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COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

**COST PERFORMANCE OF CONSTRUCTION
PROJECTS IN ACCRA METROPOLITAN
ASSEMBLY**

**A Dissertation submitted to the Department of Building Technology in
partial fulfillment of the requirements for the award of Master of Science
(MSc) in Construction Management**

BY

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OCTOBER, 2014

DECLARATION

I hereby declare that this submission is my own work towards the award of MSc. Construction Management and that, to the best of my knowledge, it contains no material 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 in the text.

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ABSTRACT

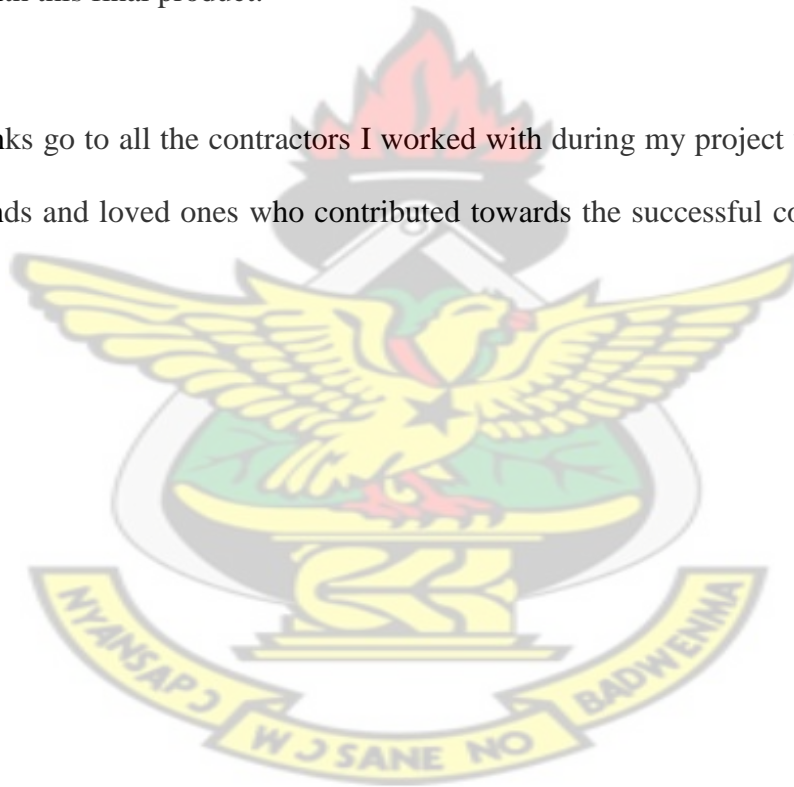
The Accra Metropolitan Assembly (A.M.A) is one of the local authorities in Ghana, which by statute has considerable responsibility towards providing the needed infrastructure in its area of jurisdiction. This commission can only be achieved through good coordination among both stakeholders that is the A.M.A and contractors who work in the metropolis. This research aimed at assessing cost performance of construction projects in A.M.A by identifying the key performance indicators used in measuring construction performance, identifying the causes of cost overruns and making recommendations to control cost in the construction industry. A literature review was deployed to generate a set of factors believed to affect project cost performance, which included examining other peoples work (dissertations),using the website etc. on the subject area. A total of fifty (50) structured questionnaires were distributed to contractors working on A.M.A projects. Forty Five (45) questionnaires were received from the respondents and the results were analyzed and presented using descriptive statistics and the ranking theory method. The survey findings indicate that material price fluctuation, differentiation of currency prices, high cost of machinery, inaccurate/poor estimation of original cost and incessant variation/change order were the first five factors out of the seventeen factors causing cost overruns in projects administered by A.M.A. Based on the findings, the study recommends that: 1)there should be appropriate scope definition; 2)there should be proper project costing and financing and finally; 3)contractors should use competent personnel in managing their projects.

ACKNOWLEDGEMENT

First of all, I give thanks and glory to Jehovah for giving me life and strength to carry out this study.

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Finally my thanks go to all the contractors I worked with during my project work, my course mates, my friends and loved ones who contributed towards the successful completion of this project.



DEDICATION

I dedicate this work to my loving wife, LAWRVETTE KESSEWAH NYENKU, my parent, EDDIE OSMOND YENKU, and JULIANA ABENA YENKU for their selfless, relentless and unwavering contribution towards my education and my life in general.

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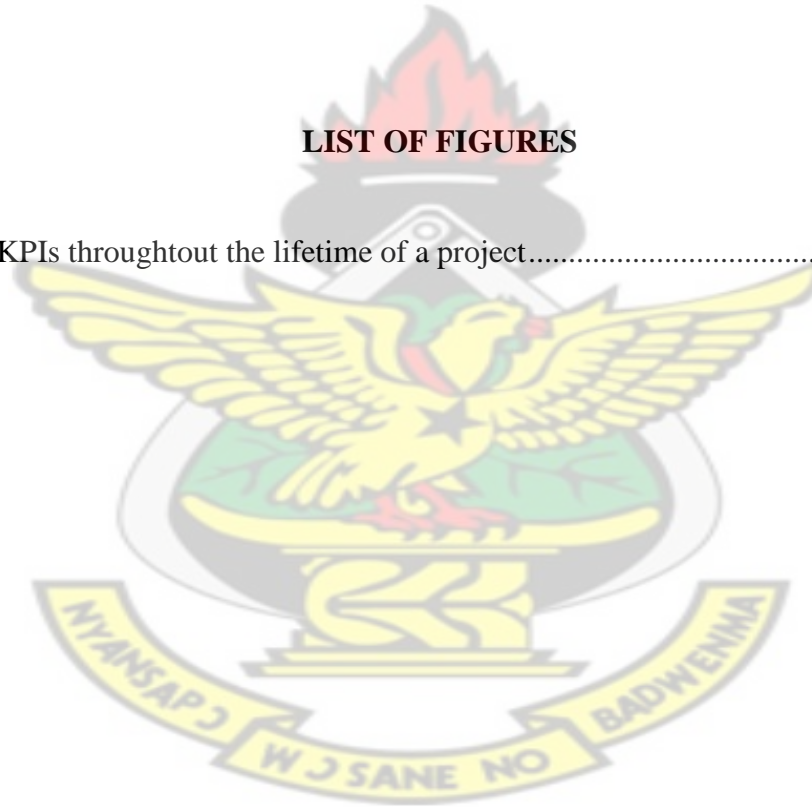
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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Construction projects, an element of infrastructure development, are key drivers of economic growth of a country. In countless ways, the pace of economic growth of any nation can be measured by the development of physical infrastructures, such as buildings, roads and bridges (Takim and Akintoye, 2000). The Construction Industry accounts for around 10% of the world's gross domestic product and provides 7% of global employment (Fiona, 2007). According to Chitkara (2004), the construction industry in many countries accounts for 6-9% of the Gross Domestic Product (GDP); and according to Bhimaraya (2001); it reaches up to 10% of the GDP of most countries. Currently, the construction industry's share of GDP and contribution to growth are 8.9% and 1.0% respectively in Ghana (ISSER, 2007). Construction project development involves numerous parties, various processes, different phases and stages of work and a great deal of input from both the public and private sectors, with the major aim being to bring the project to a successful conclusion. The level of success in carrying out construction project development activities will depend heavily on the quality of the managerial, financial, technical and organizational performance of the respective parties, while taking into consideration the associated risk management, the business environment, and economic and political stability (ibid). The finished product in any industry requires satisfying a certain standard to provide customer satisfaction and value for money. In the construction industry, achieving quality of the finished product is no less than in any other industry (Chan and Tam, 2000).

A construction project is acknowledged as successful when it is completed on time, within budget, and in accordance with specification and in accordance to stakeholder's satisfaction (Takim and Akintoye, 2002). This dissertation basically looks at cost performance of construction projects in the Accra Metropolitan Assembly (A.M.A).

Many authors affirmed that construction projects usually present delays and cost overruns. These overruns are considered a critical issue in this business because they represent a loss of money for the contractors and owners. This idea was also suggested by Morris and Hough (1987) who stated that, although the management of projects has been studied for many years, most projects either failed or present cost and time overruns. Many projects are cancelled due to the lack of proper management which causes expenditures of significant amount of money over the original budget (ibid). This idea was reinforced by Leeman (2007) who also suggested that the failure of projects has increased in construction projects because the project contractors and owners do not use management methodologies that are useful to distribute resources properly.

The failure of construction projects has been discussed by many authors, who have not agreed on a single method to measure success in a project. However, Morris and Hough (1987) suggested three different measures to recognize if a project is successful or not. Firstly, they mentioned the project functionality which means that the project should function technically and financially. Secondly, the authors proposed a second measure about the management of the project, which indicates if the project meets the budget and schedule targets. Finally, the project should be evaluated depending on the performance of the contractors which analyze if they provide services that benefit the project. On the other hand, many other authors measure the success of a construction project assessing

the time performance, cost performance and the final quality of the project (Chan *et al.*, 2004). Therefore, there is not a unique way of determining success in a project; however, cost performance is a critical issue to be considered in the success or failure of project.

