

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

KUMASI

COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

COST AND SCHEDULE CONTROL ON ENGINEERING, PROCUREMENT &

CONSTRUCTION (EPC) PROJECTS IN GHANA

(A CASE STUDY OF KPONE THERMAL POWER PROJECT)

BY

WISDOM KWAME AGBOZO

(BSC. QUANTITY SURVEYING AND CONSTRUCTION ECONOMICS)

**A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
PROJECT MANAGEMENT**

NOVEMBER, 2018

DECLARATION

I do hereby declare that this submission is my own work towards the degree of **Master of Science in Project 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 acknowledgement has been made in the text.

WISDOM KWAME AGBOZO

(PG1144717)

.....
Signature

.....
Date

CERTIFIED BY:

PROF. EDWARD BADU

(Supervisor)

.....
Signature

.....
Date

CERTIFIED BY:

PROF. BERNARD KOFI BAIDEN

(Head of Department)

.....
Signature

.....
Date

ABSTRACT

Many EPC projects in Ghana and across the globe have experienced delays resulting in unreasonable cost and schedule overruns. While there exist several factors connected to this phenomenon, the control of project costs and schedule continues to be important factors. The need to reduce the risk of projects' poor performance is very crucial in the emerging countries as most of the socio-economic programmes have an element of a construction project. This research aimed at identifying the factors inhibiting the practitioner's ability to effectively control their project and the corresponding mitigation measures for cost and schedule control on EPC projects in Ghana using Kpone Thermal Power Project (KTPP) as case study. The methodology adopted for this research was quantitative research using the questionnaire survey. From the study, the top five factors inhibiting cost control are comparable to the one's affecting schedule control also. By means of the Spearman's rank correlation coefficient, the test run showed a moderate positive correlation of the factors identified for both cost and schedule control. The top four factors inhibiting cost control are Risk and uncertainty associated with projects, inaccurate evaluation of projects time/duration, Inflation of prices and Fluctuation of currency/exchange rate. Similarly, there ones inhibiting schedule control are financing and payment for completed works, inaccurate evaluation of projects time/duration, Complexity of works and Risk and uncertainty associated with projects. These inhibiting factors can be mitigated by implementing these measures identified in the study. The six top mitigating measures are: To ensure adequate project finance is available before start of the project, Employ Value Management techniques, Proper project planning and scheduling, Plan realistically and built up from first principle, Refuse to accept unrealistic project time scale by client and Perform a preconstruction planning of project tasks and resources needs. The least three desired mitigation measure from the study in the descending order are Proper emphasis on past experience, Clear information and communication channels and frequent coordination between the parties. It is recommended that future research is extended to investigating more than one EPC project in order make a cross comparative analysis and conclusion.

Keywords: Project management, Cost Control, Schedule Control, Inhibiting factors, Mitigation measures.

TABLE OF CONTENTS

DECLARATION	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
DEDICATION	ix
ACKNOWLEDGEMENT	x
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background to the Research	1
1.2 Problem Statement	3
1.3 Research Questions	4
1.4 Aim.....	4
1.5 Research Objectives	4
1.6 Significance of the Study.....	5
1.7 Scope of the Study.....	5
1.8 Research Methodology	5
1.9 Organization of the Study	6
CHAPTER TWO	7
LITERATURE REVIEW	7
2.1 Introduction.....	7
2.2 Definition of Project and Project Management	7
2.3 Engineering, Procurement and Construction (Epc) Projects	9
2.4 Construction Business Processes	9
2.5 The Ghanaian Construction Industry	10
2.6 Project Control	11
2.7 Cost Control.....	12
2.7.1 Cost Control Practices	15
2.7.2 Effect of Cost Control on Project Performance	17

2.7.3 Documentation and Data Collection	19
2.7.4 Challenges with Cost Control in Implementing Project.....	20
2.8 Schedule Control.....	24
2.8.1 Scheduling Change Management.....	24
2.8.2 Project Manager	25
2.8.3 Project Planner/ Scheduler.....	25
2.8.4 How Scheduling Control Play an Important Role during Project Development	26
2.9 Identified Top Inhibiting Factors	29
CHAPTER THREE	30
METHODOLOGY.....	30
3.1 Introduction.....	30
3.2 Research Design.....	30
3.3 Research Approach / Strategy.....	30
3.4 Research Method.....	31
3.5 Population of the Study	31
3.6 Sample Size.....	32
3.7 Sampling Technique.....	32
3.8 Sources of Data	32
3.9 Data Collection Instruments	33
3.10 Data Administration Procedure.....	33
3.11 Data Analysis	34
CHAPTER FOUR.....	35
DATA PRESENTATION AND DISCUSSION OF RESULTS	35
4.1 Introduction.....	35
4.2 Respondents' Demographic Information.....	35
4.3 Results	40
4.4 Discussion of Results	46

CHAPTER FIVE.....	47
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	47
5.1 Introduction.....	47
5.2 Findings	47
5.3 Conclusion	48
5.4 Recommendations for Further Studies	49
REFERENCES.....	50
APPENDIX.....	57

LIST OF TABLES

Table 2.1: Inhibiting Factors for Cost and Schedule Control.....	29
DATA PRESENTATION AND DISCUSSION OF RESULTS	35
Table 4.1: Respondents engagement status on the project	35
Table 4.2: Respondents party on the project	36
Table 4.3: Respondents tenure on the project.....	38
Table 4.4: Respondents tenure in the construction industry.....	38
Table 4.5: Schedule control inhibiting factors.....	40
Table 4.6: Cost control inhibiting factors.....	42
Table 4.7: Mitigating Measures for both Cost & Schedule Inhibiting Factors	44

LIST OF FIGURES

Figure 4.1: Respondents role on the project	37
Figure 4.2: Respondents educational background	39

DEDICATION

I dedicate this research work to God Almighty, my lovely wife Doris and my children Deladem and Mawulorm.

ACKNOWLEDGEMENT

First and foremost, I acknowledge Prof. Edward Badu and Dr. Ernest Kissi, my supervisors for their directions and guidance; but for them, this research work would not have reached this final stage of perfection.

I say a big thank you to Nana Twum Boateng for your inspiration and contribution towards the success of my study and research work.

My final thanks go to the management and staff of Zakhem Construction Ghana Limited and VRA for their cooperation during data collection for the research work.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Research

Projects are thought of as a group of activities that has to be accomplished in accordance to specific objectives that involve the use of the resources of a company (Baker et al., 2011). Companies/organizations look to prognostication tools that will assist in speeding their progress toward performance improvement including guiding them from pitfalls which may slow down or stop their initiatives (Zarina et al., 2014). As indicated by Navon (2005), a control system is very important component to spot the very factors that affect the effort of construction project. The project control environment should have procedures, measurable undertakings as well as policies to manage the estimate cost, communicate with project client, program project's control aspects, and administer the documentations of the project. Also, as Shtub et al. (2017) posits, developing an appropriate control system for a project stands to be significant part of the management effort of a project.

An effective cost and schedule control should provide contractors with the needed information to support their decision making processes especially with regards to taking corrective and preventive actions against pitfalls to keep project within planned parameters. To accomplish this feat, the cost and schedule control ought to have a better baseline plan for the project including an efficient and effective monitoring system for performance management. Likewise, it is important to have a sound cost and schedule control procedures especially in the construction industry so as to combine the cost and

schedule projections to ensure adopting a common approach in line with best practice. Hazir (2015) also posits that collectively the various deviations from the activities of a project would certainly impact the cost performance and the schedules of the project. The control systems of projects are targeted to increase project performance. Kerzner (2009) cites controlling as three-step procedure which includes measuring project's progress, assessing that left to be completed, and corrective measures for achieving or exceeding the set objectives of the project. Currently, cost and schedule control are executed in many sectors and industries including the construction industry. In the construction industry, projects are exposed to huge number of stakeholders including issues of the environment making projects subject to deviations from intended budget and work progress (Jha and Iyer, 2006). Given that construction projects involve several tasks, innovations and relationships, the control processes ought to be varied significantly throughout the phases of the project. According to Angus et al. (2000), controlling and monitoring of projects must be carried out carefully. Balancing the three aspects of controlling varied from one project to the other and also varied from time to time within same project.

Projects continue to underperform in many parts of the world with a significant impact on the developing world. Many reasons are always brought forward including project control. The need to reduce the risk of poor projects' performance is very crucial in the emerging countries because most of the socio-economic programmes have an element of a construction project. While many reasons have been forwarded for the poor performance of construction projects, lack of effective control remains high on the list. This is firstly, because project control is not a self-contained activity but rather an integrated activity that receives outputs from earlier phases of the project life-cycle

processes (PMI, 2017). Without a good project management plan, other aspect like cost and schedule control would be hard to achieve. Secondly, cost and schedule control demands vigilant, effective and efficient procedures and actions in order to accomplish project objectives successfully. Olawale and Sun (2015) observed that the execution of cost and schedule controls begins with assessing the available resources of the company in order to ensure the company have enough levels of employees, materials and equipment resources to deliver the project.

1.2 Problem Statement

Construction projects in developing countries continue to experience delay and cost overruns. Over the years, a number of huge projects of construction have been picked on by schedule delays and cost overruns (Flyvbjerg et al., 2002). The researchers go on to state that approximately 90% of government projects face problems of the aforementioned. While a lot of problems connect to this phenomenon, control of costs and schedule of projects continues to be important factors. Several indications point to poor control practice as the root cause of schedule delays and cost overruns of projects. Numerous cost and schedule management tools and techniques have been expounded which are used for addressing cost, time, quality, et cetera.

Prior studies conducted by Vidogah and Proverb (2003) show that current systems of cost control are inadequate for most projects especially the major ones and as a result multifaceted control system of project is required to control, monitor and measure the objectives of the project. Also, a combined system is needed to measure the status of the project throughout its various phases. Baccharini (1999) posits that successful projects do not only meet the standard quality, but also time and cost objectives. Therefore, judging

from the above concerns, perceptions, challenges and assertions, there seems to be factors affecting how cost and schedule control practices can be used to mitigate schedule delays and cost overruns on construction projects.

1.3 Research Questions

The following are the basic research questions:

- What are the cost control practices used on EPC projects in Ghana?
- What are the schedule control practices used on EPC projects in Ghana?
- What are the factors inhibiting both cost and schedule control of EPC projects in Ghana?
- What are the mitigating measures for factors inhibiting cost and schedule control of EPC projects in Ghana?

