualifications and 13.90% with HND qualifications. This indicated that at least 86.10% of the respondents had a minimum of a first degree from a recognized university. This confirms Oppong's (2013) assertion that majority of personnel in the big firms have a minimum of a first degree. This in total indicates that the respondents are capable of making good judgements hence responses could be relied on.

Table 4.4 Educational level of respondents

EDUCATIONAL LEVEL				
	HND	BSc	MSc	TOTAL
D1/K1 contractors	2	5	2	9
D2/K2 contractors	2	15	5	22
Total	4	20	7	31
% of total	13.90%	64.52%	21.58%	100%

4.3 SITE MANAGEMENT PRACTICES EMPLOYED BY LOCAL CONSTRUCTION FIRMS IN GHANA

The second session of the questionnaire sought to address the first objective of this study which is to identify the site management practices employed by local construction firms in Ghana. A number of site management practices were identified by literature. This include five (5) plant management practices, five (5) commercial management practices,

six (6) materials management practices, four (4) planning, monitoring and control practices, seven (7) legal, health and safety practices, eight (8) site administration, supervision and management practices and four (4) construction methods. The limits of definition used for the RII were $0 \leq RII \leq 1$ for all factors with $0 \leq RII \leq 0.20$ indicating a factor never employed, $0.20 \leq RII \leq 0.40$ for a factor rarely employed, $0.40 \leq RII \leq 0.60$ for a factor employed sometimes, $0.60 \leq RII \leq 0.80$ for a factor employed often and $0.80 \leq RII \leq 1$ for a factor employed very often. This is consistent with the findings of Ayegba (2013) and Badu *et al* (2013).

Table 4.5 Extent to which respondents employ Site Administration, Supervision and Management Practices

SITE MANAGEMENT PRACTICES	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Documentation of issued drawings	-	4	4	12	11	123	0.79
Balancing of skilled and unskilled labour on projects	1	4	5	9	12	120	0.77
Documentation of site correspondences	3	4	2	10	12	117	0.75
Implementation of corrective actions during the construction process	3	6	4	8	10	109	0.70
Documentation of site instructions	3	4	8	10	6	105	0.68
Training of site supervisors	4	5	7	7	8	103	0.66
Communication management planning within the company	3	9	6	8	5	96	0.62
Motivation of the labour force	13	10	4	2	2	63	0.40

Table 4.5 above reveals that of all the site management practices employed under site administration, supervision and management, motivation of the labour force is the only practice that is rarely employed by local construction firms in Ghana.

Table 4.6 Extent to which respondents employ Commercial Management Practices

COMMERCIAL MANAGEMENT PRACTICES	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Cost and value reconciliation	-	1	5	7	18	135	0.87
Subcontracting	-	5	6	8	12	120	0.77
Credit arrangement with suppliers (material suppliers and plant hirers)	3	8	4	5	11	106	0.68
The use of front and back end rate loading margin systems	4	6	5	8	8	103	0.66
Cash flow management	4	7	4	7	9	103	0.66

Table 4.6 above reveals that all the site management practices employed under commercial management practices were either employed very often or often by local construction firms in Ghana.

Table 4.7 Extent to which respondents employ Planning, Monitoring and Control Practices

PLANNING, MONITORING AND CONTROL PRACTICES	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Progress reporting	-	-	5	6	20	139	0.89
Training of on-site staff on the use of techniques and software to control time and cost on projects	8	18	2	2	1	63	0.40
Time control and monitoring using software	10	12	6	2	-	60	0.39
Cost monitoring and control using software	11	14	4	2	-	59	0.38

Table 4.7 above reveals that practices such as cost monitoring and control using software, time control and monitoring using software and training of on-site staff on the use of techniques and software to control time and cost on projects commercial management practices were employed rarely by local construction firms in Ghana.

Table 4.8 Extent to which respondents employ Legal, Health and Safety Practices

LEGAL, HEALTH AND SAFETY PRACTICES	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Provision of safety signs at vantage points to educate and inform workers and visitors on site	-	8	9	8	15	125	0.81
Housekeeping on site	1	4	5	8	13	121	0.78
Accident reporting and maintenance of records	-	5	7	7	12	119	0.77
Health and safety education of various work trades on site	3	5	6	6	11	110	0.71
Provision of adequate welfare facilities on site	2	5	7	8	9	110	0.71
Operation of an open door policy on safety on site	4	8	6	7	6	96	0.62
Training of safety officers to improve on their performance on safety and relevant legislation on the jobsite	5	8	6	5	7	94	0.61

Table 4.8 discloses that all the site management practices employed under legal, health and safety practices were either employed very often or often by local construction firms in Ghana.

Table 4.9 Extent to which respondents employ Materials Management Practices

MATERIALS MANAGEMENT PRACTICES	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Materials handling	-	3	3	9	16	131	0.85
Purchasing and inventory management	1	4	3	4	19	129	0.83

Stores management	-	2	6	10	13	127	0.82
Materials planning and scheduling	2	5	5	9	10	113	0.73
Materials waste management	2	7	5	6	11	110	0.71
Information technology (IT) in materials management	14	9	5	3	-	59	0.38

Table 4.9 discloses that majority of the site management practices linked to materials management were either employed very often or often by local construction firms in Ghana. An exception to this assessment was information technology in materials management which recorded an RII of 0.38 which per the limits of definition used considered as a rarely employed practice.

Table 4.10 Extent to which respondents employ Plant Management Practices

PLANT MANAGEMENT PRACTICES	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Plant information management	2	5	4	7	13	117	0.75
Planning of the traffic routes to be used by plants on site	1	5	8	6	11	114	0.74
Training and safety education of operators on construction equipment	3	4	6	8	10	111	0.72
Insurance and licensing legalities management of plant and equipment	2	5	8	4	12	112	0.72
Plant and equipment maintenance management	1	8	5	8	9	109	0.70

Table 4.10 unveils that all the site management practices employed under plant management practices were either employed very often or often by local construction firms in Ghana.

Table 4.11 Extent to which respondents employ Construction Methods

CONSTRUCTION METHODS	Frequency					WEIGHTING (EW)	RII
	1	2	3	4	5		
Adherence to specifications agreed on in construction contracts	-	6	3	9	13	122	0.79
Supervision or labour management	2	4	3	9	13	120	0.77
Testing or checking of site conditions to come out with realistic method statements and planning of the works	3	4	3	5	16	120	0.77
Adequate preservation and storage of materials before use	3	3	6	7	12	115	0.74

Table 4.11 unveils that all the site management practices employed under construction methods were either employed very often or often by local construction firms in Ghana.