1.2 PROBLEM STATEMENT

In Ghana the construction industry especially government funded projects is plagued with various problems of cost overrun and with its manifold effects such as tying down the clients' capital, project abandonment and liability of firm to bad debt or bankruptcy. The most serious signal being that it sends wrong signals to foreign donors thereby slowing down the national growth.

It is very important to find the major causes of cost overrun in the construction projects in the District Assemblies so as to determine an optimal approach to reducing the negative impact it has on projects.

It is however not clear on the understanding of the stakeholders what the causes of cost overruns are and what needs to be done in preventing or minimizing the occurrence. This study seeks to offer knowledge which will help stakeholders gain much insight on the underlying causes of construction cost overruns and also offer recommendations that would help reduce the occurrence of cost overruns.

1.3 AIM OF STUDY

The aim is to assess cost performance of construction projects in Accra Metropolitan Assembly by identifying the causes of cost overruns and making recommendations to control cost in the construction industry.

1.4 OBJECTIVES OF STUDY

The objectives of this study are:

- To identify the Key Performance Indicators (KPIs) employed in measuring performance of construction projects.
- To identify the various factors that interplay in impacting construction cost performance in Accra Metropolitan Assembly.
- To recommend ways of curtailing the effects of cost overruns.

1.5 RESEARCH QUESTIONS

The study was guided by the following research questions:

- What are key performance indicators in construction projects?
- What are the main causes of cost overruns in construction project administered by A.M.A?
- What are the success factors that can help control cost overruns in the construction projects in A.M.A?

1.6 SCOPE OF STUDY

The study focused on the Construction Industry in Ghana and examined the causes of cost overruns in A.M.A projects. Accra Metropolis was chosen because it is the commercial hub of the country.

The area of study is limited to D1/K1 and D2/K2 contractors and this is because of their dominance in the Accra Metropolis.

1.7 RESEARCH METHODOLOGY

In addressing the key research questions mentioned earlier, it is important to adopt an approach which would enable appropriate data collection, analysis and interpretation of the findings for the benefit of practitioners and researchers. Subsequently, as in most researches, the study commenced with an extensive literature review to help provide a deep understanding of the recent development in the methodologies used for measuring the performance of contractors at local government levels. The literature review provides insightful opportunity to identify an appropriate theoretical framework for the study. Thereafter structured questionnaire was used to elicit the relevant data and analyzed by the Relative Index Technique.

1.8 ORGANIZATION OF CHAPTERS

The dissertation consists of five (5) chapters which are as follows:

Chapter One: this chapter covers the background of the study, the problem statement, the aim and objectives, scope, methodology and the general organization of the study.

Chapter Two: this chapter covers the review of literature concerning the subject matter.

Chapter Three: this chapter deals basically with the collection of data by means of questionnaires.

Chapter Four: covers analysis and discussion of the data collected.

Chapter Five: the recommendations and conclusion based on the outcome of the analysis are outlined and elaborated in this chapter.

1.9 SUMMARY

The background of the study including the problem statement, aim and objectives, scope, and research methodology have been presented. The next chapter (i.e. chapter two) introduces the literature review (review of previous work relating to research problem (to define, explain, justify) review of previous work relating to methodology (to define, explain, justify) review of previous.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The review of related literature is extensively done in this chapter to identify existing knowledge and gap on factors affecting the performance of construction projects (Key Performance Indicators, with a central focus on construction cost performance. This section of the dissertation therefore examines various factors that interplay in impacting construction cost performance. It also includes definition of terms and provides the reader with an idea about what the current situation in terms of what has been done. The chapter will conclude with a summary of the issues discussed.

2.2 DEFINITIONS AND CONCEPTS

Okuwoga (1998) indicated that the performance of the construction industry is considered as a source of worry to both public and private sector clients. Karim and Marosszeky (1999) researched into performance measurement using Key performance indicators (KPIs). KPIs enable a comparison between different projects and enterprises to identify the existence of particular patterns. The specialist contractors hoped that the data trends observed will provide insight into certain inefficiencies that are prevalent in the market. They intend to use the data to expose these inefficiencies and as a basis for industry development (Karim and Marosszeky, 1999).

Key performance indicators (KPIs) include factors such as time, cost, quality, client satisfaction; client changes, business performance and safety in order to enable measurement of project and organizational performance throughout the construction industry. This

information can then be used for benchmarking purposes, and will be a key component of any organization move towards achieving best practice (DETR, 2000). Lehtonen (2001) specified that performance measurement is a current issue in academia, as well as in business community. Samson and Lema (2005) stated that KPIs are very significant in order to deliver value to stakeholders. So, companies must be sure they have right processes and capabilities in place. The KPIs also allow to trace which processes and capabilities must be competitively and distinctive, and which merely need to be improved or maintained.

Five key steps have been identified as shown in Figure 2.1 (DETR, 2000), in order to define the KPIs throughout the lifetime of a project.

A. Commit to Invest: the point at which the client decides in principle to invest in a project, sets out the requirements in business terms and authorizes the project team to proceed with the conceptual design.

B. Commit to Construct: the point at which the client permits the project team to start the construction of the project.

C. Available for Use: the point at which the project is available for substantial occupancy or use. This may be in advance of the completion of the project.

D. End of Defect Liability Period: the point at which the period within the construction contract during which the contractor is obliged to rectify defects ends (often 6 months from point C).

E. End of Lifetime of Project: the point at which the period over which the project is employed in its original or near original purpose ends. As this is usually many years after the project's completion, this is a theoretical point over which concepts such as full life costs can be applied.

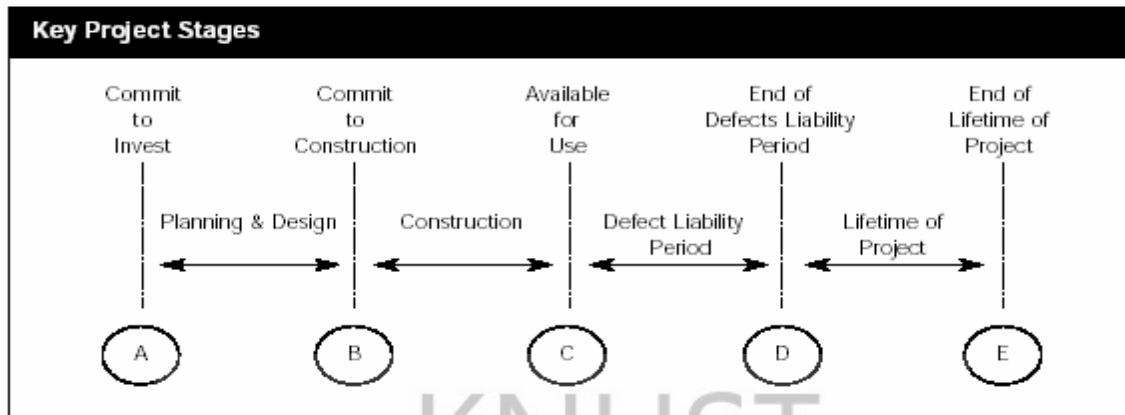


Fig. 2.1 KPIs throughout the lifetime of a project (Source: DETR, 2000)

Performance measurement and its indicators had been studied for a number of years. Karim and Marosszeky (1999) defined performance measurement as an operational management accounting including financial and non-financial performance indicators. Karim and Marosszeky (1999) specified that performance measurement is a process of re-thinking and re-evaluation of business processes to achieve substantial performance improvements of projects. Reichelt and Lyneis (1999) defined performance measurement as a model which treat project as the complex dynamic system.

The key performance indicators are identified by DETR (2000) as an applicable indication of project and/or company levels. In some cases the company indicator is the average value of that company's project indicators. Al-Momani (2000) identified that the owner satisfaction for performance can be defined as the gap between what the owner presumes and the level of performance they believe is being provided by the contractors. Lehtonen (2001) stated that performance measurement is a basis for progressive improvement and monitoring of company productivity. Chan and Kumaraswamy (2002) remarked that project performance measurement include time, budget, safety, quality and overall client satisfaction. Thomas

(2002) defined performance measurement as monitoring and controlling of projects according to regular basis. Kuprenas (2003) stated that project performance measurement means an improvement of cost, schedule, and quality for design and construction stages. Long et al (2004) stated that a project performance measurement is related to many indicators such as time, budget, quality, specifications and stakeholder's satisfaction.

Navon (2005) defined performance measurement as a assessment between the anticipated and the actual performances. Ugwu and Haupt (2007) categorized the key performance indicators as site-specific and project-specific. Early Contractor Involvement (ECI) and Early Supplier Involvement (ESI) give contractors and suppliers the opportunity to give advice and/or specific ideas earlier to enhance performance.

According to previous studies, concepts and definitions, it can be said that the performance measurement is a process that include factors as Key Performance Indicators (KPIs) such as time, cost, quality, client satisfaction; productivity and safety in order to enable measurement of current organizational project performance and to achieve significant performance improvements of future projects.

2.2.1 PROBLEM OF PERFORMANCE IN CONSTRUCTION INDUSTRY

The failure of any construction project is mainly related to the problems and failure in performance. Moreover, there are many reasons and factors which attribute to such problem. Ogunlana et al, (1996) stated that the construction industry performance problems in developing economies can be grouped into three layers: problems of shortages or

inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies.

