

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY KUMASI,
GHANA.**

**EVALUATION OF RISK FACTORS LEADING TO SCHEDULE AND COST
OVERRUN IN THE DELIVERY OF PUBLIC CONSTRUCTION PROJECTS
WITHIN THE METROPOLITAN, MUNICIPAL AND THE DISTRICT
ASSEMBLIES. A STUDY IN THREE MMDA's.**

BY

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Economics)**

**A Dissertation Submitted to the Department of Construction Technology and
Management, College of Art and Built Environment
In Partial fulfilment of the requirement for the degree of**

MASTER OF SCIENCE

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DECLARATION

I hereby declare that, this submission is my own work towards the Msc. 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 or any other university except where due acknowledgement has been made in the text

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ABSTRACT

Construction industry is a very important industry for the economic development of the country. However, this industry has been facing serious problems i.e. failure to complete projects within stipulated time and cost and abandoning of projects which always drain public funds to waste. This is one of the critical issues faced by the metropolitan, the municipal and the district assemblies in Ghana. Hence, the reason for evaluating the risk factors that cause schedule and cost overruns in the delivery of public sector construction works within these MMDA'S in Ghana and to recommend measures that must be put in place to mitigate or reduce this problem. A total of 34 factors were identified from previous studies. The data collections were carried out using structured questionnaire survey. Nominal group technique was used to attach probabilities to determine the level of occurrence and severity of impact using the risk matrix. The evaluated risks were categorised into high, medium and low risks. This study found that there were 18 high risk factors and 7 medium and low risk factors. The key recommendation advanced by the research due to the agreeability of the reviewed mitigation variables are; The MMDA's must ensure prompt payment of any work done by the contractors; planned projects to be executed must be sizeable enough to meet the available budget allocation; The MMDA's must ensure that before any tendering advertisement is done, all design details are completed to enable accurate extraction of quantities and proper view of the design proposal; monitoring and evaluation of the work is important, this will enable the contractors to stay within the scope of the work and finally, contractors must not be awarded contracts based on political grounds, but their capabilities to perform the contract must be ascertained.

Keywords: schedule overrun, cost overrun, risk.

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DEDICATION

This dissertation is dedicated to Beatrice Adams, Mrs Grace Sackey and Patience Abbam.

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CHAPTER ONE

INTRODUCTION

This is a chapter that seeks to address the general background of the research, highlights the problem identified. Spells out the aim and objectives and the scope my work is limited to.

1.1 BACKGROUND OF THE STUDY

In the past several decades, large construction projects have been known for their cost overruns and late completion times (Pickrell 1990; Flyvberg Holm & Buhl, 2003), and the aim of project control in the construction industry is to ensure that projects finish on time, within cost and achieve other project objectives (Le Hoa *et al.*, 2008). Cost overrun can be defined as when the project objectives have not been achieved within estimated budget (Avots 1983). The situation of a construction project in which budgetary estimate exceeds estimation and actual payments becomes more than budget is a global phenomenon (Ali & Kamaruzzaman, 2010).

Cost overruns are a major problem in both developed and developing countries (Angelo and Reina 2002). Therefore, problem of cost overruns is critical and needs to be studied to alleviate this issue in the future. While, average cost overrun was recorded as 12% of the contract cost.

It is also found in Nigeria as reported by. Besides that, a study conducted in Pickrell 1990; Flyvberg Holm & Buhl, 2003). identified underestimating of costs to make the projects more viable, addition of scope during later stages of project planning and even during construction, changed conditions, design error, flow of funds etc were responsible for these problems. It is therefore clear that if project costs or schedules exceed their planned targets,

client satisfaction would be compromised and the funding profile would no longer match the budget requirement.

Consistent cost and schedule overruns, in the public sector projects are not the best use of taxpayer money and increased construction schedule reduces the number and size of projects that can be completed during any given fiscal year. Due to these overruns, many public sector projects in our country have become extensions of previous project which are broken down into phases and continuation of old projects with very little room for new projects. These factors result in improper sequencing of related projects or phasing within projects, thus delaying much needed improvements.

In as much as overruns on cost and schedule impedes much needed development in our communities, this study will therefore examine construction project cost and schedule overruns and evaluate the risk factors that contributes to them. It will also find ways of ensuring how public sector projects can be completed on budgeted cost and schedule in the (MMDA's) in Ghana.

1.2 PROBLEM STATEMENT

The performance of cost, schedule, safety and generally quality are normally the basis through which project success are assessed. Assessment shows that, ability of the project achieving its intended objectives and being able to be finished with respect to time and cost. (Ejaz et al., 2013). Globally, cost and time overrun is a major problem in the construction industry (Le-Hoai *et al.*, 2008; Sweis *et al.*, 2013), and is seen as a problem of repetition which produces adverse impact to the projects (Sweis, 2013). Government funded projects are always noted to exceed it budgetary allocation. This usually creates backlogs to critical infrastructural needs due to the public funds that are limited. This therefore means that if any planned project

exceeds its budget, other projects are dropped or sacrificed from the planned programme or the scope is then reduced to provide funds necessary to cover the cost that has increased.