1.4 Aim

The study aimed to identify inhibiting factors and their corresponding mitigation measures for cost and schedule control on EPC projects in Ghana.

1.5 Research Objectives

The set objectives of the study were as follows:

- To identify inhibiting factors for cost control of EPC projects in Ghana;
- To identify inhibiting factors for schedule control of EPC projects in Ghana; and
- To identify mitigating measures for factors inhibiting cost and schedule control of EPC projects in Ghana.

1.6 Significance of the Study

The significance of this study is not only adding to the body of knowledge with regards to cost and schedule control of EPC projects in Ghana but also stakeholders will be sensitized on the critical inhibiting factors and the appropriate mitigating measures to adopt. Other EPC projects which might be privy to the final report might compare notes towards taking appropriate steps for the way forward. The findings of the study will further heightens the researcher's knowledge on how EPC projects perceive project control practices. Other students might researched on similar topics and can thus see this ultimate report as a helpful material for reference.

1.7 Scope of the Study

This study only covered cost and schedule control of EPC projects in Ghana (A case study of Kpone Thermal Power Project). This was due to ease of access to information as the researcher works on that project. It was hoped that the strategy also cut the cost down and minimize the amount of time required and hence enable the researcher to effectively complete the study. Further to this, the study lasted from June 2018 to September 2018.

1.8 Research Methodology

The study was quantitative research and the survey method was used. The target population for the study were current and former middle and senior level management on Kpone Thermal Power Project in Ghana. The actual reason attached to using this group of respondents was that activities of the group is having a bearing on the subject matter which also stands to be the study's scope. The study selected the respondents using convenience sampling method. Questionnaire was used for collecting primary data from the selected sample size. The researcher personally was responsible for the distribution

and collection of all questionnaires and allotted a week for the whole data collection process to avoid the possible delays and losses. Microsoft Excel package was used for this analysis.

1.9 Organization of the Study

The study was organized in five (5) distinctive chapters. The first chapter being the general introduction gives the study's background information, problem statement, the research aim and its objectives, the importance of the research, the study's scope, the research limitations, outline of the research methodology and finally the study's organization. The second chapter discusses germane literature as it outlines the various theoretical considerations that were used in discussing the empirical findings of the study. The third chapter highlights the methodology used for the research as the chapter four presents analysis of the data gathered and interpret it to reflect the situation examined. Finally, the fifth chapter gives a summary to the research findings, conclusions as well as proposed recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter two identifies theoretical and empirical literature on cost and schedule control on EPC projects. The review is intended to provide an extensive study of related literature in order to situate the research in an apt theoretical and practical literature. By so doing, the study is aimed to give basis for the contemporary work including serving as literature for additional research.

2.2 Definition of Project and Project Management

The PMBOK Guide 6th ed. defines a project as an impermanent exertion undertaken for the purposes of creating a unique service, product or result (PMI, 2017). The preceding definition contrast to daily activities or operations geared for continuous process without a predetermined end. Projects have the following characteristics: it has purpose; it is unique; it has life cycle; and has interdependence set of activities which conflict (Meredith and Mantel, 2000). Again, a project defines a unique resources investment geared towards achieving specific objectives so as to make profit or provide services for communities (Merna and Al Thani, 2008). Projects have process groups which include initiation, planning, executing, monitoring and control, and closing; these are performed repeatedly over the project duration.

The PMI (2017) defines project management as the application of skills, knowledge, tools and techniques to series of activities of a project so as to meet the requirements of

the project. The management of projects harnesses competencies of various individuals, combining their efforts and enabling them to accomplish the project's objectives for project success. Cost and schedule are important factors for evaluating projects' successes as well as project management practices.

However, there are variations in the definitions of Project Management among the various disciplines. The definition of project management in each discipline has direct adjustment to the type or nature of project being highlighted. According to Osien (1971), project management refers to the application of set of techniques/tools to control the usage of project resources towards achieving a unique, complex, temporary assignment within cost, quality and time constraints. Morris (1994) subsequently defined project management as the process of combining all forms of resources by engaging all the management techniques as the project evolves from one phase to the other until the final product is handed over to the rightful owner. Burke (2003) considers PM to be a specific management technique, to program and manage projects in a phase a strong point of task. Generally, Turner (1993) also defines PM as the science and art of making possible vision a reality. Turner (1999) argues that PM is about the management of human resources to deliver specific results. Nevertheless, other authors have also suggested that the definition should also describe the interpersonal, cultural and structural aspects. Following the divergent view of researchers, Wideman (1990) argues that PM is a philosophical technique that equip the various practitioners the ability to perform to their highest potential in the phase of scarce resources and thus maximizing profitability. In the same vein, PM is the art of coordinating and directing all resources towards achieving stated objectives considering budget, client satisfaction and time.

2.3 Engineering, Procurement and Construction (Epc) Projects

EPC projects refers to projects that have the contractor responsible for design and engineering, procurement of equipment and materials and finally the construction of works. The process can be discussed in three main phases namely Engineering phase, Procurement phase, Construction phase known as EPC phases ((Mahmoud-Jouini, 2004). Also, referred to as Turnkey projects.

2.4 Construction Business Processes

According to Marasini and Dawood (2006), numerous inspection instruments centre on controlling cost and time and overlook the internal relationships existing between different factors which affect business process. A study carried out by Payne and Turner (1999) shows that the level of achievement of a project is more when there exist a custom made strategies for controlling the project which contrast the established control methodology. In any case, clearness with respect to the degree of the established and the customized control system becomes faint. However, Falco and Macchiaroli (1998) reports that despite the constant advancement in project management field, it remain obvious that the customized control system shows the absence of proper technique for controlling cost. In view of the two contentions, and many-sided quality of business ventures, it is suitable to use the established control strategy with minor alterations from project to project. It includes changing existing control forms and moreover utilizing the best among the various practices. In any case, there is additionally the need to understand the basis of collection of the undertakings by the firm.

2.5 The Ghanaian Construction Industry

The industry of construction is one of the spines of Ghana's economy providing around 8.5% to Ghana's general GDP and utilizing 2.3% of the dynamic populace (Akomah et al., 2010). Notwithstanding, it is one industry that is immersed with poor execution. This is on the grounds that numerous who head even the bigger Ghanaian held construction firms have next to zero learning about the business (Tawiah, 1999). They have restricted information in the use of fundamental administration systems in tackling issues on life ventures. The lack in information has prompted the erratic utilization of budgetary, material and HR which does not advance hierarchical development (Vulink, 2004). The sector is exceptionally unsteady. It has high inflationary rate which cheapens the capital of contractors and makes it to a great degree troublesome for contractors to deal with their organizations (Dansoh, 2005). This makes it unthinkable for indigenous contractors to rival outside firms who have the money related muscles to embrace extensive and complex ventures (Vulink, 2004).

There are various difficulties that the contractor in Ghana confront. Each one of the difficulties has a method for affecting execution. Laryea (2010) recognized money, imbursement postponements, poor designs, quality issues, staffs' issues, inducement and corruption and poor contractor characterization and little assignments as a portion of the difficulties of Ghanaian contractors. He said subsidizing and access to credit by temporary workers are the two primary essential issues influencing Ghanaian contractual workers. It was contended that these two issues give off an impression of being associated with numerous different issues that Ghanaian contractors need to fight with in the running of their organizations. He finished up by recognizing that any change in access to fund and credit would not be an all-inclusive solution for the issues

encountered by companies yet will give companies the chance to be choosy and specific in their hunt for projects/ventures.

2.6 Project Control

Project monitoring and control is a process undertaken continuously throughout the project (PMI, 2017). This process tracks, reviews, and regulates project's performance and progress in all the knowledge areas in which achieving or making changes to the plan may be required.

Monitoring and Controlling comprises:

- Assessing the current activities of the project;
- Checking the various variable of the project (i.e. scope, cost, effort) against performance baseline and management plan;
- Recognize corrective activities appropriate for addressing problems and risks; and
- Manipulating the factors capable to outwit combined change controls so that only the accepted variations are executed.

Monitoring and controlling procedure in complex projects provides response between phases of the project, in imperative to execute preventive or corrective measures caused the project to agree to management plans of the project in all the knowledge areas including cost and schedule management. Cost and schedule control are discussed further below.

2.7 Cost Control

PMBOK (2017) characterizes controlling process – assures that venture goals are achieved by checking and estimating consistently for progress from the design phase so that remedial actions can be undertaken when necessary and further separate controlling process so it has connections with preparation and implementing process. Similarly, Kerzner (1995) notices controlling to be in a three-development process i.e. estimating work progress, assessing the work done or performance, and corrective activity to achieve or even surpass project's set objectives. Fortune and White (2006) posits that the execution checking sub-scheme is met of monitoring procedural changes including recording deviations from the desired outcome – rendering sub-scheme able to commence restorative activity where essential. IPMA (1998) stipulates that control in project management is dependent on examination of standard designs as well as contracts with genuine instances while choosing what should be done (i.e. re-arranging) once the two do not match up. Likewise, Zhang et al (2015) notices that the cost of the three (3) gorges projects was fantastically controlled within the endorsed spending plan. Accordingly, in preparation, it is conceivable to accomplish idealize management of the task. Again, as Ahern et al. (2001) opines, observing includes composing parameters, risks, investor participation, landmark evaluations, assurances, information administration, development appraisals and overseeing incorporates scrutinize and remedial arrange.

According to Gardiner (2005) casual project control components occurs in cases where the tasks are less and the project team members are extremely inspired and the choosing of control framework must base on risks included as well as cost in terms of the control framework. The researcher further specified that the complexities of construction

projects are huge and that they require devoted control outline. Falco and Macchiaroli (1998) notices that undertakings are lively and undertaken in varying situations demanding control and monitoring activities. In spite of the fact that PMBOK (2004) stated that the elements of control are of different information zones, there is dependably the need to comprehend the significant achievement factors, that when actualized adequately will upgrade the management methods in all organizations.