Okuwoga (1998) identified that the performance problem is related to poor budgetary and time control. Long et al, (2004) remarked that performance problems arise in large construction projects due to many reasons such as: incompetent designers/contractors, poor estimation and change management, social and technological issues, site related issues and improper techniques and tools.

Navon (2005) stated that the main performance problem can be divided into two groups: (a) unrealistic target setting (i.e., planning) or (b) causes originating from the actual construction (in many cases the causes for deviation originate from both sources). Kim et al, (2008) stated that international construction projects performance is affected by more complex and dynamic factors than domestic projects; frequently being exposed to serious external uncertainties such as political, economical, social, and cultural risks, as well as internal risks from within the project.

2.2.2 CONSTRUCTION PROJECTS AND PERFORMANCE

Success of construction projects depends mainly on success of performance. Many previous researches have studied performance of construction projects. Dissanayaka and Kumaraswamy (1999) remarked that one of the principle reasons for the construction industry's poor performance has been attributed to the inappropriateness of the chosen procurement system. Reichelt and Lyneis (1999) remarked three important structures

underlying the dynamic of a project performance which are: the work accomplishment structure, feedback effects on productivity and work quality and effects from upstream phases to downstream phases. Thomas (2002) identified the main performance criteria of construction projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting.

Chan and Kumaraswamy (2002) stated that construction time is increasingly significant because it often serves as a crucial benchmarking for evaluating the performance of a project and the efficiency of the project organization. Cheung et al (2004) identified project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication.

Navon (2005) stated that a control system is an important component to identify factors affecting construction project effort. For each of the project goals, one or more Project Performance Indicators (PPI) is needed. Pheng and Chuan (2006) obtained that human factors played an important role in determining the performance of a project. Ugwu and Haupt (2007) remarked that both early contractor involvement (ECI) and early supplier involvement (ESI) would minimize constructability-related performance problems including costs associated with delays, claims, wastages and rework.

2.2.3 KEY PERFORMANCE INDICATORS

Karim and Marosszeky (1999) defined the purpose of KPI's as to enable a comparison between different projects and enterprises to identify the existence of particular patterns. Dissanayaka and Kumaraswamy (1999) used different representation values to evaluate time and cost performance such as project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, external condition. Karim and Marosszeky (1999) stated that the development and use of key performance indicators (KPI's) can help to identify dysfunctional procurement process. Karim and Marosszeky (1999) studied the development of key performance indicators to measure performance such as cost of pricing the tender as a percentage of contract value, number of times base tender price changed, time from the first tender to actual award of contract, average delay in payment of base claim, average delay in payment of agreed variations, average time for approval of agreed variations.

Samson and Lema (2002) remarked that characteristics of emerging performance measurement indicators need analysis of both the organization and environment such as: nature of work, global competition, quality awards, organizational role, external demands. The indicators should be able to identify causes of problems, address all possible performance drivers, and identify potential opportunities for improvement.

Cheung et al (2004) remarked seven main key indicators for performance which are: time, cost, quality, client satisfaction, client changes, business performance, and safety and health. Navon (2005) stated that a number of research efforts to fully automate project performance control of various project performance indicators have been carried out in recent years. These

are also briefly described together with the concept of measuring indirect parameters and converting them into the sought indicators. These are (1) labor and earthmoving productivity based on measuring the location of workers or earthmoving equipment at regular time intervals; (2) progress based on the above data; (3) a comprehensive control of construction materials starting by monitoring orders and purchasing up to the movement of the materials on site.

Pheng and Chuan (2006) stated that project performance can be determined by two common sets of indicators. The first set is related to the owner, users, stakeholders and the general public which are the groups of people who will look at project performance from the macro viewpoint. The second are the developer, a non-operator, and the contractor which are the groups of people who will look at project performance from the micro viewpoint. Jin et al (2006) studied the relationship-based factors that affect performance of general building projects in China. Thirteen performance metrics was used to measure the success level of construction projects. These factors were categorized into four groups namely cost, schedule, quality and relationship performance. It was recommended that foreign firms that have entered or are going to enter the Chinese construction industry should learn how to build cooperative and harmonious relationships with Chinese partners and finally achieve satisfactory project performance by paying sufficient attention to the aforementioned factors.

Ugwu and Haupt (2007) developed and validated key performance indicators (KPI) for sustainability appraisal using South Africa as a case study. It used four main levels in a questionnaire to identify the relative importance of KPI. The main indicators were: economy,

environment, society, resource utilization, health and safety and project management and administration. Luu et al, (2007) provided nine key performance indicators (KPIs) which can be applied to measure project management performance, PMP and appraise potential contractors as well as their capacity by requesting these indices.

2.2.4 PROJECT SUCCESS AND PROJECT PERFORMANCE

Al-Momani (2000) stated that the success of any project is related to two important features, which are service quality in construction delivered by contractors and the project owner's expectations. Managing the construction so that all the participants perceive equity of benefits can be crucial to project success. It is obtained that the complete lack of attention devoted to owner's satisfaction contributes to poor performance. Declining market shares, low efficiency and productivity, and the rapid construction cost escalation also lead to poor performance. Nitithamyong et al, (2004) remarked that the success of construction projects depends upon technology, process, people, procurement, legal issues, and knowledge management which must be considered equally.

Pheng and Chuan (2006) defined project success as the completion of a project within acceptable time, cost and quality and achieving client's satisfaction. Project success can be achieved through the good performance indicators of the project. So, success refers to project success and performance refers to performance of indicators such as project managers. Wang and Huang (2006) stated that Project success has been widely discussed in the project management (PM) literature. The focus of most studies of project success is on dimensions of project success (how to measure it) and factors influencing project success. Wang and

Huang (2006) studied that how the engineers evaluate project success and to what extent key project stakeholders' performance correlates with project success. It is obtained that project owners play the most important role in determining project success, and project management organizations' performance as the single point of project responsibility has significant correlations with project success criteria.

Lam et al, (2007) stated that the allocation of risk among the contracting parties in a construction contract is an important decision leading to the project success.

2.3 COST PERFORMANCE

“Cost is among the major consideration throughout the project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success” (Azhar et al., 2008:7). Gido and Clements (2003) mentioned that cost performance is an effective technique in project management effort expended and it is widely accepted in the literature and industry. Earned Value Analysis (EVA) is used to evaluate cost performance of different types of projects. Cost control, cost estimating, and cost budgeting are three cost related processes that interact among each other and with other scopes of construction projects.

Besides that, Gido and Clements (2003) indicated that there are four cost-related measures in cost performance analysis which are used to analyze cost performance of a project. The measure is used to evaluate the project whether the project is being performed within the budgeted cost or whether it is in line with the actual cost. The four cost-related measures are

TBC (total budgeted cost), CBC (cumulative budgeted cost), CAC (cumulative actual cost), and CEV (cumulative earned value).

Normally, cost estimation will be made before start of project so that it can be controlled within cost budget. A project may require more than one person and may occur more than once during the life of a project which depends on the complexity of the project. It may be very simple or extremely complex when managing the cost of project. In project management, it should also consider the needs of project stakeholders in the project cost (Gido and Clements, 2003).

2.3.1 COST OVERRUN

Cost overrun is a very common phenomenon and majority of projects in the construction industry is faced with this problem. Avots (1983) in a study conducted indicated that cost overrun occurs when the final cost or expenditure of the project exceeds the original estimation cost. Angelo and Reina (2002) pointed out that cost overrun is one of the main problems in construction industry. The problem may be found in both developing and developed countries. There are some contributing factors to cost overrun in construction industry which are found from the researchers' study. The factors are as follows:

2.3.1.1 INACCURATE OR POOR ESTIMATION OF ORIGINAL COST

Peeters and Madauss (2008) pointed out that the biggest factor that contributes to overruns of budget is inaccurate estimation of original or initial cost of a project. It is because of technical problem on how to estimate project costs and also not enough project information is

available in the early stage of project. Also in a study conducted by Elinwa et al, (2001) in the Nigerian construction industry, project cost underestimation was identified as an important factor contributing to cost overruns.

2.3.1.2 INADEQUATE PLANNING

According to Frimpong (2003), improper planning and management experience limitation causes project failures. The processes to produce a product become very slow and take longer period to complete the project. Flyvbjerg et al, (2003) also confirmed that inadequate or improper planning was a major setback in achieving project success.

2.3.1.3 INCESSANT VARIATION/CHANGE ORDER

Aibinu and Jagboro (2002) identified in a study conducted that incessant variation or change orders were among the highest contributing factor causing cost overrun in the construction industry. A change order broadening the scope of the contractor would cause an increase in the initial cost since that was not part of the initial agreement.

2.3.1.4 CHANGE IN PROJECT DESIGN

According to Long et al, (2008), poor designs and change in project designs are caused by poor competent designers especially for government funded projects. The unrealistic design which is later found after the start of construction projects has to be changed leading to cost overrun as a results of delay in construction time.

2.3.1.5 POOR CONTRACT MANAGEMENT

The role of the contract or project manager or project management team is probably the most important element in controlling and/ managing the costs of a construction project. It is often true that a good project, if combined with poor project management, will usually face serious difficulties.