To be able to perform better on construction projects, a firm would have to apply the practices associated with the various site management processes efficiently and frequently. From the above tables, it can be concluded that majority of the practices identified from literature were employed by the local construction firms in Ghana. The exception to this assessment were practices such as; motivation of the labour force, cost monitoring and control using software, training of on-site site staff on the use of techniques and software to control cost and time, time monitoring and control using software and information technology in materials management. These practices recorded RII's of 0.40, 0.38, 0.40, 0.39 and 0.38. These indices were between 0.20 and 0.40 which per the definition limits are classified as practices employed rarely in local construction firms in Ghana.

4.3.1 Motivation of the Labour Force

Motivation of the labour force is very important in maintaining a competitive environment among workers on site. Badu *et al* (2013) cited Shapiro *et al* (2007) who reported that the incentives in the construction industry usually consists of performance bonuses based on achievements, commendations and promotions. Very few contractors in the Ghanaian construction industry offer bonus schemes to workers when they meet project targets. Motivation of workers is considered as one of the factors that stimulates productivity in the construction industry. Communication affects worker motivation and this is not known to a lot of Ghanaian contractors specifically supervisors on site. During the administration of the questionnaire it was gathered that supervisors or personnel in charge of labour crews on site displayed authoritarian approaches to managing the workers which Hancock (2013) labels as outdated.

4.3.2 Cost Monitoring and Control Using Software

The element of cost in every construction project is paramount to the realization of the project. Controlling cost is a striking objective of every construction manager. Construction in Ghana just as in other countries is hampered by unforeseen conditions and sometimes poor management. The study reveals that Ghanaian construction companies are not employing software in monitoring and controlling cost in their day to day running of activities on site. This was very dominant for sole proprietor firms. During an interaction with one of the respondents in such firms the explanation given for such a practice was that, owners of the company felt that the orthodox manual way of controlling cost was still the best since it provided them with their margins of profit and did not add to their overhead costs. Some also argued that being able to operate the software required some kind of training which they were unwilling to pay for.

4.3.3 Training of On-Site Site Staff on the Use of Techniques and Software to

Control Cost and Time

Once it was evident that majority of the firms were not employing software to control and monitor cost, it was not going to be possible for them to train their on-site staff on the use of techniques and software to control cost and time on construction projects. Training of staff in the construction industry is a process and not an event which involves funding and time.

4.3.4 Time Monitoring and Control Using Techniques and Software

Managing to keep a project on course all through its life sequence can help save money by eradicating every construction managers' nightmare which is a missed "deadline". The study reveals that majority of the Ghanaian construction companies are not employing software in monitoring and controlling time in their day to day running of activities on site. Many of the time management software packages which are available for controlling cost include; Primavera project planner, Microsoft project, Asta power project, Project commander and others. Very few of the contractors with whom discussions were held with revealed the fact that they employed the use of a software in controlling cost especially Microsoft project but admitted that one required some level of training and time to be able to use it efficiently. This was something the larger majority of contractors engaged in the study were unwilling to do since it came with cost and time which they didn't have the luxury of.

4.3.5 Information Technology in Materials Management on Site

Construction in this modern era has gotten to a level where it relies heavily on information. Information technology in materials management is generally thought of as an integration of all materials related operations in a framework to make managing materials efficiently. The study reveals that Ghanaian construction companies are not employing information technology in materials management. Observations made during

the administration of questionnaires revealed that construction companies were still indulged in the manual methods of managing materials such as recording in books. This was due to lack of awareness of the company of such available technology and technique. Others also argued that employing information technology in materials management attracted additional operational cost which would eventually affect their profits. But they were not mindful of the long term advantages.

4.4 Highly Influential Site Management Practices

Table 4.13 below indicates in rank the order of the site management practices on the performance of large established construction firms in Ghana. The variables with relative importance index of 0.80 and above were considered to have very high ratings and therefore highly influential on the performance of contractors. The limits of definition used for the RII were $0 \leq RII \leq 1$ for all factors with $0 \leq RII \leq 0.20$ indicating a very low influence factor, $0.20 \leq RII \leq 0.40$ for a low influence factor, $0.40 \leq RII \leq 0.60$ for a moderate influence factor $0.60 \leq RII \leq 0.80$ for a high influence factor and $0.80 \leq RII \leq 1$ for a very high influence factor. This is consistent with the findings of Donkor (2011) and Ayegba (2013). From table 4.13 below, documentation of site instructions came first with a relative importance index of 0.88. This was followed by provision of safety signs at vantage points to educate and inform workers and visitors on site of prevailing conditions with an index of 0.84. Timely delivery of materials came third with an index of 0.83. Progress reporting came fourth with an index of 0.82. Accident reporting and maintenance of records, health and safety education of various work trades on site, inaccurate measurement by the quantity surveyor and communication between client's representatives and the contractor came in fifth with an index of 0.81. Compliance of workers to wearing safety gears and materials waste by workers came in ninth with an index of 0.80. The overall ranking of all the factors can be found at the appendix section of this study.

Table 4.12 Ranking of Highly Influential Site Management Practices

SITE MANAGEMENT PRACTICES	Frequency					WEIGHTING (EW)	RII	RANK
	1	2	3	4	5			
Documentation of site instructions	-	2	5	12	14	137	0.88	1 st
Provision of safety signs at vantage points to educate and inform workers and visitors on site of prevailing conditions	-	2	3	13	13	130	0.84	2 nd
Timely delivery of materials	-	3	4	10	14	128	0.83	3 rd
Progress reporting	1	2	4	10	14	127	0.82	4 th
Health and safety education of the various work trades on site	1	-	7	11	12	126	0.81	5 th
Inaccurate measurement by the quantity surveyor	1	3	3	11	13	125	0.81	5 th
Communication between the client representatives and the contractor	2	2	4	13	11	125	0.81	5 th
Accident reporting and maintenance of records	1	-	4	18	8	125	0.81	5 th
Compliance of workers to wearing safety gears	1	3	3	12	12	124	0.80	9 th
Material waste by workers	2	3	6	12	10	124	0.80	9 th
Delay in receiving payment for work done from clients	2	3	5	12	10	121	0.78	11 th

4.4.1 Documentation of Site Instructions (Variation Orders)

Documentation of site instructions or variation orders are of great importance to the contractor as the majority of disputes and claims arise from them. Face to face or verbal communication between the contractor and consultants would have been an ideal medium of exchange of information concerning issues on site. Unfortunately, our building contracts frown on them. It is very common to find on Ghanaian construction sites, situations where consultants be it Architects, Structural engineers or services engineers and others issue verbal instructions with an assurance to put them in writing at later dates.