Legitimate cost control is additionally an essential element for a fruitful venture. The initial step of cost control is to recognize the variables that influence project costs. The current variables can be segregated into two noteworthy classifications: quantitative components and subjective elements. As of now, the construction industry scholars have given numerous endeavors to advance procedures that singular consider quantitative factors and overlook subjective factors, for example, customer need on construction time, contractor's scheduling ability, acquirement strategies and economic situations including level of construction movement (Elchaig, Boussabinaine, and Ballal, 2005). Because of an awesome number of variables that should be contemplated, is hard to anticipate the correct cost to finish construction ventures (Gould, 2004). It is widespread to see that the last venture cost is higher than the planned cost. It was accounted for that a cost overrun is among the fundamental issues in the construction sector (Reina and Angelo, 2002). According to Peeters and Madauss (2008), the greatest reason for cost overruns is wrong estimation toward the start of a task. An approximation or estimation is a general assessment of the impending venture cost, and the financial backing signifies to the measure of cash that the partners might want to contribute. The more exact the approximation or estimation is, the closer the monetary allowance is to the real cost,

which implies the revenue is nearer to what the project members imagine (Peeters and Madauss, 2008).

Practically speaking, controlling cost is primarily carried out during execution phase as a result of the deviations noted to be affecting the organized work. Cost control fundamentally depends on remedial activities, field information and breaking down of work activities. Together with these, brisk and quality access to manage information is very important. This would best fit especially when project team members work in synchronization with site management. Additionally, Reschke and Schelle (1990) indicates that controlling constitute the expertise needed to convey an undertaking from the beginning of the project to last phase without risking the set objectives. According to Jackson (2004), the seven (7) essentials stages for project control cycle include the following: develop task design; defined the undertaking targets; check the undertaking implementation; recognize implementation deviations; assess remedial choices; device changes when needed; and report, archive and assess outcomes. As needs be, for successful cost control understanding the following is important:

- Records and Information Gathering;
- Tools as well as Strategies;
- Usage of Data innovation in Control procedure;
- Onset aptitudes needed for Control procedure; and
- Documenting framework and Hierarchical business procedure.

2.7.1 Cost Control Practices

A standout amongst the most touted multi-dimensional project control frameworks is the Earned Value Analysis (EVA). The viability of the framework as a cost control device has been of much acclaim in project management writing (Kezerner, 2005; Cleland and Ireland, 2007). Dealing with a task is to act remembering the end goal of the project to accomplish the proposed objectives inside characterized achievement criteria, following a past arranging/scheduling time (calendar) and cost (spending plan) (Marques, Gourc and Lauras, 2011).

Diverse instruments and standards are utilized as a part of overseeing ventures for an attractive result. A portion of these apparatuses and systems are Gantt Diagrams, Project Networks (Programme Evaluation and Review Techniques, and Critical Path Method), Work Breakdown Structure (WBS), Project Sensitivity Analysis, PRINCE 2, Project Software, Cost Benefit Analysis, as well as Graphical Evaluation and Review Technique (GERT). The WBS manages separating of the tasks into reasonable individual segments in a progressive structure. It characterizes activities to a point of making the task easy to be finished freely of distinct tasks, inciting asset designation, control of venture and task of responsibilities and estimation. Wysocki (2009) likewise indicated that WBS is an absolute device for characterizing job bundles as well as creating and following the calendar and cost of the task. Work Breakdown Structure gives a typical structure to the regular improvement of arranging and controlling a venture and it is the reason for separating task into determinable augmentations out of which the announcement of task can be created and specialized, plan cost, as work hour detailing becomes possible to set up.

The Gantt graph is a valuable instrument for arranging and booking ventures. It demonstrates graphical portrayal of the length of undertakings against the movement of time. It was created by Henry Gantt in 1915 deliberately to monitor ventures movement and following. Gantt diagrams have turned into a typical procedure for signifying the stages and exercises of venture while WBS can also be comprehended by many observers everywhere throughout the world as Wysocki (2009) posits.

PRINCE 2 implies Project in Controlled Condition 2; it is a procedural strategy use for managing projects. PRINCE 2 is a perfect tool utilized broadly by the government of the United Kingdom. It is generally perceived in the public and private space, in the UK and the world at large. Its highlights incorporate, center around business validation, division of undertaking into reasonable and controllable stages, adaptable in application at a level proper to the project management group. PRINCE 2 essentially depicts product-based scheduling, change control strategy and quality survey system. Task Affectability Investigation figures out the factors that have the potential to affect project. The factors include the following: dangers; venture term; assignment length; slacks among successors and antecedents; total cost of project; achievement rate and costs among others. It is likewise helpful in basic management under hazard and vulnerability.

Cost Benefit Analysis (CBA) stands out among the most used strategies for venture examination for huge infrastructure within the private and public space. CBA remains an unbending strategy that directs one on the criteria to consider in basic management as it guarantees that the total benefits to society exceed that of the total costs (Patel, 2008).

Graphical Evaluation and Review Technique (GERT) is a system investigation strategy used as integrate of project management which allows probabilistic handling of both

system rationale as well as action duration estimation. GERT is a valuable management tool for planning, arranging and controlling multifaceted undertakings (Westland, 2006). The actual objective of GERT as a management tool is to examine based on the system rationale and evaluated term of the movement and determine interpretation on few exercises that would not be carried out. GERT can be used alongside a complimentary system for investigative assessment procedure utilized as part of project management, for example PERT and CPM. Moreover, CPM is additionally project network examination method employed to figure out which groupings of exercises have the least measure of booking compliance and consequently will by all means decide the duration with which the venture can be completed. Again, Programme Evaluation and Review Technique (PERT) is a rationale and probability-based system examination framework used in most cases where exercises as well as their terms are difficult to characterize. PERT is often used as integrate of extensive program where tasks comprises several associations at extraordinary huge areas.

2.7.2 Effect of Cost Control on Project Performance

Krazner (1995) said that control on project is blended with assessing, checking as well as making corrective moves. This is exactly the basic belief with PMI and moreover IPMA. According to Angus et al. (2000), wobbly project management can caused a task to gain too much power and further extraordinary and over-receptive control will be able to convey the undertaking to a stop. The researchers continue to state that controlling an activity such that it becomes too firm could render project team followers apprehensive and be less imaginative. Angus et al. (2000) likewise affirms that observing as well as controlling of an activity ought to be carried out judiciously. The harmony between the 3 features of controlling changes from one project to the other and furthermore from period

to period in an akin task. Similarly, the steadiness is tied to the growth of the organization. In this way, it will be more appropriate for firms to undertake best practices method of the control process.

As Jackson (2004) posits, data as well as great announcing outline are key to a successful task control outline. The procedure set up should equipped one in getting quality data out of projects/ventures. Fringenti (2002) avers that execution data compare to advance data is simpler to get. The success of St. Lucie Unit 2 atomic power project can be linked to opportune detailing of results, quality change program, collaboration for taking care of issues, quality change program, gifted staff, markers among others. Cleland et al. (1998) indicates that this explains the reason attached to the harmony between capacity approach and process approach of project control.

Similarly, Cleland et al. (1998) by means of diverse cases, for example, Iowa Public Service Company, Minnesota Power and Light organization among others, specifies that contract laws are very strict for these reasons: shadowy conduct; unnecessary utilization of project management tools as elements for project disappointments; and poor qualities of project supervisors. Construction firms when met by time and cost overruns, find it difficult to adjust themselves in a control approach i.e. firms either exaggerate or poorly execute controlling procedure to the extent of checking assessment and/or remedial actions. According to Jackson (2004), the following deviations among arranged execution throughout the task will assist in ensuring remedial activities are taken. Appropriately, developing a good practices ensure successful monitoring throughout the various phases of the project. To develop good practices, the accomplishment factors that

encourage procedure enhancement as well as capacity drivers for each of the 3 project control phases i.e. assessment, restorative and checking activities ought to be fixed.

2.7.3 Documentation and Data Collection

Aitken (2000) indicated that venture reports constitute a fundamental approach for ensuring every member of the project is educated. According to the PMBOK (2000), quality arrangement, cost spending plans contract, standard designs, and hazard administration design archives constitute the best contributors to checking phase. Again, PMBOK (2000) suggested that alteration demands will shape the primary component to arrange for archives. In view of that, checking constitute the starting phase of 'cost controls' as it integrate report invention. Frigenti (2002) claimed that productive control and checking frameworks would enhanced the project team to get applicable and precise data in a consistent and an expedient way. As Aitken (2000) posits, a common report incorporates cost and extension, official rundown, varieties to time, bar diagram as well as dangers. Notwithstanding, the nature of data is critical and according to Jackson (2004), the work destinations are occupied and fail to furnish checking individual with enough required data.

In this manner, obtaining a complete and exact information from field is essential and is moreover a useless connection in the control process of task.

Jackson (2004) likewise stipulates that observing report should center on venture targets, helpless work segments, profitability growth/deterioration, projected culmination date including result and spending plan. Aitken (2000) suggested that a characteristic venture answering to be delivered at customary interims to Project supervisor and the rest of the senior administration and customer. He continue to state that reports ought to be

delivered in way that will be easy for comprehension by non-professionals. Be that as it may, it is important to understand how well quality data is being created by the task managers including how well time is spent on information accumulation and all sorts of abilities are needed specifically for such action.

2.7.4 Challenges with Cost Control in Implementing Project

The requirement to diminish the danger of poor execution of tasks is extremely significant in emerging nations in light of the fact that the greater part of the financial projects have a component of a development construction project/venture (Meredith and Mantel, 2003). While numerous reasons have been sent for the poor execution of construction projects/ventures, absence of powerful control stays high on the catalogue. First of all, since project control is certainly not an independent action, yet rather a coordinated action that gets yields from prior periods of the project life-cycle forms (PMI, 2011). Without a decent quality arrangement, cost control cannot be accomplished. Furthermore, cost control requires productive, compelling and watchful procedures and activities to guarantee its effective achievement.

Within their descriptive paper, Rozen et al. (2006) investigated writing identifying with different techniques used to accomplish project control. The foremost classes recognized were the one-dimensional and the multi-dimensional control frameworks. The previous is the place the control targets center around one particular venture measurement as opposed to the whole arrangement of aims/objectives. These are regularly straightforward frameworks to execute and comprehend. Regardless of whether two goals are utilized all the while, there is an absence of the essential coordination. Then again, multi-dimensional control frameworks coordinate numerous project objectives

(Rozen et al., 2006) giving a multi-faceted revealing framework. Project/ventures are perplexing endeavors and include a bunch of difficulties. These difficulties incorporate forceful indigenous and overseas rivalry, groupings, venture execution instability, authoritative issues and staff turnover (Wilczynski et al., 2006). These difficulties are basic all by themselves. The difficulties likewise have suggestions on how exercises learned are done and the estimation of exercises learned regarding their utilization and reuse. Therefore, it is imperative to focus on the reasons of disappointment and in addition accomplishment to discover learning conceivable outcomes and useful focuses for future tasks. There are some regular attributes of fizzled projects/ventures, for example (Meredith and Mantel, 2000):

1. Difficulties with sorting out task group.
2. Weak undertaking administration.
3. Communication issues.
4. Conflict and determination.
5. Insufficient upper administration inclusion.
6. Difficulties in characterizing work in adequate detail.