According to User's Guide (2005), a poor project management structure will have an impact at all stages of the construction process leading to:

- Lack of planning and coordination;
- Poor communication between members of the project team and the project sponsor;
- Failure to identify problems and institute necessary and timely design and programming changes;
- Lack of control over time and cost inputs; and
- Lack of end user involvement.

Good project management manages costs by estimating, scheduling, accumulating and analyzing cost data and finally implementing measures to correct problems related to cost.

2.3.1.6 MATERIAL PRICE INFLATION

Price fluctuation causes cost overruns in most cases where it is hard to estimate the cost accurately because it is objective. This happens as a result of high inflation of price in developing countries or the speculation of suppliers (Long et al, 2008).

Adamson (1996) defined inflation as the rate of increase in general price level in an economy. Effects of inflation have been identified to cause loss of profits and higher cost overruns to the project owners. Estimates or construction rates are based on prices at a

particular point in time. Hence, the prices are only relevant only for that time and the near future. Pohl and Mihaljek (1992) observed that unexpected inflation is the primary cause of cost overruns.

2.3.1.7 COST OF REWORK

According to Love (2002b) rework has various definitions and interpretations within the construction management literature: terms for it include “quality deviations” (Burati et al, 1992), “nonconformance” (Abdul-Rahman, 1995), “defects” (Josephson and Hammarlund, 1999), and “quality failures” (Barber et al, 2000). Love et al, (2000) characterize rework as the unnecessary effort of redoing a process or activity that was incorrectly implemented the first time.

Several studies have explored the cost of rework in the construction industry. Research conducted by Construction Industry Institute (CII) reports that direct costs caused by rework average 5% of total construction costs (CII, 2005). Josephson and Hammarlund (1999) estimated that the cost of rework on residential, industrial, and commercial building projects ranges from 2 to 6% of contract values. Similarly, Love and Li (2000) found that the costs of rework for residential and industrial building projects are on average 3.15 and 2.4% of the contract values, respectively. The nonconformance costs excluding material wastage and head office overhead of a highway project are estimated to be 5% of the contract value (Abdul- Rahman 1995). These authors suggest that nonconformance costs may be significantly higher on projects where poor quality management is found. The potential for such significant losses make it critical that rework costs should not be overlooked in efforts to improve project cost performance.

2.3.1.8 DIFFERENTIATION OF CURRENCY PRICES

The change in foreign exchange rate is particularly relevant if materials or other elements of the construction project are being purchased from foreign countries. If the foreign exchange rates change beyond the expected level; then the cost of the project may increase which automatically lead to cost overrun (Morgah, 2013).

2.3.1.9 HIGH COST OF MACHINERY

Chan and Park (2005) found that high cost of machineries is one of the costly resources in the construction industry. Construction industry is mainly market driven where it is influenced by current market style. For example, when the oil needed to run machineries increases, the rental cost of machineries also shoots up.

2.3.1.10 OBSOLETE/UNSUITABLE CONSTRUCTION EQUIPMENT AND METHODS

Obsolete and unsuitable equipment and methods cause the progress of construction works to become slow. Some countries try to import or transfer the modern technology into their countries. However, the method is unsuccessful because they lack skillful human to operate the technology (Long et al., 2004a).

2.3.1.11 INSUFFICIENT FUND

Long et al. (2008) noted that delay of the projects followed by cost increasing to cover all the expenses during construction was a result of cash flow problems. Owners do not prepare sufficient fund for project and pay on time as shown in contract agreement to contractor.

2.3.1.12 UNFORESEEN SITE CONDITIONS

Nega (2008) found that actual site conditions of a project are not usually determined until excavation is completed. It is sometimes possible that site conditions are overlooked by the initial review or conditions have changed due to change of weather conditions or subsoil conditions. The unexpected conditions on sub surface sometimes require fundamental redesign of projects with high expense. Changes in site conditions can lead to problems for moving machinery and supplies around the site, and in undertaking excavations and laying foundations. This can also increase costs and add to the construction time required.

2.3.1.13 FORCE MAJEURE

This term covers a range of events which are also commonly referred to as “Acts of God”. They include revolution, war, riot, earthquake, landslide, fire, political and economic instability, projectile missile, hostilities, contamination and other such risks. Where they do occur, they will normally lead to significant delays and cost overrun to construction projects (Morgah, 2013).

Acts of God are beyond the control of the key stakeholders. However, if adequate insurance cover is taken against such acts the impact of their occurrence would be almost negligible.

2.3.1.14 UNPREDICTABLE WEATHER CONDITION

In a study conducted by Belassi and Tukel (1996) external environment factors, such as weather and social environment, were considered so influential that they can cause failure of the project during the implementation stage.

2.3.1.15 PROJECT SITE LOCATION

Pilcher (1994) stated in a study conducted that among the many factors that influenced the final cost of a project is the location. The further the project location is from the materials needed in the execution, the higher the project cost.

2.3.1.16 POOR COMMUNICATION

Fugar and Baah (2010) investigated the causes of delays and cost overrun and found that poor communication between parties was a contributing factor to cost overruns.

2.3.1.17 PROJECT COMPLEXITY

Olawale (2010) conducted a study on the main causes of cost overruns in the UK construction projects and found out that project complexity was ranked the fifth highest cause of cost overrun.

2.3.2 MEASURES TO CONTROL CONSTRUCTION COST

There are some measures which are found from the researchers' study to control the construction costs or to overcome the problems of cost overruns. The measures are as below:

2.3.2.1 APPROPRIATE SCOPE DEFINITION

Nega (2008) agreed that well-defined scope of works was required in completing the project successfully. Guarding against incomplete identification of scope is important to avoid frequent changes thereby reducing cost overruns.

2.3.2.2 ESTABLISH TRAINING PROGRAMS

Organizing training programs for the primary stakeholders has been identified as one of the measures to control cost overruns (Grigoroudis et al, 2006). Workshops and seminars must be organized for key personnel's on how to plan the project at the pre contract stage and also control cost at the construction stage.

2.3.2.3 PROPER PROJECT COSTING AND FINANCING

Kaliba et al. (2009) stated that delays of schedule may occur because of delayed payments due to complex financial processes in client organizations. Delay in payment would cause financial difficulties to contractors and subsequently delay the schedule to complete the activities on site. Interest could be charged on delayed payments hence inducing cost overruns in the project. This therefore means that the project sponsors or client should secure the needed funding before initiating a project to ensure better cost performance.

2.3.2.4 REALISTIC COST ESTIMATION

The initial cost estimates should be as accurate as possible. Accuracy of cost estimation allows clients to check and determine that the required funds are made available for project execution (Kaliba et al., 2009).

2.3.2.5 RISK MANAGEMENT DURING PROJECT EXECUTION

Peeters and Madauss (2008) found out some approach to avoid cost overruns. In any development project, there must be certain amount of risks. Therefore, a risk management

function needs to be performed by project or construction manager to determine and reduce the risks of the particular project. The aim of risk management is to minimize any risk that might result in failing to meet the project requirements.

2.3.2.6 COMPETENT PERSONNEL

Kaliba et al, (2009) mentioned that contractors, consultants, and clients should ensure that they have the right personnel with appropriate qualifications to manage their projects efficiently. It is better if the key personnel's such as construction managers have experience and qualifications in project or construction management.

2.3.2.7 EFFICIENT MANAGEMENT

Gould (2002) stated that efficient management is important to produce a productive and cost efficient site. Scope may change due to inadequate planning and feasibility studies. In order to control the project effectively, the project manager must follow up the schedule to avoid additional costs and ensure that the building can be occupied on time and within cost as planned.

2.3.2.8 INCREASE SUPPLY OF MATERIALS

Frimpong et al, (2003) found that there should be adequate allowance for materials in stock for any emergency to cover the increasing material cost due to inflation.

2.3.3 SUMMARY

This chapter devoted attention to review previous and related work in the subject area under discussion and exposed potential factors causing cost overruns with regard to construction performance and measures to mitigate against such variables. The factors noted in the literature review will be used in the design of the questionnaire to seek the viewpoint of the contractors working in the Accra Metropolis. The next chapter presents the research methodology.



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter presents the research methodology of the study. It describes and justifies the methods and processes used to collect data that helped achieve the research objectives. The chapter is presented under the following sections namely: definition of research methodology and methods, the source of data, the concept of population and sampling, and method of data collection.

3.2 RESEARCH DESIGN

Kothari (2003) defines research as the pursuit of truth with the help of study, observation, comparison and experiment, which is a systematic method of finding solutions to a research problem identified. Research methods may be understood as all those methods/techniques that are used for the conducting of research. Kothari (2009) further explained that research methods can be put into the following three groups:

- In the first group we include those methods which are concerned with the collection of data. These methods will be used where the data already available are not sufficient to arrive at the required solution;
- The second group consists of those statistical techniques which are used for establishing relationships between the data and the unknowns;
- The third group consists of those methods which are used to evaluate the accuracy of the results obtained.

Research methodology on the other hand is inclusive of the research methods and encompasses the overall approach to the research process from definition to selection of the appropriate research method and analysis of data and drawing conclusions from the analysis. Kothari (2009) explained it as a way to systematically solve the research problem. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them.