The friendly relationships that exist between consultants and contractors sometimes give the contractor the room not to doubt that the instruction will be written and so do not follow up on them. The promised instructions are never written and whenever contractors issue claims to such variations, it is challenged. An identified cause of such behaviours by consultants is when they realize that there are serious errors in their design and much has not been done in terms of contract documentation to cater for it. Masahudu (2015) confirms this assertion by indicating that documentation of site instructions or variation orders is very key in ensuring that projects don't stall as a result of conflicts and are completed within proposed budgets.

4.4.2 Provision of Safety Signs at Vantage Points to Educate and Inform Workers and Visitors on Site of Prevailing Conditions

The study identifies this as the second most influential variable to the performance of construction firms. Provision of safety signs at vantage points in and around the site is very important in educating people, both visitors and workers of the prevailing conditions on site. There is a legal aspect to this and this is what makes this practice an influential one. As part of our common laws in Ghana, liability is owed to a visitor, a licensee and trespasser. The highest degree of care is ideally owed by the contractor to anyone who enters the site in pursuance of a contract with him. At common law, the occupier owes the trespasser no duty of care, there only exists a duty of common humanity. This duty can only arise when it can be shown that the occupier is aware of the danger or has reasonable grounds that it exists and its one against which can reasonably offer the trespassers some protection. The Factories, Offices and Shops Act, 1970 (Act 328), one of the health and safety legislations for governing health and safety on Ghanaian sites also echoes the fact that an employee or anybody in pursuance of a contract with the employer is entitled to recover damages of breach of the provisions of the act. Ghanaian

contractors are not heeding to a lot of the safety regulations in Ghana hence going through a lot of unnecessary stress at the moment on the various projects they are working on.

4.4.3 Timely Delivery of Materials

The construction industry without a doubt is heavily dependent on material suppliers.

The most common consequence of delay in delivery materials is additional time. Anytime there is a delay in material deliveries, the progress of workers and labour only contractors are greatly affected. It is unfortunate that in most of the constructions contracts delays caused by the inactions of the contractor cannot serve as basis for pleading for extra time under the contract. Timely delivery of materials is considered as an influential site management practice on the performance of local construction companies as it affects the ability of the company to be able to deliver the project on time. Darvik and Larsson (2010) confirmed this in their research by indicating that the timely delivery of materials is the most important factor of a supplier's performance.

4.4.4 Progress Reporting

It is important that at every stage of the construction process a document is readily available to explain to the stakeholders the details of the project at that stage. It usually informs the project participants of the progress made on the project over a specific period of time. Progress could be kept on either cost or time during the life cycle of the project. The study identifies progress reporting as one of the influential site management practices on the performance of a firm as it assists senior management personnel to know whether the project is doing well or not. During questionnaire administration it was gathered that site supervisors did not have a grasp of the use of simple project monitoring tools such as earned value analysis. The identification of this variable as one of the influential site management practice confirms Wusua-Affare's (2012) study that identified progress

reporting as important in monitoring and controlling the project and that avenues such as site meetings provide the best means of assessing or discussing progress reports.

4.4.5 Health and Safety Education of Various Work Trades

Health and safety education of various work trades on construction sites is key to avoiding painful and costly work-related injuries. This variable has been identified as one of the influential site management practices on the performance of a firm as it is geared towards reducing accidents or work-related injuries and producing a conducive working environment. The construction workforce in the industry is a transient one where employee turnover is very high. New and young workers are recruited and almost always have less experience in identifying hazardous situations than already existing workers. This supports the notion that health and safety education of the various work trades should be taken seriously in order to put all workers on the same level in identifying hazards on site. Mthale (2008) also confirmed in his research that education of workers on health and safety is key to avoiding injuries and creating a conducive working environment on site.

4.4.6 Inadequate Measurement by the Quantity Surveyors

Profit is a vital pointer of the performance of a company and a typical construction firm in the Ghanaian context is no exception. Interim valuations are a characteristic of all major methods of contract and measurements are a means by which contractors earn income for a particular project. This is identified as a highly influential variable as it affects the performance of construction companies. Inaccurate measurements here may refer to a situation where the amount of work certified to be paid is less than the amount of work actually done. Jimoh (2012) identifies inadequate measurement by the quantity surveyor as one of the difficulties associated with site management through the construction phase of a project.

4.4.7 Communication between Client Representatives and Contractors

Communication is very key to the survival of every construction project. Because construction is such a fragmented industry, challenges in communicating has severe impacts on construction projects. There must be compatibilities between people to permit them to communicate efficiently. Lack of consultancy and inadequate feedbacks on the part of contractors are considered some of the root causes of defects to communication between consultants and contractors (Fugar 2016). The study identifies communication as an influential variable due to the cost and duration effects it has on projects. An example could be cited where an architect provides a contractor with scanty drawings. This may lead to delay of the construction works. Once there is conflict and lack of trust between the project stakeholders, there is a shortfall in the realization of project objectives.

4.4.8 Accident Reporting and Maintenance of Records

Accidents on construction sites are usually complex and may result from a number of events. Accidents reports normally contain detailed information about the accident. This study identifies accident reporting as one of the site management practices with high influence on the performance of construction firms as they provide information and causes of the various accidents and recommendations for future prevention and intervention. Accident reports and records also form the basis of consideration of new jobs by clients hence their importance. The identification of accident reporting and maintenance of records as an influential site management practice confirms Mthlene (2008) who indicated that accident reporting and maintenance of records is important even to the extent that it should be looked at when considering sub-contractors for selection for jobs.