As per Olateju, Abdul-Azeez and Alamutu (2011), the difficulties confronted with cost control framework in actualizing project incorporates the accompanying;

- **Management issues:** This comprises of issues identifying with oppressive proprietor lender impacts, family impedances, poor hierarchical administration, and absence of premeditated scheduling, absence of activities, work environment legislative issues, and arrangement of authoritative objective to proprietor individual objectives. The

unbending hierarchical structures of organizations challenge between play of project instruments to the burden of project/task results.

- **Limited fund:** Restricted investment incorporates issues identifying with restrictive cost of PM programming and supporting ICT framework, PM expertise attainment, cost of drawing in PM specialists, and failure to obtain adequate financial investment from banks for projects/ventures.
- **Limited PM learning:** This identifies with PM information gap issues related with myths of project management. The mythologies incorporate; project management is essential for small enterprises, project management moderate's business process, project management rehearse is tedious and bureaucratic, project management abilities are excessively particular, project management is an authoritative weight, project management is capital escalated. It stretches out to poor learning of project activities nature and absence of authentic documentations about shut or completed projects/ventures.
- **Environmental problems:** In specific territories of research condition, projects/ventures executions draw in troublesome consideration and exercises of region young men, government offices, law authorizations, wanton demolition of projects, and indigenes' persistence on providing project objects or forcing engagement of their incompetent work. This issue reaches out to troublesome climate circumstances, social introductions, religious convictions and social anti-project temperaments to a few ventures.
- **Corruption:** This alludes to extensive variety of degenerate practices unfriendly to project delivery, national improvement and social request, for example, coercions,

jungle justice, deception, inducement, over billing, over supplying, supply of phony project substances and in addition any lawful, monetary, and disciplinary bargains.

- **Policy difficulties:** This gathering of concerns incorporates insecure monetary strategies, different tax collection/imposes, numerous clearance and permits, obstructive strategies on advancement exchanges, established disorganizations, precarious exchange rates, impacts of contention among levels of government, and absence of formative structures.
- **Awareness glitches:** This identifies with issues that block acknowledgment, selection and dispersion of project management inventive practices, for example, absence of adequate project management mindfulness, deficiency of assessment pioneers and project management achievement references. It additionally incorporates powerless social and media correspondence channels.
- **Labor versatility issues:** Work versatility identifies with redeployments, acquiescence, exchanges, advancements and re-assignment of project delivery personnel. Numerous projects collapse because of the organizations' trademark high rate of project management proficient portability amid which over the span of project usage, project management regions and predefined results are modified by approaching work force.
- **Personnel deficiency:** This alludes to absence of imperative project management staff with broad learning of project management aptitudes, devices and strategies. Organizational projects are taken care of by novices with absence of adjusted specialized and individual skills needed for successful management of projects.

2.8 Schedule Control

Schedule Control is the project management action in which advance on project exercises is contrasted against Calendar gauge with comprehend whether project is in front of the calendar or behind. In light of the deviation you can anticipate remedial or preventive activities and oversee changes to standard. This procedure helps subsequently decreases the danger of conveyance slippage when overseen well (Shenoy, 2018).

Schedule Control starts at the initiation of the project's work. The means engaged with control are:

- Checking the Schedule exercises for real begin and complete dates and anticipating the rest of the lengths for work that is in process.
- Execution assessments of advancement and earned esteem.
- Calendar Examination to decide basic way and Schedule deviations from plan.

Calendar Control gives early sign of deviations from plan all together that remedial activities can be executed to limit Schedule and cost effect to the project's execution actions can be implemented to minimize schedule and cost impact to the project's performance.

2.8.1 Scheduling Change Management

The change management process concedes the significance of appreciating the execution plan of projects including the evaluation and identification of the resource and schedule requirements associated with the changing quantity or changing scope basis. Updates of schedule ought to integrate changes which will accurately reflect the on-going activities of the project. Resource requirements and activity durations ought to be adjusted to reflect the approved changes. This make certain that the schedules of the project

continues to operate as accurately as possible for the execution plan and predictions of the project reflects updated resource requirements.

2.8.2 Project Manager

The project manager leads the entire project team in terms of planning project's activities which result in preparing all schedules of the project. PMs ensure that schedules for each activity at a particular level remain detail so as to support the prerequisites for planning a project for monitoring status and progress during the project life cycle.

2.8.3 Project Planner/ Scheduler

The project scheduler/planner works hand in hand with the management team to develop project schedule to meet the requirements specified in the contract and also develop plan for project execution. Project schedulers/planners updates all schedules for every activity, reporting tangible starts, tangible finishes including an estimate of duration remaining for the all the activities in headways. Project planners gather schedule status on a more detailed schedule, by means of either proofread copies of schedules or schedule meetings on that matter. With regards to the meeting, the planner will execute time analysis to compute the updated CPM dates. After validating data of the updates, and approved by the construction manager, the scheduler will then distribute the new schedule to project staffs.

Planners conduct evaluation of performance, by comparing earned value and planned progress to the actual earned value and progress. Furthermore, a planner carries out schedule analysis to find out the resource, critical path and events deviating from the

plan. Identification of deviations stands key to understanding the trends and direction taking by the project.

Planners prepares schedule analysis report for the entire project team as well as the project controls department management. Such reports are concise as they itemize future risks and deviations. Project team are required to identify corrective measures for minimizing cost and schedule impacts to the project's plan.

Planners participate with the project's control team to predict cost outcome and schedules of the project. Management reporting will be performed at minimum and on monthly basis as a result of the detailed schedule update.

2.8.4 How Scheduling Control Play an Important Role during Project Development

Scheduling including its function constitute one of the key aspects of managing project. Once the techniques of network-planning are employed, scheduling relies on the planning function. Schedule simply refers to a timetable prepared according to plan, and thus it is hard to established it unless the project plan is done preparing.

The foremost step for establishing any project is to first estimate the time it will take the entire project to get completed, that is, the time the project commenced and the time it will be finished. The duration estimated for every single activity culminate to constitute the actual time to get the work done together with all associated waiting time. It is advisable to have a personnel to be in charge of a particular activity and as well make duration schedule for that same activity. This ensures the personnel commit to the task and thus avoid bias that will be introduced as one person prepare the duration estimates for all of the project activities.

The estimate for the duration preparation must be tied to the quantity of resources available to execute the project. The estimation ought to be aggressive, yet genuine.

Throughout the entire project phase, some of the activities will require longer duration in the estimate, others will on the contrary require shorter duration, and only few may fit exactly to the estimated time.

To establish the basis for calculating project schedule by utilizing duration estimates, it is important to make selection of the estimated time for commencing the project and the required time for completion of the entire project. Thus, the starting and the completion times define the overall time for the project to get completed. Projects require set time of completion which constitute part of the objectives as it is stated inside the contract document. As long as the estimated duration for every activity is stated in the network and the complete window of time for the completion of the entire project is likewise stated, one has to decide whether those activities within the project can be executed to meet the time for completion.

One significant aspect of effective control of project is to measure progress of work and compare that to the predetermined progress on a regular and timely basis and also take important corrective measures as quickly as possible. The control process of the project includes gathering data on regular basis on performance of the project against the predetermined performance. This aspect of managing projects must occur on regular basis till completion.

It begins by establishing a model plan which shows or directs how the scope of the project ought to achieve within budget and on time. Once this is done and is agreed with the client the project begins. A regular period for reporting must be established to compare the progress of the project against the predetermined progress. Reporting can be done on monthly, weekly or on daily bases depending on the project's duration and its

complexity. During reporting, two types of information or data required to be gathered; that is, information on changes to budget, scope and schedule of the project, and data on project's actual performance.

Once calculations for the updated budget and schedule have been done, it is required that comparison is made to the baseline budget and schedule and further analysis be done to identify the variances which will determine whether the project is making headways or not. The control process for the project is maintained throughout the phase of the project. The following steps are ways of controlling schedule:

1. Analyzing schedule to points out the areas that require corrective action;
2. Determining the corrective actions to be taken;
3. Studying the plan so as to integrate the selected corrective actions; and
4. Recalculating project schedule to analyze efforts of the predetermined corrective actions.

Anytime project schedule is recalculated in any project it very important to analyse first the newly calculated schedule so as to determine of find out whether the time schedule demands extra attention. The analysis to carry out ought to include finding out the critical path and the other path of activities.

2.9 Identified Top Inhibiting Factors

Olawale and Sun (2015) identified twenty (20) factors that inhibit cost and schedule control on construction projects. Some of the factors were relating or overlapping the others.

Table 2.1: Inhibiting Factors for Cost and Schedule Control

NO.	INHIBITING FACTORS
1	Inflation of prices
2	Weak regulation and control
3	Project fraud and corruption
4	Design changes
5	Dependency on imported materials
6	Complexity of works
7	Conflict between project parties
8	Unpredictable weather conditions
9	Financing and payment for completed works
10	Risk and uncertainty associated with projects
11	Non-performance of subcontractors and nominated suppliers
12	Lack of proper training and experience of PM
13	Discrepancies in contract documentation
14	Low skilled manpower
15	Inaccurate evaluation of projects time/duration
16	Contract and specification interpretation disagreement
17	Unstable interest rate
18	Unstable government policies
19	Fluctuation of currency/exchange rate
20	Lack of appropriate software

Source: Olawale and Sun (2015)

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter three is dedicated to the research methodology for this research. It gives detailed information on the techniques used in collecting, processing as well as analyzing our research data. This section of the study therefore describes the research design, target population, sampling procedures, sources of data, collection instruments, administering procedure and data analysis.

3.2 Research Design

Research design basically considers research approach, research strategy and research method for the study. This kind of research design will be deemed the most appropriate since it best describe the opinions, personal characteristics, perceptions, preferences and attitudes of respondents. In addition, it will enable a specific coverage area, giving respondents the opportunity to critically analyze the cost and schedule control inhibiting factors they are exposed to from both personal and professional points of view.