There are two basic approaches to research; quantitative approach and the qualitative approach (Kothari, 2009). Qualitative Research is collecting, analyzing, and interpreting data by observing what people do and say (Anderson, 2006) whereas quantitative research is an inquiry into an identified problem, based on testing a theory composed of variables, measured with numbers, and analyzed using statistical techniques (Creswell, 1994). It deals with numbers and their manipulation in order to gain insight in that which is being studied. Quantitative research methods include the use of experiments, quasi-experiments and surveys. Qualitative research is much more subjective than quantitative research and uses very different methods of collecting information, mainly individual, in-depth interviews and observation of focus groups.

This study adopted a quantitative research approach to achieve the objectives of this research.

3.3 SOURCE OF DATA

The preliminary data for this research was collected through a literature review. Robinson and Reed (1998) defined a literature review as “a systematic search of published work to find out what is already known about the intended research topic”. A literature review helps

to gain insight and understanding into the problem at hand and it allows the researcher to find out what has been done in terms of the problem being investigated to ensure duplication does not occur.

The detailed literature review was done through the review of books, published journals, newspapers, and information from the internet. The purpose of the literature review was to basically establish factors affecting cost performance from the existing literature which would then be used in the design of a structured questionnaire for field survey. A literature review was also conducted on cost control measures by reviewing literature on critical success factors in mitigating against cost overruns.

3.4 POPULATION AND SAMPLING

Jacobs (2012) defined a population as the larger group from which individuals are selected to participate in a study. A “population” consists of all the subjects you want to study (Yount, 2006). Sampling is the process of selecting a group of subjects for a study in such a way that the individuals represent the larger group from which they were selected according to Gay as cited in Yount (2006); the purpose to gather data about the population in order to make an inference that can be generalized to the population. This representative portion of a population is called a sample.

Yount (2006) explained regardless of the specific type of sampling used, the steps in sampling are essentially the same: identify the target population, identify the accessible population, determine the size of the sample, and select the sample. In determining the sample size, we may make use of a census for small populations, imitating a sample size of

similar studies, using published tables, and applying formulas to calculate a sample size (Glenn, 1992). In imitating a sample size used in a similar study, there is a risk of repeating errors that were made in determining the sample size for that study. However, the level of accuracy can be more controlled by the researcher with the use of published tables or formulas which factors in combinations of precision, confidence levels, and variability.

To ensure that the sample is representative of the population from which it is to be selected, the researcher must identify the sampling method that will be used. Quantitative sampling methods are classified as either probability or non- probability. Probability methods include random sampling, systematic sampling, stratified sampling and cluster sampling. In non-probability sampling, members are selected from the population in some non-random manner and these include convenience sampling, quota sampling, and purposive sampling (Jacobs, 2012, cited in Morgah, 2013). The advantage of probability sampling is that sampling error can be calculated. Sampling error is the degree to which a sample might differ from the population. In non-probability sampling, the sample error remains unknown.

This study examines the cost performance of construction projects in Accra Metropolitan Assembly. A list of fifty (50) registered contractors was received from the A.M.A's development office comprising D1/K2 and D2/K2 classification.

For a smaller population size ($N < 100$), there is little point in sampling, thus a survey of the entire population must be done (Jacobs, 2012). This is also in agreement with Yount (2006) sample size rule of thumb, which explains for a population size of between 0-100 sampling must be 100% of the population.

3.5 SAMPLE SIZE CLASSIFICATION

Table 3.1 : Sample size classification

TITLE	NUMBER OF SAMPLE	NUMBER OF DISTRIBUTED QUESTIONNAIRE	NUMBER OF RESPONDENTS	NUMBER OF VALID RESPONDENTS
BUILDING CONTRACTORS D1/K1 – D2/K2	50	50	45	45

(Field Survey, 2014)

3.6 METHODS OF DATA COLLECTION

The validity and reliability of the data collected and the response rate achieved depend to a large extent on the design of the questions, the structure of the questionnaire (Robson 2002, cited in Omar 2009).

Naoum, (1998), intimates that two major research techniques are available to elicit data and information from respondents. These are postal questionnaire and the personal interview. It has to be stressed however, that data collection does not necessarily depend on one method or technique. Some research depends solely on one method of data collection but others do not. In other words, it is possible for you to conduct a postal questionnaire and a case study, or to conduct interview in addition to a postal. It is also possible that your dissertation questionnaire includes quantitative questions as well as qualitative ones.

The data collection tool for this research took the form of a self-administered questionnaire targeted specifically at key officials of the contracting firms in the Accra Metropolis, and this is because the response rate wanted to be increased. It was designed to obtain answers to questions and ensure that all respondents understood the question in the same way. To promote equal understanding, the use of clear and familiar wording further enhanced the

validity of the questionnaire. The questionnaire aimed primarily to collect reliable and accurate data in a consistent manner. The survey questionnaire was designed to provide data that could be quantitatively analyzed.

3.7 QUESTIONNAIRE DESIGN

The variables in the theoretical framework form the basis of the questionnaire content. (See Appendix 1 for the questionnaire)

There are four (4) parts in the questionnaire form to hold up this study.

3.7.1 PART 1: RESPONDENT PROFILE

This ascertains the position of the respondent in the construction firm and also provides years' experience in the construction industry. With this it should be possible to establish the working profile of the respondent.

3.7.2 PART 2: KEY PERFORMANCE INDICATORS

This part includes the list of the factors in measuring performance of construction projects in A.M.A. For each factor there is a question, for measuring the degree of usage of the key performance indicators on performance in construction project. The degree of usage is based on a five-point scale.

3.7.3 PART 3: COST OVERRUN DETERMINANTS

This part includes the list of the factors that contribute to cost overrun in A.M.A projects. For each factor there is a question, for measuring the degree of impact on cost performance in construction project. The degree of impact is based on a five-point scale.

3.7.4 PART 4: RANKING OF MEASURES TO CONTROL CONSTRUCTION COST

This part includes the list of the factors that will contribute to cost control measures in A.M.A projects. For each factor there is a question, for measuring the degree of importance in mitigating the effect of cost overrun. The degree of importance is based on a five-point scale.

3.8 DATA ANALYSIS

The responses to the Part One on the questionnaires were analyzed using frequencies and percentages, with the use of Statistical Package for Social Science (SPSS) Version 16.0. To ensure consistency, the responses in the questionnaires were edited and coded. The results were presented using frequencies and percentages. The Relative Importance Index was used to analyze Part Two, Three and Four.

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 INTRODUCTION

The quantitative data obtained from the study are analyzed and presented in this chapter.

The methods of analysis are in four parts. The first five (5) questions under Part 1 were analyzed using percentage frequency and presented in a tabular form whereas Part 2, Part 3 and Part 4 employs ranking method that is relative important index.

4.2 ANALYSIS OF RESEARCH DATA

4.2.1 BACKGROUND INFORMATION

The first part of the questionnaire consisting of (Question 1-5) sought the background information of the respondents such as the respondent's position in firm, the financial classification of the firm and years' experience among others in the construction industry.

Table 4.1: Position/ Designation in Firm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Managing Director	5	11.1	11.1	11.1
	Construction Manager	9	20.0	20.0	31.1
	Quantity Surveyor	13	28.9	28.9	60.0
	Engineer	18	40.0	40.0	100.0
	Total	45	100.0	100.0	

(Field Survey, 2014)

Table 4.1 indicates the position of the respondents in the firm. Out of the forty five (45) respondents, five (5) were Managing Directors representing 11.1% of the total respondents. Nine (9) were Construction Managers representing 20% and thirteen (13) Quantity Surveyors representing 28.9%. Eighteen were Engineers which also represented 40% of the total respondents.

Engineers accounted for the highest respondents because the questionnaire was administered on site and these ones are most often present on site because of the supervisory role they play.

Table 4.2: Highest educational level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Higher National Diploma	6	13.3	13.3	13.3
	Bachelor's Degree	16	35.6	35.6	48.9
	MBA / MSc	23	51.1	51.1	100.0
	Total	45	100.0	100.0	

(Field Survey, 2014)

Six (6) out of the forty five respondents had HND certificate representing 13.3% of the total respondents whereas sixteen (16) respondents representing 35.6% had a Bachelor's degree. The remaining twenty three (23) respondents possessed MBA/MSc. qualification representing 51.1% being the highest respondent.

Table 4.2 above indicates that all the respondents have attained their tertiary education.

Table 4.3: Experience in Construction Industry

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0-5 years	11	24.4	24.4	24.4
5-10 years	24	53.3	53.3	77.8
10-20 years	10	22.2	22.2	100.0
Total	45	100.0	100.0	

(Field Survey, 2014)

The above Table 4.3 indicates the number of years' experience the respondents have been working in the construction industry.

Eleven (11) out of the forty five respondent representing 24.4% had years' experience ranging from (0-5) years whereas twenty four (24) respondent representing 53.3% were within (2-10) years. The remaining ten (10) respondents representing 22.2% fell within (10-20) years. It can be seen from the above statistics that majority of the respondents have considerable experience in the construction industry averaging 5-10 years.