4.4.9 Compliance to Workers Wearing Safety Gear

The construction industry has been regarded as one of the dangerous industries in the world. The Ghanaian construction industry has a poor health and safety performance score compared to other industries hence the need to adhere to safety instructions on site. Employers are required by law in this country to provide all workers with personal protective clothing on site. It is very unfortunate to note that a considerable number of contractors are providing their workers with all the safety gears but workers are refusing to wear them. This variable is considered an influential one because non-compliance to wearing safety gears cause accidents on our sites which have huge effects on both construction costs, company reputation and work environment. The workmen's compensation act (Act 1963) which provides compensation for disfiguring or other social injuries to workmen is drawn on company profits thus the company bears the hospital and other bills of the injured worker. Compensation payment to accident victims is independent of negligence on the part of the employer. Clients are now looking to award contracts to contractors with very good safety records. Mthale (2008) confirms non-compliance to wearing safety gears as one of the common causes of accidents which in turn affects the performance of construction firms in a research he carried out on the economic and social impacts of accidents in South Africa.

4.4.10 Materials Waste By Workers

According to Khyomesh (2011), 30 to 70 percent of project cost is consumed by materials. Management of material waste on construction sites is an avenue for reducing construction costs and duration. Material waste by workers may be caused by poor handling, inadequate protection to finished work and poor housekeeping. This study identifies material waste by workers as an influential practice on the performance of a construction company as it robs them of intended profits to be gained from contracts. By

this, materials that are actually brought for the works are not actually used for the work and this in no doubt has a detrimental effect on the outcome of a project.

4.4.11 Delay in Payment for Work Done

Delay in payment for work done came ninth (9th) in the rankings of the factors that influence performance of local contractors. This confirms Laryea's (2010) study that identified delay in payment as one of the biggest problems contractors were facing on construction contracts. Funds are one of the key resources in running a construction project hence it being an influential variable on the performance of a contractor. Payment-related delays usually disrupt the contractors scheduling and planning of the construction activities. In worst scenarios it could cause an abrupt end of the whole construction process.



CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This research work concentrated on assessing the influence of site management practices on the performance of local construction firms (class D1/K1 and D2/K2 contractors) in Ghana with the view of recommending measures that could be adopted to help improve on the site management practices. Chapter one talked about the introduction to the study. Chapter two reviewed and discussed existing literature on the topic which subsequently formed the basis for the scrutiny and interpretation of the research data. In chapter three, the appropriate research approaches were adopted to address the objectives of the research. Chapter four gave a whole view of the analysis and discussions made on the results obtained. In this chapter the research is brought to a closure by summarizing all what had been done to address the aim and objectives of the work.

5.2 HOW THE OBJECTIVES WERE ADDRESSED

5.2.1 Identifying Site Management Practices Employed By Local Construction Firms (Class D1/K1 and D2/K2 Contractors) in Ghana

This objective was achieved primarily through the literature reviews and conducting of survey questions. The literature review spelt out the various site management practices that were employed by construction companies all over the world. This included five (5) plant management practices, five (5) commercial management practices, six (6) materials management practices, four (4) planning, monitoring and control practices, seven (7) legal, health and safety practices, eight (8) site administration, supervision and management practices and four (4) construction methods. The results of the survey questions then confirmed which of the practices identified in the literature were employed by local construction firms (class D1/K1 and D2/K2 contractors) in Ghana. It was

concluded that majority of the practices identified from literature were employed by the local construction firms in Ghana. The exception to this assessment were practices such as

1. Motivation of the labour force
2. Cost monitoring and control using software
3. Training of on-site site staff on the use of techniques and software to control cost and time
4. Time monitoring and control using software
5. Information technology in materials management

5.2.2 Determining the Degree of Influence of Site Management Practices on the Performance of Local Construction Firms in Ghana

This objective was also achieved mainly by identifying from literature the various site management practices and using the likert scale with the help of the development of a Relative Importance Index to identify the degree of influence each factor had on the performance of a firm. Fifty-six factors (56) were identified by literature as site management practices that influence the performance of local contractors in Ghana. They were listed under four (4) main headings including five (5) plant management practices, seven (7) commercial management practices, ten (10) materials management practices, eight (8) planning, monitoring and control practices, eight (8) legal, health and safety practices, twelve (12) site administration, supervision and management practices and six (6) construction methods. Respondents were asked to rate the relative influences of the practices to the performance of their companies. The rating involved the contractors ranking the identified practices on a scale of 1-5. The site management practices that were identified as highly influential on the performance of large established firms were documentation of site instructions, provision of safety signs at vantage points to educate and inform workers and visitors on site, timely delivery of materials, progress reporting,

health and safety education of the various work trades, inaccurate measurement by the quantity surveyor, communication between the client representatives and the contractor, accident reporting and maintenance of records, compliance levels of workers to wearing safety gears and material waste by workers.

5.3 CONCLUSIONS

An overall assessment of the site management practices employed by local construction firms in Ghana revealed that majority of the practices identified from literature were employed by the local construction firms in Ghana. Few of them such as motivation of the labour force, cost monitoring and control using software, training of on-site site staff on the use of techniques and software to control cost and time, time monitoring and control using software, information technology in materials management were rarely employed. Other findings of this research also revealed that amongst all the site management practices employed by local construction firms in Ghana, practices such as documentation of site instructions, provision of safety signs at vantage points to educate and inform workers and visitors on site, timely delivery of materials, progress reporting, health and safety education of the various work trades, inaccurate measurement by the quantity surveyor, communication between the client representatives and the contractor, accident reporting and maintenance of records, compliance levels of workers to wearing safety gears and material waste by workers were identified as the highly influential site management practices on the performance of large established contractors in Ghana.

5.4 RECOMMENDATIONS

Site management as indicated earlier in this study is not only restricted to the practical technicalities of the construction project but also involves having an effective understanding of the complex relations that exist between the project team members. The following recommendations are therefore measures and strategies that could be adopted

by contractors to improve on the site management practices they employ in managing construction projects. Project stakeholders also have a role to play in ensuring that projects are managed well at site level to be able to obtain returns on their investments.

5.3.1 To Contractors

1. Documentation of site instructions should be taken seriously by contractors. Contractors are to insist that consultants reduce their verbal instructions to written ones so as to ensure that whenever claims are raised in respect of such orders, they are adequately reimbursed. This will help foster trust and unity among consultants and contractors.
2. Health and safety rules governing construction projects should be strictly enforced on site by contractors or their representatives. Employing safety officers or training existing supervisors in occupational health and safety practices and requirements is a step in the right direction to enforcing the right practices.
3. Contractors should do their best to involve workers in managing safety on sites as it helps build awareness and responsibility on their part to ensure a safe working environment.
4. Contractors should ensure that they avoid the practice where materials management is entrusted in the hands of a single individual. Looking at the volumes of materials employed by large construction firms, a materials management department solely to deal with materials management should be setup in most firms. Materials management components such as planning and purchasing should be looked at critically by every construction company. Under planning, contractors should ensure that they put in charge experienced personnel in the estimating of materials needed to carry out works on site.