3.3 Research Approach / Strategy

The study will be carried out using quantitative research, which is concerned with investigating things which could be observed and measured in some way (Degu and Yigzaw, 2006). Quantitative research is on collecting and analyzing numerical data; it concentrates on measuring the scale, range, frequency of phenomena. This type of research, although harder to design initially, is usually highly detailed and structured and

results can be easily collated and presented statistically (Neville, 2007). Quantitative research is based on the measurement of quantity or amount (Kothari, 1985).

The quantitative approach has been selected as data collected will be analyzed with statistical procedures. Rajasekar et al, (2013) intimated that quantitative research often begins with the collection of data based on a theory or hypothesis or experiment followed by the application of descriptive or inferential statistical methods. This study will therefore make use of statistical methods to analyze the collected data which will form the bases of formulating recommendations.

3.4 Research Method

Questionnaire survey will be used to sample views from middle and senior level management on the KTP project. On most of the questions, respondents were asked to express their views on a five-point Likert scale (from “1” to “5” i.e. from Not important to Very important) .The responses were analyzed with the help of the five-point Likert Scale. Responses were requested on issues ranging from their demographic information; their views on factors inhibiting both cost and schedule control; their mitigating measures.

3.5 Population of the Study

According to Zikmund (2003), the definition of population was identifiable total set of elements of interest being investigated by a researcher. The target population for the study was middle and senior level management on the KTP project. The main reason for using this category of people is that their activities directly or indirectly has a bearing on the subject matter which is the scope for the study. A total of twenty (20) participants are qualified to partake in the study.

3.6 Sample Size

In this study, census sampling method adopted, were the whole population is the sample size. In all twenty (20) questionnaires were distributed to the middle and senior level management on the KTP project. The participants were selected because their activities directly or indirectly has a bearing on the subject matter which is the scope for the study. Added to this, these respondents will be allowed to participate in the research study under free will without any form of coercion.

3.7 Sampling Technique

The study will select the respondents using census sampling method. This sampling technique will provide the answers needed to achieve the research questions. More importantly, census sampling technique select respondents who could provide require information in the whole population. Based on this, questionnaires which fully reflect the research objectives of the study will be administered to all twenty (20) target participants.

3.8 Sources of Data

Data will be collected using both primary and secondary sources of data through the use of self-administered questionnaires with respondents. Secondary sources of data will be obtained from already written literature on cost and schedule control from text books, magazines, management reports, operations guidelines and other research work that have already been carried out.

3.9 Data Collection Instruments

Questionnaires will be used to collect primary data from the selected sample size. In designing the questionnaire much attention will be paid to ensuring that the objectives of the research are covered in order to make it effective. The questionnaire will be used because it will enable the participants work at their own pace and convenience. Another reason why the questionnaires will be used is because questionnaires provide a great deal of anonymity to respondents, in terms of soliciting for open and honest responses. In addition, the questionnaire will enable the respondents to feel comfortable when answering questions which are personal and which would have been very difficult to obtain during a face to face interview because of its anonymity nature. The questionnaires are structured with both open and closed ended-questions which will provide possible alternatives to choose from, where respondents are asked to tick answers pertaining to questions based on the research questions.

3.10 Data Administration Procedure

The researcher personally will be responsible for the distribution and collection of all questionnaires to avoid the possible delays and losses. The mode of response will be well explained to the respondents to enable them easily fill the questionnaire with relevant responses as well as help clarify ambiguities and uncertainties regarding the questions. Although the questionnaires will be self-administered, the researcher will have follow up on discussions with the respondents to allow further probing and clarification of unclear issues.

3.11 Data Analysis

The data collected will be analyzed using Microsoft Excel package. This five-point Likert scale was converted to a Relative Importance Index (RII) for each individual factor, using the following formula, as adopted by Kumaraswamy and Chan (1997, 1998) and Iyer and Jha (2005):

$$\text{Relative importance index (RII)} = \sum W \div (H \times N)$$

Where W is the total weight given to each factor by the respondents and is calculated by an addition of the various weightings given to a factor by the entire respondent, H is the highest ranking available (i.e. 5 in this case) and N is the total number of respondents that have answered the question.

To ascertain the similarities between cost control rankings and schedule control rankings, Spearman's rank correlation coefficient will be used to test the agreement or disagreement between the two rankings. The Spearman's rank correlation is a non-parametric test. The correlation coefficient varies between +1 and -1, where +1 signifies perfect positive correlation and -1 shows a perfect negative correlation or disagreement. The formula for the Spearman rank correlation is given by the equation below:

$$r_s = 1 - (6\sum d_i^2 / (N^3 - N)).$$

Where r_s is the Spearman rank correlation coefficient, d_i represents the difference between ranks for each case and N is the number of subjects or pairs of ranks (Weinberg and Abromowitz, 2008).

CHAPTER FOUR

DATA PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter reports on the results obtained from the study and the analysis of the findings thereof in the light of the objectives of the study. The total number of questionnaires administered by researcher was 20 and same number was completed and returned. This represents a response rate of 100%. Descriptive statistics such as frequencies, percentages, mean, standard deviation and rank score were used to analyze the data collected from the field. The presentation and analysis of the collected data were carried out using descriptive statistics (such as frequencies, percentages, mean and rank score) and analytical tools.

4.2 Respondents' Demographic Information

The background information of respondent relevant to the study are analyzed below.

Table 4.1: Respondents engagement status on the project

	Frequency	Percent	Cumulative Percent
Currently on project	12	60.00	60.00
Formally on project	8	40.00	100.00
Total	20	100	

Source: Field Data, 2018

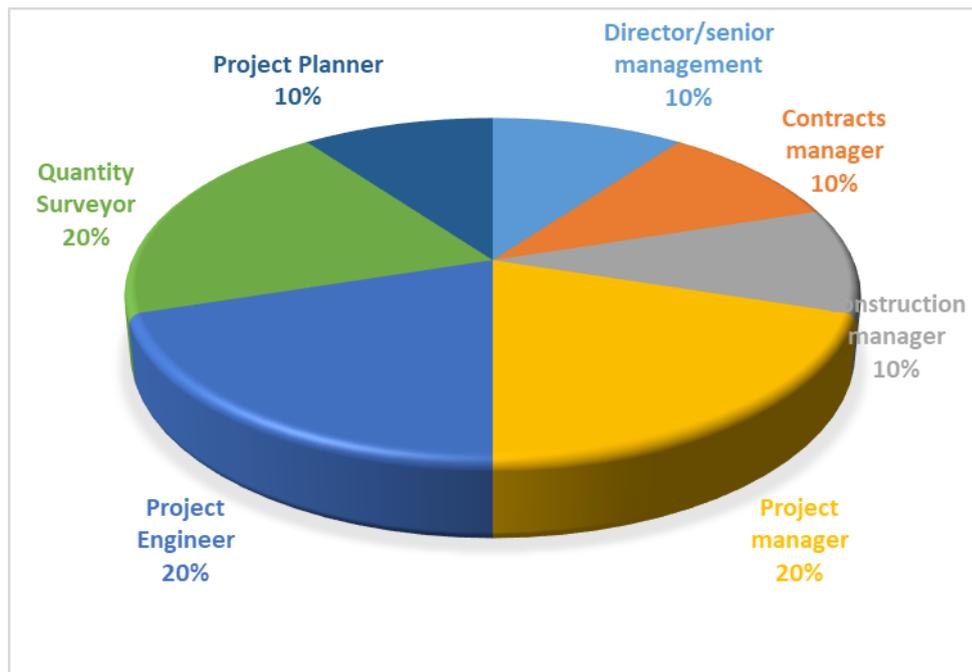
On respondent's engagement status on the project (12, 60%) were currently on project while (8, 40%) were formally on project. It can therefore be seen that majority of the respondents were currently on the EPC project.

Table 4.2: Respondents party on the project

	Frequency	Percent	Cumulative Percent
Client / Consultant	9	45	45
Contractor	11	55	100
Total	20	100	

Source: Field Data, 2018

When asked respondents party on the project, (9, 45%) were Client / Consultants while (11, 55%) were Contractors.



Source: Field Data, 2018

Figure 4.1: Respondents role on the project

The study sought to determine the respondent's role on the project. As attained in the Figure above, most of the respondents (20%) were Quantity Surveyors, Project Engineers, and Project Managers respectively. Other respondent's role on the project were (10%) who were Project Planners, Contract Managers, Instruction Managers and Director/Senior Management. Conclusions therefore be made that most of the respondent's role on the project were Quantity Surveyors, Project Engineers, and Project Managers respectively.

Table 4.3: Respondents tenure on the project

	Frequency	Percent	Cumulative Percent
Less than 1 years	0	0	0
1-3 years	10	50	50
4-6 years	10	50	100
Total	20	100	

Source: Field Data, 2018

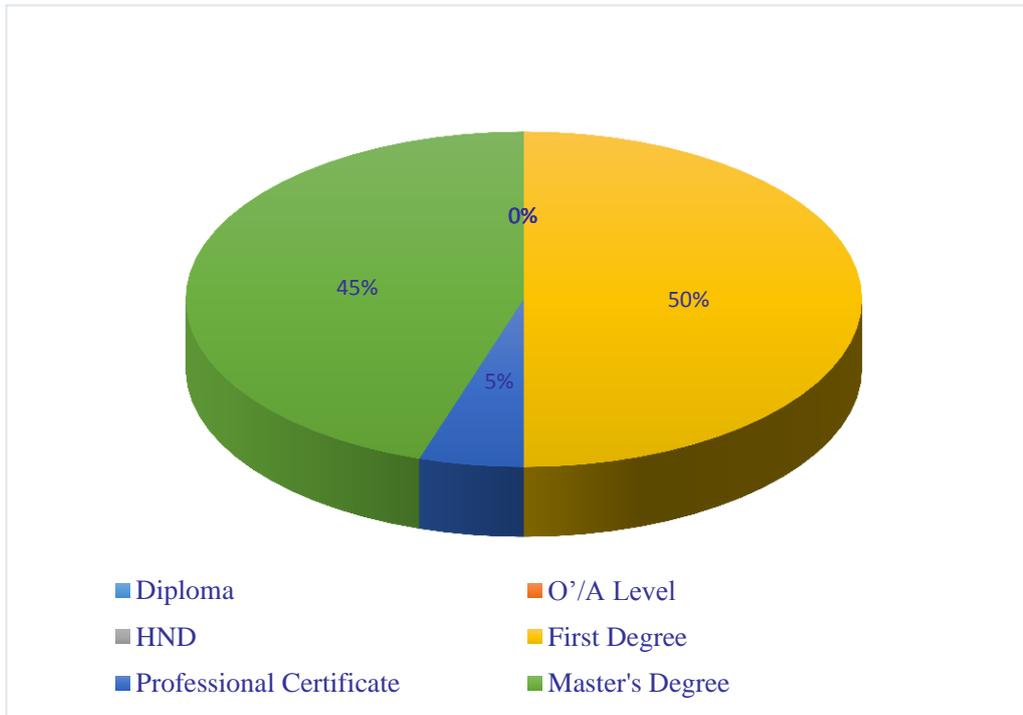
From Table 4.3, the outcome shows that majority of 10 (50%) of the respondents have spent less than 6 years at the company in various capacities. The result shows that, on average the respondents have spent more time with the company so they have enough knowledge about the subject matter under consideration

Table 4.4: Respondents tenure in the construction industry

	Frequency	Percent	Cumulative Percent
Less than 1 years	0	0	0
1-3 years	0	0	0
4-6 years	0	0	0
7-9 years	4	20	20
9 years and above	16	80	100
Total	20	100	

Source: Field Data, 2018

On the percentage of years of working experience of the respondents, (4) 20% of the respondents have 7-9 years working experience, (16) 80% of the respondents have 9 years and above working experience. This shows majority of respondents had good understanding of the construction field.