Table 4.4: Annual value of projects executed in A.M.A. the last 5 years

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 200000-500000	5	11.1	11.1	11.1
Over 500000	40	88.9	88.9	100.0
Total	45	100.0	100.0	

(Field Survey, 2014)

Table 4.4 shows the annual value of A.M.A projects executed for the last five (5) years by contractors. Five (5) out of the forty five respondents had executed work ranging from GH¢

(200,000 – 500,000) which represents 11.1% while forty (40) out of the forty five executed projects over GH¢500,000 which also represents 88.9%.

The above project figures show how respondents have been actively involved on A.M.A projects. Forty (40) of the respondents indicated that they had executed work exceeding GH¢500,000 which indicates that most of the contractors involved in A.M.A projects are D1/K1 contractors.

Table 4.5: Financial classification of firm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	D1/K1	28	62.2	62.2	62.2
	D2/K2	17	37.8	37.8	100.0
	Total	45	100.0	100.0	

(Field Survey, 2014)

Table 4.5 aims at getting the number of contractors that belongs to the different financial ceiling given by the Ministry of Water Resources, Works and Housing.

Out of the forty five (45) respondents, twenty eight (28) respondents representing 62.2% belongs to class D1/K1, whereas the remaining seventeen (17) belongs to class D2/K2 contractors. The above statistic confirms that majority of A.M.A projects ongoing are being executed by D1/K1 contractors.

4.2.2 KEY PERFORMANCE INDICATORS

Various factors derived from the literature review were grouped in this section and the respondents were to rank the various factors as to the extent of usage in measuring performance of construction projects in Accra Metropolitan Assembly.

The respondents ranked the variable on the Likert-rating scale of 1-5 where

5: Extremely used

4: Often used

3: Moderately used

2: Rarely used

1: Never used

4.2.2.1 Ranking of Factors

In order to rank the various factors, the relative importance index, R_{II} was used in each variable to assess their perceived significance. The relative importance index significance was then computed using the formulae below:

$$R_{II} = \frac{\sum r}{(S \times N)}$$

R_{II} = relative importance index

$\sum r$ = summation of the weighting given to each factor.

S = highest ranking which in this case is 5 for all the factors.

N = total number of respondents for that particular factor

The results of all the variables have been summarized and shown in Table 4.6 below.

Table 4.6: Ranking on the extent of usage of the Key Performance Indicators

No.	FACTORS	SCORE					WEIGHTING	R _{II}	RANK
		5	4	3	2	1			
i	Time	0	9	26	10	0	134	0.60	2
ii	Cost	35	10	0	0	0	215	0.96	1
iii	Quality	0	0	10	29	6	94	0.42	4
iv	Client Satisfaction	0	0	9	36	0	99	0.44	3
v	Client Changes	0	0	0	10	35	55	0.25	8
vi	Business Performance	0	0	0	20	25	65	0.29	6
vii	Health & Safety	0	0	9	16	20	79	0.35	5
viii	Environment	0	0	0	9	36	54	0.24	9
ix	People	0	0	0	0	45	45	0.20	10
x	Technology	0	0	0	15	30	60	0.27	7

(Field Survey, 2014)

From Table 4.6 above, the following factors have been ranked as to the extent of usage in measuring performance of construction projects in the Accra Metropolitan Assembly in order of importance.

They are as follows:

1st: Cost

2nd: Time

3rd: Quality

4th: Client Satisfaction

5th: Health & Safety

6th: Business Performance

7th: Technology

8th: Client Changes

9th: Environment

10th: People

4.2.3 COST OVERRUN DETERMINANTS

Various factors derived from the literature review were grouped in this section and the respondents were to rank the various factors as to whether they commonly occur and do lead to cost overrun in construction projects in Accra Metropolitan Assembly.

The respondents ranked the variable on the Likert-rating scale of 1-5 where

5: Most occurrence

4: More occurrence

3: Average occurrence

2: fewer occurrence

1: Least occurrence

Table 4.7: Ranking of cost overrun factors

No.	FACTORS	SCORE					WEIGHTING	R _{II}	RANK
		5	4	3	2	1			
i	Inaccurate/Poor estimation of original cost	18	11	15	0	1	180	0.80	4
ii	Inadequate Planning	12	9	14	10	0	158	0.70	9
iii	Incessant variation/change order	14	14	17	0	0	177	0.78	5
iv	Change in Project design	2	13	14	11	5	131	0.58	12
v	Poor contract management	14	20	2	9	0	174	0.77	6
vi	Material price fluctuation	34	7	4	0	0	210	0.93	1
vii	Cost of rework	2	10	26	4	3	137	0.60	11
viii	Differentiation of currency prices	33	3	9	0	0	204	0.91	2
ix	High cost of machinery	21	12	9	3	0	186	0.83	3
x	Obsolete/unsuitable construction equipment and methods	11	18	13	1	2	170	0.75	8
xi	Insufficient fund	9	22	12	2	0	173	0.76	7
xii	Unforeseen site conditions	4	13	25	1	2	151	0.67	10
xiii	Force Majeure	0	0	0	13	32	58	0.25	17
xiv	Unpredictable weather condition	0	0	23	19	3	110	0.48	14
xv	Project site location	0	2	11	24	8	97	0.43	15
xvi	Poor communication	0	4	25	11	5	118	0.52	13
xvii	Project complexity	0	4	6	14	21	83	0.36	16

(Field Survey, 2014)

From Table 4.7 above, the factors that lead to cost overruns in construction projects in Accra Metropolitan Assembly have been ranked in order of importance.

They are as follows:

- 1st: Material price fluctuation
- 2nd: Differentiation of currency prices
- 3rd: High cost of machinery
- 4th: Inaccurate/Poor estimation of original cost
- 5th: Incessant variation/change order
- 6th: Poor contract management
- 7th: Insufficient fund
- 8th: Obsolete/unsuitable construction equipment and methods
- 9th: Inadequate planning
- 10th: Unforeseen site conditions
- 11th: Cost of rework
- 12th: Change in Project design
- 13th: Poor communication
- 14th: Unpredictable weather conditions
- 15th: Project site location
- 16th: Project complexity
- 17th: Force Majeure

4.2.4 RANKING OF MEASURES TO CONTROL CONSTRUCTION COST

Various factors derived from the literature review were grouped in this section and the respondents were to rank the measures that will contribute to construction cost control in Accra Metropolitan Assembly.

The respondents ranked the variable on the Likert-rating scale of 1-5 where

5: Extremely important

4: Very important

3: Moderately important

2: Slightly important

1: Not important

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Table 4.8: Ranking of Measures to Control Construction Cost

No.	FACTORS	SCORE					WEIGHTING	R _{II}	RANK
		5	4	3	2	1			
i	Appropriate scope definition	33	12	0	0	0	213	0.95	1
ii	Establish training programs	9	13	20	3	0	157	0.69	6
iii	Proper project costing and financing	32	13	0	0	0	212	0.94	2
iv	Realistic cost estimation	6	20	19	0	0	167	0.74	5
v	Risk management during project execution	9	8	10	18	0	143	0.63	7
vi	Competent personnel	13	26	6	0	0	187	0.83	3
vii	Efficient management	8	19	18	0	0	170	0.76	4
viii	Increase supply of materials	0	13	8	24	0	124	0.55	8

(Field Survey, 2014)

The purpose of Table 4.8 above was to rank the factors that could contribute to cost control measures in construction projects in the Accra Metropolis.

The order is as follows:

1st: Appropriate scope definition

2nd: Proper project costing and financing

- 3rd: Competent personnel
- 4th: Efficient management
- 5th: Realistic cost estimation
- 6th: Establish training programs
- 7th: Risk management during project execution
- 8th: Increase supply of materials

From the above, the respondents ranked appropriate scope definition, proper project costing and financing and competent personnel as the first three (3) measures that can help in contributing to better construction cost control measures in the Accra Metropolis with respect to A.M.A projects.

4.3 DISCUSSION OF THE RESULTS

Forty-Five (45) out of the fifty (50) administered questionnaires were retrieved for the analysis representing 90% of the response rate, indicating that most of the respondents were committed to the study. The background information from the analysis of the research data as shown in Table 4.1 indicates that majority of the respondents were Engineers representing 40% whereas 28.9% were Quantity Surveyors, 20% were Construction Managers and 11.1% being Managing Directors. The study revealed that, the Construction Industry accommodates many professionals from different fields and the high endorsement of Engineers, Quantity Surveyors and Construction Managers are attributed to the fact that the administering of the questionnaires were mostly done on the construction site and these professionals play a key supervisory role on construction site.

The Construction Industry operates based on the qualification and competency of the individuals involved. Due to the nature of the industry, professionals with strong knowledge in construction are required. It is not surprising for the study to reveal that, 51.1% of the respondents are MBA/MSc holders, 35.6% with Bachelor's degree and only 13.3% being holders of HND as shown in Table 4.2. Although, the outcome of their qualifications are not surprising, the results suggest that, with time the basic requirement for employment in a managerial or technical position in the construction industry will be a Bachelor degree.