This is the situation in the Ghanaian public and private sector construction activities. Similarly, it is also a global issue and even severe problem in Malaysian construction. These problems have therefore, caused many studies to be conducted to identify the factors that cause these overrun generally. The previous research works mostly aimed to identify the factors that cause the problem of time and cost overrun. There are little work done on evaluation of risk factors that contributes to schedule and cost overrun throughout the construction project cycle. This research is narrowed down to look into these issues within the Metropolitan, Municipal and the District Assemblies in Ghana. Since construction project cycle involves planning, design, construction and finishing phases, there are own risks in all these phases normally caused by parties that are involved in each of these phases. That is why it is crucial to determine the risk factors of cost and time overruns in each of them so as to plan a mitigation measure to eliminate it.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 Aim

The aim of the study is to determine the risk factors that lead to schedule and cost overruns and to identify ways public construction projects in the MMDA's can be delivered on budgeted cost and schedule.

1.3.2 Objectives

The following objectives will help to achieve the aim of the research study:

- identify the risk factors that influence schedule and cost overrun in the MMDA's and
- identify ways public projects can be delivered on budgeted cost and schedule in the MMDA's.

1.4 RESEARCH QUESTION

To achieve the objectives of the study, the following questions were answered:

- What are the risk factors that lead to cost overrun?
- What are the risk factors that contribute to time overrun?
- How can cost and schedule overrun be eliminated from public project in MMDA's in Ghana.

1.5 RELEVANCE OF THE STUDY

Cost and schedule overrun are a drain on public resources and affects developmental projects which eventually develops our societies and the country at large. Hence the need to put the necessary measures down to reduce, if not eliminated completely, from our contract administration processes. This research to a large extent is to provide the necessary measures and action that should be taking into consideration to prevent the occurrence of this menace in our public sector construction project activities

1.6 SCOPE/DELIMITATION OF THE STUDY

This study will involve the use of both quantitative and qualitative approach adopting the use of structured questionnaires to collect data and evaluate the risk factors that lead to schedule and cost overruns in public project execution.

The scope however is limited to Metropolitan, Municipal and District Assemblies (MMDA's) in the country. Three of these assemblies will be used for the analysis. People who will be targeted to respond to data collection exercise will be; contractors, engineers, procurement officers, project managers, construction consultants, finance officers coordinating directors and budget analysts.

1.7 ORGANIZATION OF THE STUDY/LAYOUT

The aim of the study is to identify the factors causing the problem of time and cost overrun.

This thesis is organized into five chapters, namely:

1. Chapter one: showing the background research and the justification in understanding the project topic.
2. Chapter two: describing the previous literature related to the study.
3. Chapter three: showing the methodological procedure in helping to achieve the objectives of the research.
4. Chapter four: showing the findings and the discussions of the outcome after the analysis.
5. Chapter five is the conclusion of the research results, as well as recommendations and future researches

1.8 CHAPTER SUMMARY

General introduction and background to the research was discussed in the first chapter. The problem statement was also presented and the need for the research explained. The chapter also introduced the research aim, objectives, and the scope of the study. The research question was also formulated to enable us arrive at the objectives of the study. The Chapter finally concludes with discussions on the importance of the study and how the research is organized.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 INTRODUCTION

This is a chapter that attempt to review the works that have been done previously by other people which will help to understand the problem of the research. It's arrangement is based on the key subheadings which relates to the research.

2.2 CONSTRUCTION INDUSTRY IN GHANA

Ghana has a complex construction sector which is a major contributor to the economy and its growth. There are two distinct areas that make up this industry, they are the general construction works and specialist trade works. This industry which is mostly led by the private sector participants is increasingly becoming dynamic and has seen consistent growth over the years. ‘’ Ghana’s GDP surged to 4.1% in the first quarter of 2015, as compared to 3.8% in the same period in 2014. Construction activity contributed 2,888 GHS Million to GDP in 2014’’, according to Ghana statistical service. This was equal to 12.7% of GDP and up 26.9% from 2.9% in 2013. It was also seen to be the largest subsector of industry in 2015 with a growth rate of 30.6% and a 14.8% share of GDP. Currently it has increased to 3175 GHS Million in 2017 from 3036.96 GHS Million in 2016, according to the same source. It has grown consistently over the years and employing over 320,000 people.

Since the growth of this economy is much dependent on the performance of this industry, it is very important that factors that pose much risk on budget and schedule performance be evaluated and necessary mechanism put in place to prevent if not eliminated completely from the industry.