Source: Field Data, 2018

Figure 4.2: Respondents educational background

The findings revealed that 50% of the respondents had an undergraduate degree followed by 45% who possessed a Master's degree. Only 5% have O/A as their highest level of education. This indicates that respondents are therefore well-informed and are well positioned to implement that various internal control systems in the company for maximum revenue generation.

4.3 Results

The table below show the schedule control inhibiting factors.

Table 4.5: Schedule control inhibiting factors

Schedule Control Inhibiting Factors	RATING					Total	ΣW	Mean	RII	Rank
	1	2	3	4	5					
Financing and payment for completed works	0	0	0	0	20	20	100	5	1.00	1st
Inaccurate evaluation of projects time/duration	0	0	0	5	15	20	95	4.75	0.95	2nd
Complexity of works	0	0	2	6	12	20	90	4.5	0.90	3rd
Risk and uncertainty associated with projects	0	0	0	12	8	20	88	4.4	0.88	4th
Unpredictable weather conditions	0	3	0	6	11	20	85	4.25	0.85	5th
Design changes	0	2	5	6	7	20	78	3.9	0.78	6th
Non-performance of subcontractors and nominated suppliers	0	0	6	10	4	20	78	3.9	0.78	7th
Dependency on imported materials	0	4	3	7	6	20	75	3.75	0.75	8th
Lack of proper training and experience of PM	0	0	9	8	3	20	74	3.7	0.74	9th
Low skilled manpower	0	4	5	6	5	20	72	3.6	0.72	10th
Unstable government policies	0	0	9	11	0	20	71	3.55	0.71	11th
Conflict between project parties	0	3	7	10	0	20	67	3.35	0.67	12th
Discrepancies in contract documentation	3	6	7	2	2	20	54	2.7	0.54	13th
Contract and specification interpretation disagreement	4	6	8	2	0	20	48	2.4	0.48	14th
Lack of appropriate software	5	7	8	0	0	20	43	2.15	0.43	15th
Unstable interest rate	7	6	7	0	0	20	40	2	0.40	16th
Inflation of prices	12	5	3	0	0	20	31	1.55	0.31	17th
Fluctuation of currency/exchange rate	12	8	0	0	0	20	28	1.4	0.28	18th
Weak regulation and control	16	4	0	0	0	20	24	1.2	0.24	19th
Project fraud and corruption	20	0	0	0	0	20	20	1	0.20	20th

From Table 4.4 all the 20 Schedule control inhibiting factors recorded average mean and RII scores. Specifically, Financing and payment for completed works recorded the highest mean of 5.0 and RII=1.0, followed by Inaccurate evaluation of projects time/duration (Mean=4.75, RII=0.95), Complexity of works (Mean=4.5, RII=0.90), and Risk and uncertainty associated with projects (Mean=4.4, RII=0.88). The highest mean value show that respondents believe that Financing and payment for completed works, Inaccurate evaluation of projects time/duration, Complexity of works, Risk and uncertainty associated with projects are the strongest common Schedule control inhibiting factors in the construction industry. The study further also shows that “Weak regulation and control” (Mean=1.2, RII=0.24) and Project fraud and corruption (Mean=1; RII=0.20) are the least Schedule control inhibiting factors applied in the construction EPC project.

Table 4.6: Cost control inhibiting factors

The table below show the cost control inhibiting factors.

Cost Control Inhibiting Factors	RATING					Total	ΣW	Mean	RII	Rank
	1	2	3	4	5					
Risk and uncertainty associated with projects	0	0	1	8	11	20	90	4.5	0.90	1st
Inaccurate evaluation of projects time/duration	0	0	3	6	11	20	88	4.4	0.88	2nd
Inflation of prices	0	0	2	12	6	20	84	4.2	0.84	3rd
Fluctuation of currency/exchange rate	0	0	3	10	7	20	84	4.2	0.84	4th
Unstable interest rate	0	0	5	9	6	20	81	4.05	0.81	5th
Complexity of works	0	0	4	12	4	20	80	4	0.80	6th
Design changes	0	2	5	9	4	20	75	3.75	0.75	7th
Financing and payment for completed works	0	5	6	5	4	20	68	3.4	0.68	8th
Unpredictable weather conditions	0	3	10	7	0	20	64	3.2	0.64	9th
Dependency on imported materials	0	6	7	7	0	20	61	3.05	0.61	10th
Lack of proper training and experience of PM	2	2	11	5	0	20	59	2.95	0.59	11th
Unstable government policies	6	4	10	0	0	20	44	2.2	0.44	12th
Conflict between project parties	6	8	6	0	0	20	40	2	0.40	13th
Contract and specification interpretation disagreement	5	10	5	0	0	20	40	2	0.40	14th
Lack of appropriate	5	10	5	0	0	20	40	2	0.40	15th

software										
Non-performance of subcontractors and nominated suppliers	7	9	4	0	0	20	37	1.85	0.37	16th
Discrepancies in contract documentation	6	12	2	0	0	20	36	1.8	0.36	17th
Low skilled manpower	11	7	2	0	0	20	31	1.55	0.31	18th
Weak regulation and control	12	8	0	0	0	20	28	1.4	0.28	19th
Project fraud and corruption	13	7	0	0	0	20	27	1.35	0.27	20th

From table 4.5 all the 20-cost control inhibiting factors also attained average mean and RII scores. The study found that, Risk and uncertainty associated with projects recorded the highest mean of 4.5 and RII=0.90, followed by Inaccurate evaluation of projects time/duration (Mean=4.4, RII=0.88), Inflation of prices (Mean=4.2, RII=0.84), and Fluctuation of currency/exchange rate respectively. Additionally, Unstable interest rate, and Complexity of works was associated with projects (Mean=4.05, RII=0.81) and (Mean=4, RII=0.80). The uppermost mean value demonstrated that respondents believe that Risk and uncertainty associated with projects, Inaccurate evaluation of projects time/duration, Inflation of prices, Fluctuation of currency/exchange rate and Unstable interest rate associated with projects are the strongest common Cost control inhibiting factors in the construction industry. Likewise, the study additional revealed that “Low skilled manpower” with a (Mean=1.55, RII=0.31), “Weak regulation and control” (Mean=1.4, RII=0.28) and Project fraud and corruption (Mean=1.35; RII=0.27) are the minimum Cost control inhibiting factors related in the construction EPC project.

Table 4.7: Mitigating Measures for both Cost & Schedule Inhibiting Factors

Mitigating Measures for both Cost & Schedule Inhibiting Factors	RATING					Total	$\sum W$	Mean	RII	Rank
	1	2	3	4	5					
Ensure adequate project finance is available before start of the project	0	0	0	3	17	20	97	4.85	0.97	1st
Employ Value Management techniques	0	0	0	8	12	20	92	4.6	0.92	2nd
Proper project planning and scheduling	0	0	5	8	7	20	82	4.1	0.82	3rd
Plan realistically and built up from first principle	0	0	8	8	4	20	76	3.8	0.76	4th
Refuse to accept unrealistic project time scale by client	0	0	9	7	4	20	75	3.75	0.75	5th
Perform a preconstruction planning of project tasks and resources needs	0	4	6	4	6	20	72	3.6	0.72	6th
Secure additional cash flow in advance	0	5	6	3	6	20	70	3.5	0.70	7th
Frequent progress meeting	0	5	6	6	3	20	67	3.35	0.67	8th
Include contingency in budget	0	3	9	8	0	20	65	3.25	0.65	9th
Effective strategic planning	0	5	8	5	2	20	64	3.2	0.64	10th
Systematic control mechanism	0	5	8	5	2	20	64	3.2	0.64	11th
Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors	0	7	7	5	1	20	60	3	0.60	12th
Use latest computerized planning & monitoring techniques	1	5	9	5	0	20	58	2.9	0.58	13th
Use of appropriate construction methods	5	4	5	6	0	20	52	2.6	0.52	14th
Comprehensive contract administration	4	6	5	5	0	20	51	2.55	0.51	15th
Enter into fixed rate loan	5	6	5	4	0	20	48	2.4	0.48	16th

contract with lending banks										
Use of experienced subcontractors and suppliers	4	6	9	1	0	20	47	2.35	0.47	17th
Effective site management and supervision	4	8	8	0	0	20	44	2.2	0.44	18th
Developing human resources in the construction industry	6	8	3	3	0	20	43	2.15	0.43	19th
Use up to date technology utilization	6	7	6	1	0	20	42	2.1	0.42	20th
Proper emphasis on past experience	9	6	4	1	0	20	37	1.85	0.37	21st
Clear information and communication channels	9	8	3	0	0	20	34	1.7	0.34	22nd
Frequent coordination between the parties	9	8	3	0	0	20	34	1.7	0.34	23rd

From table 4.6 illustrates all the 23- mitigating measures for both cost and schedule inhibiting factors similarly achieved average mean and RII scores. The study revealed that, ensuring adequate project finance was available before start of the project recorded the highest mean of 4.85 and RII=0.97, followed by employing value management techniques (Mean=4.6, RII=0.92), Proper project planning and scheduling (Mean=4.1, RII=0.82), and Plan realistically and built up from first principle (Mean=3.8, RII=0.76), respectively. Moreover, refusing to accept unrealistic project time scale by client, and performing a preconstruction planning of project tasks and resources needs attained a (Mean=3.75, RII=0.75) and (Mean=3.6, RII=0.72) respectively. The topmost mean value confirmed that respondents strongly agreed that the mitigating measures for both cost and schedule inhibiting factors were ensuring adequate project finance was available before start of the project, employing value management techniques, proper project planning and scheduling, planning realistically and built up from first principle, refusing to accept unrealistic project time scale by client and performing a preconstruction

planning of project tasks and resources needs. In the same vein, the study gathered that “Proper emphasis on past experience” with a (Mean=1.85, RII=0.37), “Clear information and communication channels” (Mean=1.7, RII=0.34) and “Frequent coordination between the parties” (Mean=1.7; RII=0.34) are the least mitigating measures for both cost and schedule inhibiting factors related in the construction of the EPC project.