In as much as qualification counts in the construction industry so does experience. Professionals in the construction industry are faced with many challenges and their ability to overcome or subdue these challenges enlightens them as to how to operate within the industry. From rational point of view, the number of years spent in an industry directly relate to experience. Table 4.3 shows that 53.3% of the respondents have had between (5-10) years of experience in the construction industry whilst 24.4% have been working in the industry within the past (0-5) years and 22.2% within the past (10-20) years. These experiences reveal that, the respondents have worked on construction projects and their response towards the study is positive.

About twenty eight (28) respondents representing 62.2% belonged to class D1/K1 financial classification of the Ministry of Water Resource, Works and Housing whiles the remaining seventeen (17) respondent representing 37.8% were of D2/K2 financial classification. This means that all the respondents fall under our study scope.

The second part of the questionnaire deliberated on the usage of the key performance indicators. After the field survey conducted it was noted that cost, time, quality and client satisfaction were ranked as the first four factors used in measuring performance of construction project in A.M.A.

Cheung et al (2004) in a study conducted remarked seven main key indicators for performance which are: time, cost, quality, client satisfaction, client changes, business performance, and health and safety. It is therefore not surprising that these performance indicators emerged as factors used in measuring construction performance.

The third part of the questionnaire deliberated on cost overrun determinants. After the field survey conducted it was noted that the first five factors that were ranked as contributing to cost overruns in A.M.A projects were material price fluctuation, Differentiation of currency prices, high cost of machinery, inaccurate/poor estimation of original cost and incessant variation/change orders.

Research conducted by Amusan (2008), reveals material price fluctuation as a potential factor stimulating project cost overrun. It is therefore not surprising that this factor is ranked first as factors contributing to cost overrun in projects administered by A.M.A. In modern economics it has become a much more telling influence and cannot be ignored in economic appraisal of investment in pre –construction stage, construction, as well as post construction stage of project works. In simple terms inflation is caused by an increase in stock of money that is available for spending while the quantity of goods available for purchase does not increase by a proportionate amount. Love et al., (2008) opine that price fluctuation makes it difficult to estimate cost of materials accurately as a result of high inflation in developing

countries or the speculation of suppliers. Material price fluctuation could result in exceeding initial material budget and which could culminate in cost overrun. This would in turn force the owner of facility being constructed to seek for an additional funding to pay the extra cost.

The second highest ranked factor was differentiation of currency prices. In developing countries and for that matter Ghana, exchange rates are particularly relevant in construction contracts where most of construction materials are purchased from foreign countries. If the exchange rates change beyond the expected level, then the cost of the project may change in proportion to the changes in exchange rate with the resultant effect leading to cost overrun.

Due to the complex construction undertaken within this century, machinery has become an essential component in the construction process. Chan and Park (2005) asserted that high cost of machineries was a contributing factor in construction cost overrun. The study identified that machinery cost actually affects construction cost and attributed it to the insignificant plant pool companies in Ghana which always result in high cost of such equipment.

Inaccurate/Poor estimation of original cost was ranked fourth in contributing to project cost overruns. Peeters and Madauss (2008) stated that the biggest factor that contributes to cost overrun of budget is inaccurate estimation of initial cost of a project. This was attributed to technical problem on how to estimate projects and the fact that not much information is available in the early stages of construction project. Cost estimates are used for planning, budgeting, among other things. If decisions are made based on inaccurate estimates, the progress of the project could be negatively undermined. In order to mitigate such cause, the

estimate must be an accurate reflection of reality capable of being used for decision making (Carr, 1989).

Incessant variation/change order as indicated by the respondents has the potential of generating cost overrun in construction project. Change in project scope could lead to cost overrun since the proposed feature is not part of the initial project cost thereby increasing the contract sum.

Cost overrun on construction projects has very negative effects such as project abandonments, followed closely with the tendency for client's capital being tied down as well as liability to insolvency.

In the light of these consequences, some eight variables were derived from the literature review as measures set out to militate against cost overrun in construction projects.

Appropriate scope definition, proper project costing and financing and competent personnel were ranked as the first three factors that will help control cost in construction projects administered by A.M.A.

Nega (2008) stated that working within well-defined scope was a remedy to avoiding unnecessary additional cost. It is however, not surprising that appropriate scope definition was ranked highest among the mitigating ways.

Proper project costing and financing was ranked second as measures in mitigating against cost overruns. Kaliba et al. (2009) stated that delays of schedule may occur because of delayed payments due to complex financial processes in client organizations. Delay in

payment would cause financial difficulties to contractors and subsequently delay the schedule to complete the activities on site. Interest could be charged on delayed payments hence inducing cost overruns in the project.

The use of competent personnel was ranked third by the respondents in controlling cost overruns. Kaliba et al. (2009) mentioned that contractors, consultants, and clients should ensure that they have the right personnel with appropriate qualifications to manage their projects efficiently. It is better if the key personnel's have experience and qualifications in project or construction management.



CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The primary aim of this research was to assess cost performance of construction projects administered in Accra Metropolitan Assembly by identifying the causes of cost overrun and making recommendations to control cost in the construction industry.

The survey also sought to find answers to the following key questions:

- What are key performance indicators in construction projects?
- What are the main causes of cost overruns in construction project administered by A.M.A?
- What are the success factors that can help control cost overruns in the construction projects in A.M.A?

In view of the above, this chapter therefore gives a detailed overview of the findings deduced from the field survey so as to answer the research questions and achieve the objectives of the study. This chapter therefore discusses the conclusion and ends by giving some recommendations.

5.2 CONCLUSION

In order to answer the first research question and achieve objective number one, an extensive review of literature was done to determine the Key Performance Indicators employed in measuring performance of construction projects. The following categories were

identified as some of the major criteria used in judging construction projects performance: “time, cost, quality, client satisfaction, client changes, business performance, health and safety, environment, people and technology”. Among the ten (10) performance indicators as shown on Table 4.6, there were three (3) of them often used in measuring performance of construction in A.M.A. These key performance indicators are:

- Cost
- Time
- Quality

From the above, it can be concluded that the key performance indicators employed in measuring performance of construction projects in the Accra Metropolitan Assembly has been identified.

Next was identifying the various factors that causes cost overrun in construction projects administered by the A.M.A. From the literature review, seventeen factors were identified as the likely factors contributing to cost overrun in the construction industry. Among the seventeen (17) factors as shown on Table 4.7, there were five (5) particular factors that significantly lead to cost overruns in the A.M.A managed projects. These factors are:

- Material Price Fluctuation
- Differentiation of Currency Prices
- High Cost of Machinery
- Inaccurate/Poor Estimation of Original Cost
- Incessant Variation/Change Order

Previous researches conducted by Amusan (2008), Chan and Park (2005) and Peeters and Madauss (2008) also affirms the above findings as factors contributing to cost overruns.

There were three (3) particular factors that had no significant effect on cost overrun of construction projects. These are:

- Project Site Location
- Project Complexity
- Force Majeure

It can be concluded from the above that the second research question and objective, that is identifying the factors that causes cost overruns has been identified.

The last research question and objective was answered by identifying from the literature review some eight factors that will help control cost overrun. The Table 4.8 sought to find out from contractors which of the stated factors had a positive effect on cost control. These three (3) factors were ranked as factors contributing to cost control:

- Appropriate Scope Definition
- Proper Project Costing and Financing
- Competent Personnel

Nega (2008) affirmed in a study conducted that working within well-defined scope was a remedy to avoiding unnecessary additional cost. Kaliba et al. (2009) stated that proper project costing and financing as well as having the right personnel with the appropriate qualification was key in controlling project cost.

These three (3) factors stated below were ranked by the respondents as having no effect on cost control on construction projects:

- Establish Training Programs
- Risk Management during Project Execution
- Increase Supply of Materials

5.3 RECOMMENDATIONS FROM RESEARCH STUDY

In view of the above findings, some recommendations have been made so as to reduce the occurrence of cost overruns, thereby improving cost performance in construction projects administered by the Accra Metropolitan Assembly.