Contractors should formulate their purchasing policies to include intermittent performance appraisals to be conducted on their suppliers to ensure that they get their materials or supplies at the right time all year round.

5. Contractors can make progress reporting easier by employing often the use of software such as Microsoft project which allows one to monitor cost, time and other key project variables at the same time. It requires some form of training and time for one to be able to use the software efficiently and any investment made pursuance to this is for the long term good of the company.

6. Accidents, near misses or incidents should be investigated no matter how minor they are to determine the number of occurrences and evaluate them against past records or standards. This will help put in place prevention mechanisms to avoid the reoccurrence of such practices.

7. Contractors should ensure that they engage quantity surveyors that have enough experience to undertake the jobs allotted to them. Refresher or training courses could also be organized for those with less experience to help equip them with the principles of the profession.

8. The labour force are to be educated on the importance of minimizing waste on site, so that they align their behaviours to avoid it. This could be done through internal meetings or pep talks in the morning before work starts. Contractors should adopt a robust system of allowable waste percentages for workers and subcontractors where they are deducted extra costs when they exceed the allowable waste.

5.3.2 To Project Stakeholders

1. Clients are advised to do their best to honour payments whenever contractors raise certificates. By this, they should engage the services of competent consultants who will

provide them with proper contract documents and financial advice which will go a long way to bring incidence of incessant variations to a minimum.

2. Consultants are advised to do their work diligently and professionally to allow for projects to run smoothly. This includes providing clients with efficient designs and documentation.

3. Consultants are encouraged to reduce their verbal site instructions into writing and know that due to the complexity in operations involved with a construction operation, any likelihood of change should be expected. What they can do is to make sure they provide adequate remedies in construction contracts to cater for them.

4. Co-ordination and co-operation of activities through interactive and group communication between consultants (client representatives) and contractors are essential in ensuring that projects are completed successfully

5. Safety should not be seen as peculiar to the contractor but as an integrated scheme encompassing other project team members from designers right to engineers. This could be achieved by developing a safety plan at the beginning of the project to make all stakeholders aware of the roles they are to play regarding safety on site.

It is envisaged that once the above recommendations are taken seriously and employed, the local construction firms in Ghana will be well equipped to fight off competition from foreign contractors and perform better on construction projects they undertake.

REFERENCES

- Adjei, Kumi, T., (2011). *2-Day Training Workshop in Executive Construction Management*. Kumasi, s.n.
- Ahadzie, D.K. and Amoa-Mensah .K., (2010), “Management Practices in the Ghanaian House Building Industry”, *Journal of Science and Technology*, 30(2), pp 62.
- Awal M. S. (2011). “Contractor Selection in Ghana”, *A Thesis he Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology. Kumasi*
- Alwi, S., Hampson, K. & Mohammed, S., n.d. *Effect of Quality Supervision on Rework in the Indonesia Context, Indonesia: s.n*
- Amoah, P., Ahadzie, D. K., and Dansoh, A., (2011). “The Factors Affecting Construction Performance in Ghana”, the Perspective of Small-Scale Building Contractors, *Survey Journal*, 4 (1), pp 41-43.
- Agyei, W., (2015). *Project Planning And Schedulling Using PERT And CPM Techniques With Linear Programming : Case Study.*, 4(08), pp.222–227.
- Ayegba, C., (2013). Assessment of Materials Management on Building Construction Sites. *Journal of Civil and Environmental Research*, 3(5).
- Badu, E. and Owusu-Manu, D., (2011). *A Handout on Plant Management*, Kumasi: IDL.
- Badu, E. & Owusu-Manu, D.-G., (2013). Rural Infrastructure Development in the Volta Region of Ghana; Barriers and Interventions. *Journal of Financial Management of Property and Construction*, 18(2), pp. 142-159.
- Bamisile, A. (2004). *Building Production Management: The Professionals Instruction*. Foresight Press Limited, Lagos-Nigeria.
- Brook, M., (2004). *Estimating and Tendering for Construction Works*. Third ed. London: Elsevier Limited.
- Buertey, T. I .J. and Adjei-kumi, T., (2012) *Cashflow Forecasting In The Construction Industry : The Case Of Ghana*, *Pentvars Business Journal* 6(1), pp.65–81.
- Cassar , G., (2004). Financing of Business Start-ups. *Journal of Business Venturing*, 19(2), pp. 261-283.
- CASA Association (2012). *Africa Adaptation Programme on Climate Change*. Singapore: Mc Graw Hill Publishers.
- Chudley, R. & Greeno, R., (2008). *Building Construction Handbook*. 7th ed. Linacre house, Jordan Hill, Oxfod OX2 8DP, UK: Elsevier Ltd.
- Creswell, W. J., (2003). *Research Design: Qualitative, Quantitative and Mixed Mthods Approaches*. 2nd ed. United States of America: Sage Publications.