4.4 Discussion of Results

When the ranking the top five (5) inhibiting factors of cost control are compared to the top five (5) inhibiting factors of schedule control, you can conclude there are similarities. “Inaccurate evaluation of projects time/duration”, “Risk & uncertainty associated with projects”, “Financing and payment for completed works”, “Complexity of works” and “Design changes” came up as the obvious factors inhibiting cost and schedule control.

A statically test was conducted on both of rankings of cost and schedule control to ascertain the above observation using the spearman’s rank correlation coefficient to examine the agreement or disagreement between the two rankings. The correlation coefficient varies between +1 and -1, where +1 signifies perfect positive correlation and -1 shows a perfect negative correlation or disagreement. The outcome of the examination is 0.42, showing a moderately positive correlation and highlighting a moderate agreement between factors inhibiting cost and schedule control. This is comparable to the findings of Chang, 2002, who concluded that it was hard to separate factors causing both cost and schedule overruns.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes the study on cost and schedule control on EPC projects in Ghana, using KTPP as a case study. The summary of this study, present notable findings and appropriate recommendations that will greatly contribute to the understanding of key factors inhibiting cost and schedule control and their corresponding mitigating measures on EPC projects in Ghana.

5.2 Findings

The findings of the study are summarized as follows:

Objective 1:

The research revealed the key factors inhibiting cost control as follows:

- Risk and uncertainty associated with projects
- Inaccurate evaluation of projects time/duration
- Inflation of prices
- Fluctuation of currency/exchange rate
- Unstable interest rate
- Complexity of works
- Design changes
- Financing and payment for completed works
- Unpredictable weather conditions
- Dependency on imported materials

Objective 2:

While, the key factors inhibiting schedule control as follows:

- Financing and payment for completed works
- Inaccurate evaluation of projects time/duration
- Complexity of works
- Risk and uncertainty associated with projects
- Unpredictable weather conditions
- Design changes
- Non-performance of subcontractors and nominated suppliers
- Dependency on imported materials
- Lack of proper training and experience of PM
- Low skilled manpower

Objective 3:

The key mitigating measures to deal with these factors inhibiting cost and schedule control have equally being identified and are namely: Ensure adequate project finance is available before start of the project, Employ Value Management techniques, Proper project planning and scheduling, Plan realistically and built up from first principle and Refuse to accept unrealistic project time scale by client.

5.3 Conclusion

In conclusion, the research emphasizes that since there are similarities in the factors inhibiting cost and schedule control, the top inhibiting factors should be managed properly so as to lead to an effective implementation of both cost and schedule control particularly on EPC projects in Ghana.

5.4 Recommendations for Further Studies

The following are the recommendations from the entire study:

- It is recommended that a future study is extended to investigate the impact of top inhibiting factors for both cost and schedule.
- It is recommended that a future research is extended to investigating more than one EPC project in order make a cross comparative analysis and conclusion.
- It is recommended that a future research works on this subject should compare and contrast between public and private sector projects.

REFERENCES

- Ahern, M.D., Clouse, A. and Turner, R. (2001) *CMMI Distilled - A practical Introduction to integrated process improvement*, Pearson Education, New Jersey, USA.
- Angus, R. B., Norman, G., Gundersen, T., and Cullinane, P. (2000) *Planning , performing and Controlling Projects – Principles and applications*, 2000, Prentice Hall Inc, Pearson Education, New Jersey , USA.
- Aitken, W. (2000) *Planning and Controlling Projects*, Scitech Educational, Broadstairs, Kent
- Akomah, B.B., Nimo-Boakye, A. and Fugar, F.D.K. (2010) ‘Safety on Ghanaian construction sites: The role of the employer and the employee’, in S. Laryea, Leiringer, R. and Hughes, W. (eds) *Proceedings: West Africa Built Environment Research (WABER) Conference, Accra, Ghana, 27-28 July 2010*.
- Baccarini D., (1999). *The Logical Framework Method for Defining Project Success* . *Project Management Journal*. Vol 30, Issue 4, pp. 25 – 32
- Bakar, A. H. A., Tufail M.A., Yusof, M. N. & Virgiyanti, W. (2011). *The role of project managers in improving project performance in construction: an Indonesian experience*. *International Journal of Academic Research*, 3(6), 164-169.
- Burke, R. (2003). *Project Management Planning and Control Techniques*, 4th edition, John Wiley & Sons.
- Chang, A. (2002) *Reasons for cost and schedule increase for engineering design projects*. *Journal of Management in Engineering*, 18 (1), 29-36.

- Cleland, D.I. and Ireland, L.R. (2002) *Project Management: Strategic Design and Implementation*. Boston: McGraw-Hill
- Dai, H., Cao, G. and Su, H. (2006) Management and Construction of the Three Gorges Project, *Journal of Construction Engineering and Management*, June 2006:615
- De Falco, Massimo & Macchiaroli, Roberto. (1998). Timing of control activities in project planning. *International Journal of Project Management*. 16. 51-58. 10.1016/S0263-7863(97)00012-4.
- Degu, G., and Yigzaw, T. (2006). Introduction to research and research methods.
- Elchaig, T., Boussabina, A., & Ballal, T. (2005). Critical determinants of construction tendering costs: Quantity surveyors' standpoint. *International Journal of Project*
- Flyvbjerg, B., Holm, M. S., & Buhl, S., (2002) Underestimating Costs in Public Works Projects: Error or Lie? *Journal of the American Planning Association*, 68:3, 279-295.
- Falco, M. and Macchiaroli, R. (1998) Timing of Control Activities in Project Planning, *International Journal of Project Management*, 16 (1):51-58, Elsevier Science Ltd and IPMA.
- Frigenti, E. (2002) *Practice of Project Management : A Strategic Guide to the Business Focused Approach*, Kogan Page, Limited, London, , GBR
- Fortune, J. and White, D. (2006) Framing of project critical success factors by a systems model, *International Journal of Project Management*, 24(): 53-65, Elsevier Science Ltd and IPMA
- Gould, F. E. (2004). *Managing the Construction Process: Estimating, Scheduling, and Project Control*. Upper Saddle River, NJ: Prentice Hall. Management, 23, 538-545.

- Gardiner, P.D. (2005) *Project Management: A Strategic Planning Approach*, Palgrave Macmillan, The UK.
- Habibi, Mohammadreza & Kermanshachi, Sharareh & Safapour, Elnaz. (2017).
Engineering,
Procurement and Construction Cost and Schedule Performance Leading
Indicators:
State- of-the-Art Review. 10.1061/9780784481271.037.
- Hazir O., (2015). A review of analytical models, approaches and decision support tools in project monitoring and control, *International Journal of Project Management*, 33 (2015) 808-815.
- Jackson, B.J. (2004) *Construction Management Jump Start*, Sybex, Incorporated, Alameda, CA, USA
- Iyer, K. and Jha, K. (2005) Factors affecting cost performance evidence from Indian construction projects. *International Journal of Project Management*, 23 (4), 283-295.
- IPMI, 2008. Significant Changes Affecting Project Management. [Online] 839 [Accessed November 12th, 2008] Available from the World Wide Web: 840 <http://www.projectmanagement.ie/images/assets/pdf/significantchanges.841pdf>.
- Jha, K. N., & Iyer, C. K., (2006). What attributes should a project coordinator possess? *Journal of Construction Management and Economics*, 24(9), 977-988
- Kerzner H., (2009). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. John Wiley and Sons.
- Kerzner H., (2005). *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. John Wiley and Sons.
- Kerzner, H. (1995) 'Project Management – A systems Approach to planning, scheduling

- & controlling, van Nostarnd Reinhold, USA: 234-235.
- Kothari, C. R. (1985). *Research Methodolgy*. New Delhi: New Age International Publishers.
- Kumaraswamy, M. and Chan, W. (1998) Contributors to construction delays
Construction Management and Economics, 16 (1), 17-29.
- Laryea, S. (2010). Challenges and Opportunities Facing Ghanaian Contractors. Proceedings of the West Africa Built Environment Research (WABER) Conference (Reading University) (pp. 215-226.) Accra
- Mahmoud-Jouini, S. B., Midler, C., & Garel, G. (2004). “Time-to-market vs. time-to-delivery:
 Managing speed in Engineering, Procurement and Construction projects”.
International Journal of Project Management, 22(5), 359-367.
- Marasini, R. and Dawood, N. (2006) Innovative managerial control system (IMCS): an application in precast concrete building products industry, *Construction Innovation*,
 6:97–120
- Marques, G., Gourc, D., & Lauras, M. (2011). Multi-criteria performance analysis for decision making in project management. *International Journal of Project Management*, 29(8), 1057-1069. doi:10.1016/j.ijproman.2010.10.002.
- Meredith, J. R., & Mantel, S. J. Jr. (2000). *Project Management: A Managerial Approach* (4th ed.). New York: John Wiley & Sons.
- Meredith, J. R., & Mantel, S. J. Jr. (2003). *Project Management: A Managerial Approach* (5th ed.). New York: John Wiley & Sons.
- Merna, T., and Al-Thani, F. (2008). *Corporate Risk Management* (2nd ed.). England: John Wiley & Sons, Ltd.