2.3 RISKS IN CONSTRUCTION INDUSTRY

Risk and uncertainties characterize situations where the actual outcome of a particular event or activity is likely to deviate from the estimate or forecast value. Construction is particularly prone to this as noted by Leu et al (2001), for there are many variables during project implementation that dynamically affect project duration and cost (del Cano and de la Cruz 2002). Effective risk management is known to be very important in the construction industry.

2.4 SYSTEMATIC APPROACH TO RISK MANAGEMENT

Risk management can be defined as a continuous process depends on the alterations of the external and internal environment. It can also be defined as a systematic way of looking at areas of risk and consciously determines how each area should be treated. It is a management tool that aims at identifying sources of risk and uncertainty, determining their impact, and developing appropriate management responses” (Uher, 2003). It is the systematic process which identifies, analyse, and respond to project risks with the objective of managing it, so that a project can be completed successfully. Considering how simple and practicable it is in dealing with fewer stages of handling risk in the industry, this study considers implementing this risk management approach in three consecutive stages as a widely acknowledged approach within the literature (Wang *et al.* 2004; Othman, 2008; Perera *et al.* 2014)., although other researchers have suggested different methods or ways to implement it. That is passing through the three stage (Zou *et al.*, 2007), four-stage (He Zhi, 1995; Fayda *et al.*, 2003) and six-stage

(Ogunsanmi *et al.*, 2011. Risk identification and risk analysis specify and predict the likelihood and the adverse impacts of risks, whereas risk response concerns the measures taken by project management to reduce the probability and effects of risks.

2.4.1 Risk identification

“Risk identification is a management process, in which potential risks associated with a construction project are identified” (Zou *et al.*, 2007). This is actually true because in identifying risk we are trying to get an analysis of it so that we can eventually map up a respond strategy to its mitigation. “It is of considerable importance since the process of risk analysis may only be performed on identified potential risks” (Wang *et al.*, 2004). All the risk in this work was identified through literature review and an interview of experts on the field. A total of 69 common factors that contribute to schedule and cost overruns were identified from 70 journals worldwide. From that, 35 factors have been identified as the causes that lead to schedule and cost overruns on 15 construction projects from the MMDA’s in Ghana. These factors have been confirmed by expert panels during the nominal group discussion. 25 risk factors were therefore categorized under client related, consultant related and contractor related which were used for data collection in this study.

2.4.2 Risk analysis

Assessment of a risk involves first of all risk identification and secondly risk analysis. Risk assessment basically is a systematic process used in evaluating the potential of risk variables that may be involved in a project activity. “The risks that are identified are then analysed to determine their severity/impact and the likely hood of occurring” (Fayda et al., 2003).

Probabilities are assigned to the identified risk through an expert group analysis.

2.5 Definition to Cost and schedule Overrun

The primary objective of project management is the coordination of construction tasks in order to successfully procure and deliver infrastructure projects “on schedule, in budget and according to contract design-specification”. Cost overrun occurs when the final cost of a project is more than the planned cost where as schedule overrun refers to a situation where a

construction project does not come to completion within the planned period. Schedule overrun in my opinion is a critical issue in construction project activities that must not be encouraged. It disrupts the work flow, brings productivity low, delay projects, increase cost, kill stakeholders interest, third party's claims, and contract termination.

This study will concentrate on these two types namely: excusable and non-excusable delays, since the factors identified were all classified as such. Most cost overruns in infrastructure projects in Sweden occur at any time from the planning phase to final design stage because of the uncontrolled change orders and the ensuing input required for technical and administrative reasons (Lind & Brunes, 2015). Design problems factor is the single largest contributing factor to costs overrun and schedule delays in Turkey (Polat et al., 2014). Problems associating this factor include design changes, late design approvals, design discrepancies, and buildability problems (Polat et al., 2014). The poor and often ambiguous project scope outlined in the contract is another leading cause for cost overruns and schedule delays (Cheng, 2014; Harding, 2012).

2.6Schedule and Cost Overrun Scenario

Some studies that had been conducted indicating schedule and cost overrun as a global phenomenon.