- Danso, O.F., (2010). “*Occupational Health and Safety Issues involving Casual Workers on Building Construction Sites in Ghana*”, An MSc Thesis he Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology. Kumasi.
- Darvik, L. & Larsson, J., (2010). *Master's Thesis in the Design and Construction Project Management*, Goteborg, Sweden: Chalmers University of Technology.
- Davies, P., (1997). *Managing Contractors; A guide for employers*. First ed. Surrey: Crown Limited.
- Doherty, M. (1994). *Probability versus Non-Probability Sampling in Sample Surveys*, *The New Zealand Statistics Review* March 1994 issue, pp 21-28.
- Donkor S., (2011). “*Determinants of Business Failure: the perspective of SME'S Building Contractors in the Ghanaian Construction Industry*”, An MSc Thesis Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology. Kumasi.
- Edwards, J. D., Harris, F. C. & McCaffer, R., (2003). *Management of Off-Highway Plant and Equipement*. First ed. London: Spon Press.
- The Factories, Offices and Shops Act, (1970) (Act 328)
- Fugar, F., (2016). *A Handout on Construction Site Administration*, Kumasi: s.n.
- Glasow, P. A., (2005). *Fundamentals of Survey Research Methodology*, Washington C3 Center Mclean, Virginia, U.S.A
- Hackman, J. K., (2015). *A Handout on Construction Site Administration*, Department of Building Technology, Kumasi: s.n
- Hardy, J.V., (1970) *Cash Flow Forecasting for the Construction Industry*, MSc project report, Loughborough University of Technology
- Haslama R.A, Hidea, S.A, Gibbb A.G, Gyia D E, Pavittb T, Atkinsona S and Duffc A R (2005). *Contributing Factors in construction accidents. Applied Ergonomics*, 36(4), pp. 401-415
- Hancock, D. J., (2006). *What value does money play in the motivation of knowledge workers such as project managers*. Bahia, Brazil, IEMC'06.
- Health and Safety Commission. (2003). *Health and Safety Statistics Highlights 2002/03* (HSE Books: Sudbury, Suffolk).
- Hennie, R. B. & Joop, J. H., (2005). Data Collection, Primary Vrs Secondary. *Encyclopedia of Social Measurement*, Volume 1, pp. 593-597.
- Jimoh, R.A., (2012). “*Improving Site Management Practices in the Nigerian Construction Industry*”, *Ethiopian Journal of Environmental Studies and Management EJESM* Vol. 5 No. 4 viewed 1 April 2016, <http://www.sleid.cqu.edu.au/viewissue.php?id=5>

- Kakande, N., (2015). *Subcontractor Management*, Kampala-Uganda: Joint Clinic Research Centre.
- Kheni, N.A., Dainty, A.R.J. and Gibb, A.G.F., (2008). *Health and safety management in developing countries: a study of construction SMEs in Ghana*, *Construction Management and Economics*, 26(11), pp.1159-1169.
- Khyomesh, P. V., (2011). *Construction Materials Management on Project Sites*, s.l.: s.n.
- Kothari, C.R., (1990), *Research methodology-Methods and techniques*, published by New Delhi Wiley eastern limited.
- Laryea, S., (2010). “*Challenges and Opportunities Facing Contractors in Ghana*”, (July), pp. 215-226.
- Longman, A. W., (1997). *Code of Estimating Practice*. Sixth ed. London: Englemere Services Limited.
- Manteau K.E., (2007). “*The Development of an Information Management System for Materials Management in Large Construction Companies Operating in the Ghanaian Construction Industry*”, *An MSc Thesis Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology*. Kumasi.
- Masahudu M., (2015). “*A Study into the Impact of the Architect’s Site Instructions On Construction Project Delivery in Ghana*”, *the Perspective of Small-Scale Building Contractors*, *A Thesis he Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology*. Kumasi.
- Mohamed, S.F. & Anumba, C.J., (2006). *Potential for improving site management practices through knowledge management*, *Construction Innovation: Information, Process, Management*, 6(4), pp. 232 – 249.
- Mohammed, S., (2002). Safety Climate in Construction Site Environments. *Journal of Construction Engineering and Management*, pp.375
- Mehra. S., (2009). Project Communication Management. Accessed from the website: <http://www.scribd.com/doc/7875707/Project-Communications-Summary-bySachin-Mehra>
- Mthalande D, Othman A.A.E and Pearl, R.G., (2008). *The Economic And Social Impacts Of Site Accidents On The South African Society*.
- Naoum, S. G., (2001). *Dissertation Research and Writing for Construction Students* Second ed, Butterworth-Heinemann.
- N’dow, W., (1996). “Policies and Measures for Small Contractor Development in the Construction Industry”
- Obiegbu, M.E., (2012). *Control of Building Production Stages: Requirements for best*

- Practice. *Being a paper presented at the mandatory workshop organised by the Council of Registered Builders of Nigeria at the Confluence Beach Hotel, Lokoja Kogi State, 29th – 31st May.*
- Ofori, G., (2012). “*Developing the Construction Industry in Ghana*” *The Case for a Central Agency*, pp.5
- Oppong F., (2013). “*A Study on Performance of Contractors Selected Using the Lowest Bid Evaluation Method as Major Criteria for Government Projects in Ghana*”, *An MSc Thesis submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology*. Kumasi.
- Pandey I.M., (2002). “*Business Finance*”, Vikas Publishing house PVT, India, First Edition
- Parks, T.B., (2012). Chapter 1 – *Construction Site Management*. , pp.1–10.
- Prempeh, E.O., (2014). “*An Assessment of Productivity Management Practices on Ghanaian Construction Sites*”, *A Thesis Submitted to the Department of Building Technology of the Kwame Nkrumah University of Science and Technology*. Kumasi.
- Resse, C. D. & Eidons, J. V., (2006). *Handbook of OSHA Construction Safety and Health*. Second ed. Boca Raton: Taylor and Francis.
- Sarden, Y. & Engstrom, S., (2010). *Modern Methods of Construction: A Solution for an Industry Characterized by Uncertainty*. Leeds, 26th Annual ARCOM Conference, 6-8.
- Thomas, H. R., Riley, D. R. & Messner, J. I., (2005). Fundamental Principles of Site Material Management. *Journal of Construction Engineering and Management*, 131(7), pp. 808-815.
- Workmen’s Compensation Act (Act 1963)
- Wusuah Affare, M. A., (2012). *An Assessment of Project Communication Mmanagement on Construction Projects in Ghana; A Thesis she submitted to the Institute of Distance Learning, Kwame Nkrumah University of Science and Technology*, Kumasi: s.n.
- www.businessdictionary.com/definition/likert-scale.html (14/06/16)

APPENDICES

APPENDIX 1

QUESTIONNAIRES

This questionnaire is part of a survey being conducted on the **INFLUENCE OF SITE MANAGEMENT PRACTICES ON THE PERFORMANCE OF LOCAL CONTRACTORS IN GHANA**. It is in partial fulfillment for the award of a Master of Science Degree in Construction Management at the Kwame Nkrumah University of Science and Technology, Kumasi. I shall be extremely grateful if you could take part in the survey by responding to the following set of questions. It is purely for academic and research purposes only. Your anonymity is assured and information given shall be treated confidential. Thank you in advance for your assistance in completing the questionnaire.