- Morris, P.W.G. (1994). *The Management of Projects: A New Model*, Thomas Telford, London
- Navon, R. (2005). Automated project performance control of construction projects, *Automation in Construction* 14: 467–476.
- Neville, C., 2007. *Introduction to Research and Research Methods*. Bradford: University of Bradford.
- Oisen RP (1971). Can Project Management Be Defined? *Project Management Quarterly* 2(1):12-14.
- Olawale, Y. A., & Sun, M. (2015). Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice. *Construction Management and Economics*, 28(5), 509-526.
- Olateju, O. I., Abdul-azeez, I. A., & Alamutu, S. A. (2011). Project management practice in Nigerian public Sector–An empirical study. *Australian Journal of Business and Management Research*, 1(8), 01-07
- Payne, J.H., Turner, J.R., (1999). Company-wide project management: the 879 planning and control of programmes of projects of different type. 880 *International Journal of Project Management*. 17 (1), 55–59.
- Patel, B. M. (2008) ‘Project Management: Strategic financial planning, evaluation and control’; New Delhi, Vikas Publishing House PVT Ltd.
- Peeters W., Madauss B., (2008) “A proposed strategy against cost overruns in the space sector: The 5C approach”, *Space Policy*, Vol. 24, No 2, May 2008, PP. 80-89.
- Project Management Institute (2017). *The Guide to the Project Management Body of Knowledge – Sixth Edition (PMBOK® Guide)*. Newtown Square, PA.
- PMBOK (2000) Available: [<http://alarcos.inf-cr.uclm.es/doc/pgsi/doc/otros/pmbok-2000.pdf>]

- Rajasekar, S., Philominathan, P. & Chinnathambi, V., (2013). *Research Methodology*, India: s.n.
- Reina P & Angelo W. J(2002). Megaprojects need more study up front to avoid cost overruns. Retrieved March 29, 2010, from <http://flyvbjerg.plan.aau.dk/News%20in%20English/ENR%20Costlies%20150702.pdf>
- Reschke and Schelle (1990). "Dimensions of Project Management", Springer-Verlag, Berlin, Heidelberg, New York
- Rozenes S, Vitner G & Spraggett S (.2006), Project Control: Literature Review. *Project Management Journal*, 37(4): 5-14.
- Shtub, A., Bard, J. F., & Globerson S., (2005). *Project Management: Processes, Methodologies and Economics*, 2nd edition. Pearson, Prentice Hall.
- Shenoy, S. (2018). *How to Control Your Project Schedule, Control Schedule Process*.
- Tawiah, O. (1999). *Factors Affecting the Performance of Ghanaian Owned Construction Firms*. Thesis submitted to the Department of Building Technology, Kwame Nkrumah University of Science and Technology. Kumasi
- Turner, J. R. (1999). *The handbook of project-based management: Improving the processes for achieving strategic objectives*. London: McGraw-Hill. pp.19.
- Turner, J.R. (1993). *The handbook of project-based management*. England: McGraw-Hill.
- Weinberg, S. and Abromowitz, S. (2008) *Statistics Using SPSS: An Integrative Approach*. Cambridge University Press, Cambridge.
- Westland A. (2006) 'Project Management Lifecycle', London, Kogan Rage Limited.
- Wideman, R. M. (1990). *Managing the Project Environment*. Vancouver, B.C.: AEW Services.

- Wilczynski, H., M. McKenna and D. VanderSchee, 2006. Unprecedented and unseen: The next great energy challenge. Strategy+Business. booz allen hamilton.
- Wysocki, R. K. (2009) 'Effective Project Management: traditional, agile, extreme, 5th ed, Indianapolis, IN: Wiley Publishing.
- www.projectcontrolsinternational.com/project-planning-and-schedule-control.html
- Vidogah, R. G., Moreton, R., & Proverbs, D., (2003). Implementing information management in construction: establishing problems, concepts and practice. Construction Innovation, Vol. 3 Issue: 3, pp.157-173.
- Vulink, M. (2004). Technology Transfer in the Construction Industry of Ghana. Department of Technology and innovation Policies, Technische Universiteit Eindhoven, Eindhoven.
- Zarina, A. Zawari, E. & Yuso, K. 2014 Determining CSF of project management practice: A conceptual framework. Procedia social and behavioural sciences, 153, (61 -69).
- Zhang, C. and Gutman, J. (2015) Aid procurement and the development of local industry: A question for Africa. Global Economy and Development and Working Paper 88. Washington, DC: Brookings Institute.
- Zikmund, W. G. (2003). Business Research Methods. (7th ed.). Ohio: South-Western.

APPENDIX

Appendix 1: Questionnaire Survey

To whom it may concern

Dear Sir/Madam,

Invitation to participate in a research into cost and schedule control on EPC projects in Ghana (A case study of Kpone Thermal Power Project (KTPP)-Tema)

I write to request your assistance as an experienced practitioner with substantial knowledge in construction project success to complete the attached questionnaire. Currently, I am undertaking a Master of Science (MSc) in Project Management in the Department of Building Technology of the Kwame Nkrumah University of Science and Technology under the supervision of Prof. Edward Badu. This research is entitled “Cost and Schedule Control on EPC projects in Ghana (A case study of Kpone Thermal Power Project (KTPP)-Tema)”.

This research aims to identify inhibiting factors and their corresponding mitigation measures for cost and schedule control of EPC projects in Ghana. Hence, your expert knowledge and experience will be extremely useful for this research.

The questionnaire will take 10 to 15 minutes. All your responses will be treated with strict confidentiality and used only for academic purpose. Your views are valuable for the success of this research. After the research, we are willing to share a summary of the outcomes with practitioners in Ghana and anyone who shows interest. For any enquiries, please contact Agbozo, Wisdom Kwame {Tel.: **0246848625**; & email: wisdomagbozo@gmail.com}.

Sincerely,

WKA

Wisdom Kwame Agbozo, MSc Student

Prof. Edward Badu, Supervisor

Department of Construction Technology and Management

The Kwame Nkrumah University of Science and Technology, Ghana

QUESTIONNAIRE SURVEY

TOPIC: COST AND SCHEDULE CONTROL ON EPC PROJECTS IN GHANA

(A CASE STUDY OF KPONE THERMAL POWER PROJECT-TEMA)

Section A: Demographic Information

Please respond to the following statements by ticking (✓) one answer from each question that applies to your circumstances.

1. What is your engagement status on the project?
 - a. Currently on project
 - b. Formally on project
2. Which party do (did) you belong to on the project?
 - a. Client / Consultant
 - b. Contractor
3. What role do you play in your organization?
 - a. Director/senior management
 - b. Contracts manager
 - c. Construction manager
 - d. Project manager
 - e. Project Engineer
 - f. Quantity Surveyor
 - g. Project Planner
4. How long have (did) you been working in that role?
 - a. Less than 1 year
 - b. 1-3 years
 - b. 4-6years
5. How long have you been working in the construction industry?

a. Less than 1 years

b. 1-3 years

c. 4-6years

d. 7-9years

e. 9 years and above

6. What is your academic qualification?

a. Diploma

b. O'/A Level

c. HND

d. First Degree

e. Professional Certificate

f. Master's Degree

Others (please state).....

Section B: Factors Inhibiting Schedule Control

From literature several factors were identified as the factors that inhibit schedule control on EPC projects. Please tick (√) the appropriate cell to indicate the degree of importance.

5- Very important 4-Important 3- Somewhat important 2- Little importance 1-Not important

No.	Schedule Control Inhibiting Factors	1	2	3	4	5
1	Inflation of prices					
2	Weak regulation and control					
3	Project fraud and corruption					
4	Design changes					
5	Dependency on imported materials					
6	Complexity of works					
7	Conflict between project parties					
8	Unpredictable weather conditions					
9	Financing and payment for completed works					
10	Risk and uncertainty associated with projects					
11	Non-performance of subcontractors and nominated suppliers					
12	Lack of proper training and experience of PM					
13	Discrepancies in contract documentation					
14	Low skilled manpower					
15	Inaccurate evaluation of projects time/duration					
16	Contract and specification interpretation disagreement					
17	Unstable interest rate					
18	Unstable government policies					
19	Fluctuation of currency/exchange rate					
20	Lack of appropriate software					

Section C: Factors Inhibiting Cost Control

From literature several factors were identified as the factors that inhibit cost control on EPC projects. Please tick (√) the appropriate cell to indicate the degree of importance.

5- Very important 4-Important 3- Somewhat important 2- Little importance 1-Not important

No.	Cost Control Inhibiting Factors	1	2	3	4	5
1	Inflation of prices					
2	Weak regulation and control					
3	Project fraud and corruption					
4	Design changes					
5	Dependency on imported materials					
6	Complexity of works					
7	Conflict between project parties					
8	Unpredictable weather conditions					
9	Financing and payment for completed works					
10	Risk and uncertainty associated with projects					
11	Non-performance of subcontractors and nominated suppliers					
12	Lack of proper training and experience of PM					
13	Discrepancies in contract documentation					
14	Low skilled manpower					
15	Inaccurate evaluation of projects time/duration					
16	Contract and specification interpretation disagreement					
17	Unstable interest rate					
18	Unstable government policies					
19	Fluctuation of currency/exchange rate					
20	Lack of appropriate software					

Section D: Mitigating Measures for both Cost and Schedule Control Inhibiting Factors

From literature several measures were identified for mitigating factors that inhibit cost and schedule control on EPC projects. Please tick (√) the appropriate cell to indicate the degree of importance.

5- Very important 4-Important 3- Somewhat important 2- Little importance 1-Not important

No.	Mitigating Measures	1	2	3	4	5
1	Effective strategic planning					
2	Proper project planning and scheduling					
3	Effective site management and supervision					
4	Frequent progress meeting					
5	Proper emphasis on past experience					
6	Use of experienced subcontractors and suppliers					
7	Use of appropriate construction methods					
8	Use up to date technology utilization					
9	Clear information and communication channels					
10	Frequent coordination between the parties					
11	Perform a preconstruction planning of project tasks and resources needs					
12	Developing human resources in the construction industry					
13	Comprehensive contract administration					
14	Systematic control mechanism					
15	Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors					
16	Secure additional cash flow in advance					
17	Enter into fixed rate loan contract with lending banks					

18	Include contingency in budget					
19	Ensure adequate project finance is available before start of the project					
20	Employ Value Management techniques					
21	Use latest computerized planning & monitoring techniques					
22	Plan realistically and built up from first principle					
23	Schedule the project considering the seasonal weather particularly summer					
24	Schedule the project considering the reduced work hours during Ramadan					
25	Ensure/Train the project planner in construction process					
26	Refuse to accept unrealistic project time scale by client					

Thank you