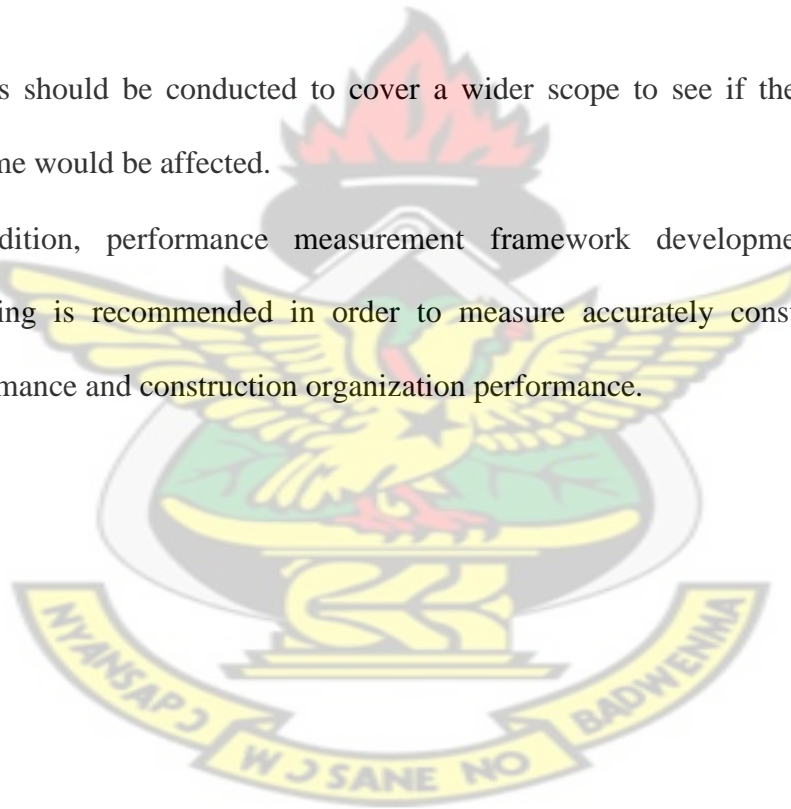
- It is recommended that project scope must be well defined in the initial or early stages of the project thereby curtailing the effect of additional or unplanned works. Detailed specifications have the potential of reducing the cause of cost overruns and its effects and as such should be included in the scope definition.
- Also sufficient funding must be secured by Accra Metropolitan Assembly or the project sponsors in order to ensure continuous cash flow during the entire project execution. Kaliba et al. (2009) found out in a study conducted that complex financial processes in some client organizations causes delay in contractor payment and subsequently delayed programmed schedules of construction activities. Interest could be charged on delayed payments hence inducing cost overruns in the project.
- Finally the field survey conducted mentioned the use of competent personnel as one

of the measures of mitigating against cost overrun in construction projects. Using the right personnel with appropriate qualification and experience to manage projects efficiently is one sure way of controlling cost on site.

5.4 RECOMMENDATION FOR FUTURE RESEARCH

This study acknowledged a number of gaps in areas which need research attention. Therefore the following recommendations are made for future research:

- Studies should be conducted to cover a wider scope to see if the variables or the outcome would be affected.
- In addition, performance measurement framework development and system modeling is recommended in order to measure accurately construction projects performance and construction organization performance.



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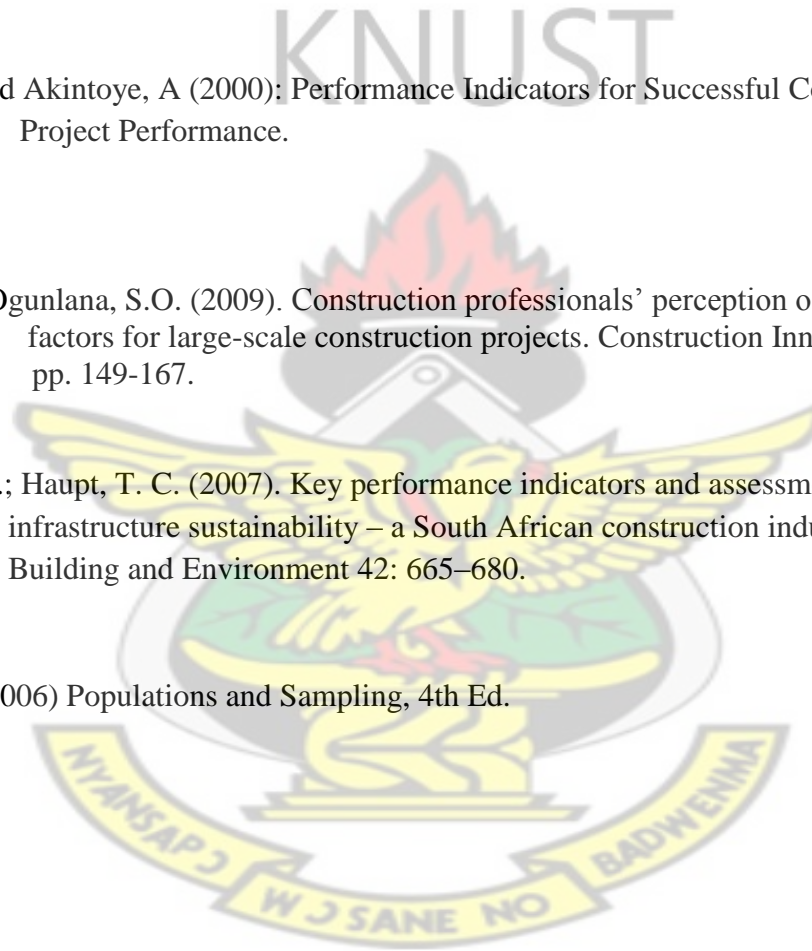
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KNUST

APPENDIX Sample of Questionnaire



KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF BUILDING TECHNOLOGY
MSc. CONSTRUCTION MANAGEMENT

TOPIC: COST PERFORMANCE OF CONSTRUCTION PROJECTS IN ACCRA METROPOLITAN ASSEMBLY.

Introduction:

I am a post-graduate student at the Kwame Nkrumah University of Science and Technology studying for a Master of Science Degree in Construction Management. I am undertaking a study on the Cost Performance of Construction Projects in Accra Metropolitan Assembly. The objectives of the study are as follows:

- i. To identify the Key Performance Indicators (KPIs) employed in measuring performance of construction projects.
- ii. To identify the various factors that interplay in impacting construction cost performance in Accra Metropolitan Assembly.
- iii. To recommend ways of curtailing the effects of cost overruns.

Your response to this research will be confidential and will be used exclusively for academic purposes.

Thank you in anticipation of your cooperation.

Please return or direct any enquiries to:

Edmund Abeiku Nyenku

P.O.Box TV 685, Tema

Tel: 0201135803

E-mail: nyenku@yahoo.com

PART 1 – RESPONDENT PROFILE

Please tick answers where applicable for the following questions:

Q.1 Please indicate your Profession/designation?

- A. Managing Director []
- B. Construction Manager []
- C. Quantity Surveyor []
- D. Engineer []
- E. Others (Please specify).....

Q.2 What is your highest educational level?

- A. GCE A 'Level / SSSCE or equivalent []
- B. Higher National Diploma (HND) []
- C. Bachelor Degree []
- D. MBA / MSc []
- E. Others (Please Specify).....

Q.3 Please indicate your number of years' experience in the Construction Industry?

- A. 0 – 5years []
- B. 5– 10years []
- C. 10 – 20years []
- D. Over 20years []

Q.4 What is the annual value (GH¢) of projects that have been executed in the Accra Metropolitan Assembly for the last five years?

A. 75,000 – 200,000 []

B. 200,000 – 500,000 []

C. over 500,000 []

Q.5 What is the financial classification of your firm according to the Ministry of Water Resources, Works & Housing (MWRWH)?

A. D1/K1 []

B. D2/K2 []

C. D3/K3 []

D. D4/K4 []



PART 2 – KEY PERFORMANCE INDICATORS

The subsequent questions require your knowledge and concerns on the Key Performance Indicators commonly used in measuring performance of construction projects in A.M.A. Each question has its rankings with their meanings. Kindly tick your answers accordingly.

1 = Never used 2 = Rarely used 3 = Moderately used
4 = Often used 5 = Extremely used

	Please rank the following factors as to their usage in measuring performance of construction project in Accra Metropolitan Assembly.					
		1	2	3	4	5
i	Time					
ii	Cost					
iii	Quality					
iv	Client Satisfaction					
v	Client Changes					
vi	Business Performance					
vii	Health and Safety					
viii	Environment					
ix	People					
x	Technology					

PART 3 – COST OVERRUN DETERMINANTS

The subsequent questions require your knowledge and concerns on factors that contribute to cost overruns in A.M.A. Each question has its rankings with their meanings. Kindly tick your answers accordingly.

1 = Least occurrence **2** = Fewer occurrence **3** = Average occurrence
4 = More occurrence **5** = Most occurrence

	Please rank the following factors as to whether they commonly occur and do lead to cost overrun in construction projects in Accra Metropolitan Assembly					
		1	2	3	4	5
i	Inaccurate/Poor estimation of original cost					
ii	Inadequate Planning					
iii	Incessant variation/change order					
iv	Change in Project design					
v	Poor contract management					
vi	Material price fluctuation					
vii	Cost of rework					
viii	Differentiation of currency prices					
ix	High cost of machinery					
x	Obsolete/unsuitable construction equipment and methods					
xi	Insufficient fund					
xii	Unforeseen site conditions					
xiii	Force Majeure					
xiv	Unpredictable weather condition					
xv	Project site location					
xvi	Poor communication					
xvii	Project Complexity					

PART 4 – RANKING OF MEASURES TO CONTROL CONSTRUCTION COST

The subsequent questions require your knowledge and concerns on measures that will contribute to cost control in the construction industry. Each question has its rankings with their meanings. Kindly tick your answers accordingly.

1 = Not important 2 = slightly important 3 = moderately important
4 = Very important 5 = Extremely Important

	Please rank the following factors as to their importance in militating against cost overrun in construction projects in Accra Metropolis.					
		1	2	3	4	5
i	Appropriate scope definition					
ii	Establish training programs					
iii	Proper project costing and financing					
iv	Realistic cost estimation					
v	Risk management during project execution					
vi	Competent personnel					
vii	Efficient management					
viii	Increase supply of materials					