Please tick [✓] where appropriate **BUSINESS CHARACTERISTICS**

1. Indicate the class of your firm according to the Ministry of Water Resources, Works and Housing classification:

a) D1/K1 []

b) D2/K2 []

2. Please indicate your position in the company

[] Site Supervisor

[] Construction Manager

[] Quantity Surveyor [

] General foeman

Others (please specify.....

3. What form of ownership is your firm?

[] Private Limited Company

[] Partnership

[] Sole Proprietor

[] Public Limited Company

Others (please specify.....

4. Please indicate which type of client your firm works for in one of the following:

a) Private clients []

b) Public/Government clients []

c) Both Private and Public clients []

5. Please indicate how long you have been involved in the construction industry?

[] Less than 5years

[] 5-10 years

[] 10-15 years

[] 15-20 years

Others (please specify.....

6. Please indicate your educational level

[] Hnd

[] Bsc

[] Msc

[] Phd

PART B

7. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

SITE ADMINISTRATION, SUPERVISION AND MANAGEMENT	1	2	3	4	5
Communication management planning within the company					
Implementation of corrective actions during the construction process					
Training of site supervisors					
Balancing of skilled and unskilled labour on projects					
Documentation of issued drawings					
Documentation of site correspondences					
Documentation of site instructions					
Motivation of the labour force					

8. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

COMMERCIAL MANAGEMENT PRACTICES	1	2	3	4	5
Subcontracting					
Cost and value reconciliation					
Credit arrangement with suppliers (material suppliers and plant hirers)					
The use of front and back end rate loading margin systems					
Cash flow management					

9. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

PLANNING, MONITORING AND CONTROL PRACTICES	1	2	3	4	5
Progress reporting					
Cost monitoring and control using software					
Training of on-site staff on the use of techniques and software to control time and cost on projects					
Time control and monitoring using and software					

10. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

LEGAL, HEALTH AND SAFETY PRACTICES	1	2	3	4	5
Operation of an open door policy on safety on site					
Training of safety officers to improve on their performance on safety and relevant legislation on the jobsite					
Provision of safety signs at vantage points to educate and inform workers and visitors on site					
Provision of adequate welfare facilities on site					
Accident reporting and maintenance of records					
Health and safety education of various work trades on site					

11. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

MATERIALS MANAGEMENT PRACTICES	1	2	3	4	5
Stores management					
Materials handling					
Purchasing and inventory management					
Materials waste management					
Materials planning and scheduling					
Information technology (IT) in materials management					

12. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

PLANT MANAGEMENT PRACTICES	1	2	3	4	5
Training and safety education of operators on construction equipment					
Plant and equipment maintenance management					
Planning of the traffic routes to be used by plants on site					
Insurance and licensing legalities management of plant and equipment					
Plant information management					

13. Kindly indicate on the Likert scale the extent to which you employ the following practices.

Never = (1), Rarely = (2), Sometimes = (3), Often (4) or Very Often = (5)

CONSTRUCTION METHODS	1	2	3	4	5
Supervision or labour management					

Adherence to specifications agreed on in construction contracts					
Adequate preservation and storage of materials before use					
Testing or checking of site conditions to come out with realistic method statements and planning of the works					

PART C

14. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

Very low influence =1 Low influence =2 Moderate influence =3 High influence =4 Very high influence =5

PLANT MANAGEMENT FACTORS	1	2	3	4	5
Training and safety education of operators of construction equipment					
Ignoring inspection and servicing of plant and equipment completely					
Plant maintenance choices employed by the company					
Planning of the traffic routes to be used by plants on site					
Company's extensive knowledge on insurance and licensing legalities associated with plant management fraternity or industry					
Others please specify					

15. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

Very low influence =1 Low influence =2 Moderate influence =3 High influence =4 Very high influence =5

COMMERCIAL MANAGEMENT PRACTICES	1	2	3	4	5
Inaccurate measurement by the quantity surveyor					
Delay in receiving payment for work done from clients					

The use of front and back end rate loading margin systems					
Credit arrangement with suppliers (material suppliers and plant hirers)					
Increased capital lock up which may results from extra work by clients					
No cash flow management system employed by the company					
Delay in works carried out by domestic subcontractors employed on projects					
Others please specify					

16. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

**Very low influence =1 Low influence =2 Moderate influence =3 High influence =4
Very high influence =5**

MATERIALS MANAGEMENT PRACTICES	1	2	3	4	5
Inadequate storage facilities					
Doubling handling of materials					
Stores layout on construction sites					
Training of personnel in charge of materials management on site.					
Material waste by workers					
Confrontation among sub-contractors due to the lack of storage space on-site					
Materials management entrusted in the hands of a single individual (overload)					
Lack of a materials management department solely responsible for materials management on site					
Timely delivery of materials					
The use of IT in materials management on site					
Others please specify					

17. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

**Very low influence =1 Low influence =2 Moderate influence =3 High influence =4
Very high influence =5**

PLANNING, MONITORING AND CONTROL	1	2	3	4	5
Life cycle costs associated with cost controls systems					

The availability of all necessary information at the start of the project to allow for practicable methods statements to be developed					
knowledge and technical expertise on the use of cost control techniques					
knowledge and technical expertise on the use of cost control software					
knowledge and technical expertise on the use of time planning and control techniques					
Knowledge and technical expertise on the use of time planning software					
The type of cost control technique employed					
The type of time control technique employed					
Others please specify					

18. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

**Very low influence =1 Low influence =2 Moderate influence =3 High influence =4
Very high influence =5**

LEGAL, HEALTH AND SAFETY PRACTICES	1	2	3	4	5
Invitation of the local authority on regular occasions to inspect and certify all stages of development works during the course of construction					
Operation of an open door policy on safety on site					
Training of safety officers to improve on their performance on safety and relevant legislation on the jobsite					
Provision of safety signs at vantage points to educate and inform workers and visitors on site					
Provision of adequate welfare facilities on site					
Accident reporting and maintenance of records					
Compliance of workers to wearing safety gears					
Health and safety education of the various work trades on site					
Others please specify					

19. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

**Very low influence =1 Low influence =2 Moderate influence =3 High influence =4
Very high influence =5**

SITE ADMINISTRATION, SUPERVISION AND MANAGEMENT	1	2	3	4	5
Clear lines of communication within the contractor's organization					
Communication between the client representatives and the contractor					
Poorly drafted contract documentation by consultants					
Communication barriers such as semantics, timing of information, message overload, filtering etc.					
Non implementation of corrective actions during the construction process					
Training of supervisors					
Inadequate motivation of the labour force					
Unequal balance of skilled and unskilled labour					
Documentation of issued drawings					
Documentation of site correspondences					
Progress reporting					
Documentation of site instructions					
Others please specify					

20. Kindly indicate on the Likert scale the degree of influence the site management practices have on the performance of your firm.

**Very low influence =1 Low influence =2 Moderate influence =3 High influence =4
Very high influence =5**

CONSTRUCTION METHODS	1	2	3	4	5
Inadequate curing procedures					
Stripping formwork too early					
Insufficient concrete cover					
Treatment of wood before being used					
Testing of soil not carried before works are carried out especially in high rise buildings					
The use of reinforcement bar diameters that do not suite the intended purpose					
Others please specify					

APPENDIX 2

OVERALL RANK OF SITE MANAGEMENT FACTORS THAT INFLUENCE PERFORMANCE

SITE MANAGEMENT PRACTICES	Frequency					WEIGHTING (EW)	RII	RANK
	1	2	3	4	5			
Documentation of site instructions	-	2	5	12	14	137	0.88	1 st
Provision of safety signs at vantage points to educate and inform workers and visitors on site of prevailing conditions	-	2	3	13	13	130	0.84	2 nd
Timely delivery of materials	-	3	4	10	14	128	0.83	3 rd
Progress reporting	1	2	4	10	14	127	0.82	4 th
Health and safety education of the various work trades on site	1	-	7	11	12	126	0.81	5 th
Inaccurate measurement by the quantity surveyor	1	3	3	11	13	125	0.81	5 th
Communication between the client representatives and the contractor	2	2	4	13	11	125	0.81	5 th
Accident reporting and maintenance of records	1	-	4	18	8	125	0.81	5 th
Compliance of workers to wearing safety gears	1	3	3	12	12	124	0.80	9 th
Material waste by workers	2	3	6	12	10	124	0.80	9 th
Delay in receiving payment for work done from clients	2	4	5	12	10	123	0.79	11 th

Delay in works carried out by domestic subcontractors employed on projects	4	3	4	14	8	122	0.79	11 th
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Treatment of wood before being used	-	1	2	12	13	121	0.78	13 th
Inadequate curing procedures	1	4	7	9	11	121	0.78	13 th
Testing of soil not carried before works are carried out especially in high rise buildings	-	1	3	10	14	121	0.78	13 th
The type of cost control technique employed	3	3	5	13	9	121	0.78	13 th
Stores layout on construction sites	-	4	6	10	11	121	0.78	13 th
knowledge and technical expertise on the use of cost control techniques	1	4	6	12	9	120	0.77	18 th
Training and safety education of operators of construction equipment	-	3	6	14	8	120	0.77	18 th
Provision of adequate welfare facilities on site	-	1	3	16	9	120	0.77	18 th
Training of personnel in charge of materials management on site.	-	-	11	8	11	120	0.77	18 th
Non implementation of corrective actions during the construction process	1	2	6	14	8	119	0.77	18 th
Inadequate storage facilities	-	4	7	10	10	119	0.77	18 th

Training of safety officers to improve on their performance on safety and relevant legislation on the jobsite		1	3	18	7	118	0.76	24 th
Increased capital lock up which may results from extra work by clients	2	4	3	16	7	118	0.76	24 th

The type of time control technique employed	1	1	6	14	8	117	0.75	26 th
Documentation of site correspondences	1	3	5	10	11	117	0.75	26 th
Communication barriers such as semantics, timing of information, message overload, filtering etc.	2	5	5	10	10	117	0.75	26 th
Clear lines of communication within the contractor's organization	2	2	5	10	11	116	0.75	26 th
The use of reinforcement bar diameters that do not matches the intended purpose	-	2	5	13	9	116	0.75	30 th
Documentation of issued drawings	2	3	8	12	7	115	0.74	30 th
Doubling handling of materials	3	1	4	17	6	115	0.74	30 th
Inadequate motivation of the labour force	1	3	8	12	7	114	0.74	30 th
knowledge and technical expertise on the use of cost control software	1	5	5	12	8	114	0.74	30 th

Poorly drafted contract documentation by consultants	2	1	8	10	9	113	0.73	35 th
Training of site supervisors	1	3	7	12	7	111	0.72	35 th
Stripping formwork too early	1	3	5	11	9	111	0.72	35 th
Insufficient concrete cover	1	2	3	8	13	111	0.72	35 th
Knowledge and technical expertise on the use of time planning and monitoring software	1	2	5	14	7	111	0.72	35 th
No cash flow management	1	4	7	11	7	109	0.70	40 th

system employed by the company								
Credit arrangement with suppliers (material suppliers and plant hirers)	1	2	5	17	4	108	0.70	40 th
Plant maintenance choices employed by the company	3	2	8	13	5	108	0.70	40 th
The availability of all necessary information at the start of the project to allow for practicable methods statements to be developed	1	5	8	12	5	108	0.70	40 th
Planning of the traffic routes to be used by plants on site	2	2	8	13	5	107	0.69	40 th
knowledge and technical expertise on the use of time planning and control techniques	4	4	6	15	5	106	0.68	45 th

Company's extensive knowledge on insurance and licensing legalities associated with plant management fraternity or industry	1	4	9	10	6	106	0.68	45 th
Materials management entrusted in the hands of a single individual (overload)	2	6	5	8	9	106	0.68	45 th
Lack of a materials management department solely responsible for materials management on site	-	5	6	12	6	106	0.68	45 th
Life cycle costs associated with cost controls systems	1	5	7	12	5	105	0.68	49 th
Operation of an open door policy on safety on site	4	6	8	11	4	105	0.68	49 th
Ignoring inspection and servicing of plant and equipment completely	4	3	4	13	6	104	0.67	51 st
The use of front and back end rate loading margin systems	1	3	12	9	5	104	0.67	51 st
The use of IT in materials management on site	-	3	10	8	6	98	0.63	53 rd
Invitation of the local authority on regular occasions to inspect and certify all stages of development works during the course of construction	4	8	5	9	5	96	0.62	54 th

Confrontation among subcontractors due to the lack of storage space on-site	1	5	4	9	6	89	0.57	55 th
Unequal balance of skilled and unskilled labour	1	1	5	9	6	84	0.54	56 th