Table 2.1 Global phenomenon of cost and time overrun

Country	Type of Project	Schedule & Cost Overrun	References
Hong Kong	Civil engineering projects	85% of the projects faced time overrun	(Yogeswaran <i>et al.</i> , 1998)
Jordan	Public projects	81.5% of projects were delayed	(Al-Momani, 2000)
Australia	Construction projects	The mean of time overrun was 20.7%. The mean of cost overrun was 12.6%	(Love <i>et al.</i> , 2005)
Saudi Arabia	Large construction projects	70% of projects experienced time overrun.	(Assaf & Al-Hejji, 2006)

Nigeria	Infrastructure Projects	The percentage of project delay was 188%. The average percentage of over budget was 14%.	(Omoregie& Radford, 2006)
Portugal	Construction projects	The average of time overrun was 201 days (40%) from expected time. The average of cost overrun was €2.054.280 (12%) of the initial average cost.	(Moura <i>et al.</i> , 2007)

Malaysia	Construction projects	17.3% of 417 government contract projects were considered sick	(Sambasivan& Soon, 2007)
		More than 3 months of delay or abandoned	
Bosnia and Herzegovina	Building construction structure	Average of time overrun was 11.55%. Average of cost overrun was 6.84%.	(Žujoet <i>al.</i> , 2010)

India	90% of projects exceeded the planned construction duration. 57% of projects exceeded the estimated cost.	90% of projects exceeded the planned construction duration. 57% of projects exceeded the estimated cost.	(Bhargava <i>et al.</i> , 2010)
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Analytical data on schedule and cost overruns performance for some selected projects from the three MMDA's.

Table 2.2 Scenario of schedule and cost overrun in the selected MMDA

AHANTA WEST MUNICIPAL ASSEMBLY								
SN	Project Name	Contract Sum (GH¢)	Start Date	End Date	Revised Date	New contract sum (GH¢)	Stat us Now	Remar ks

1	Constructi on of 3 Units classroom block with ancillary facilities	138,000.0 0	16/10/1 2	15/06/1 3	Fluctugtatio n claimed	165,250.00	85%	Sched ule &Cost overru n
2	Constructi on of District Police Head Quarters	285,510.8 2	19/01/1 5	19/08/1 5		332,150.00 (On going)	80%	Sched ule &Cost overru n
3	Constructi on of 2 storey boys Dormitory	236,627.6 8	13/05/1 5	6/11/16	Fluctuatio n claims	278,176.89	70%	Sched ule &Cost overru n
4	Constructi on of 1No CHIPS Compoun d	129,540.1 8	13/05/1 6	20/11/1 6	nil	nil	80%	Sched ule overru n

5	Constructi on of 1No.2Uniits KG Block with Ancillary Facilities	79,981.58	16/10/1 2	15/06/1 3	nil	nil	60%	Sched ule overru n
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SEKONDI TAKORADI METROPOLITAN ASSEMBLY

S N	Project Name	Contract Sum (GH₵)	Start Date	End Date	Revised Date	New contract sum (GH₵)	Stat us Now	Remar ks
1	Supply & installation of pole and wall mount street naming signage	625,000.1 7	7/6/2016	15/12/20 16	On going	767,124.21	45%	Schedu le overru n

2	Rehabilitation of two storey 14 unit classroom block	161,892.45	7/1/2015	30/9/2015	Fluctuation claim	192,437.78	90%	Schedule & cost overrun
3	Construction of two storey commercial block,	3,399,98.45	10/10/2014	24/02/2016	Fluctuation claim	3,980,65.22	80%	Schedule & Cost overrun
	Auditorium Block and Utility facility							
4	Supply and Installation of pole and wall mount street names signages	583,863.25	30/11/2016	30/10/2017	Revision	695,762.85 (Yet to take possession of site)	0%	Schedule and Cost overrun

5	Constructi on of library complex (Phase 1)	1,296,340 .61	16/05/20 14	30/03/20 16	Fluctuati ons claim	1,487,620.12 (On going)	85%	Schedu le &Cost overru n
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SHAMA DISTRICT ASSEMBLY								
S N	Project Name	Contract Sum (GH¢)	Start Date	End Date	Revised Date	New contract sum (GH¢)	Stat us Now	Remarks
1	Constructi on of 6 units classroom Block with office	222,320. 64	02/06/20 12	03/12/20 12	03/02/20 15	296,427. 51	85%	Schedule and cost overrun
2	Const. of 8- seater water closet	33,048.8 5	20/05/20 12	21/11/20 12	Not Revised	nil	50%	Abandon ed

3	Continuation & completion of comm. centre	507,775.73	10/08/2015	12/05/2016	A revised project and on going	703,672.92	55%	Schedule and cost overrun
4	Continuation and completion of dressing room & fence wall around football park	234,383.49	10/08/2015	12/05/2016	On going	285,453.57	95%	Cost & Schedule overrun
5	Continuation of lower inchaban market & lorry park	344,7441.35	04/07/2016	29/04/2017	A revised project	No claim Of fluctuation yet	35%	Schedule overrun

2.6 Factors contributing to schedule and cost overrun

As indicated to be a global phenomenon by (Le-Hoa *et al.*, 2008; Murray & Seif, 2013; Sweis, 2013) a review of 70 journals and other literatures all over from the academic site had the following to be the risk factors that leads to these overrun:

“poor site management and supervision, inadequate planning and scheduling, lack of experience, mistakes during construction, inadequate monitoring and control, cash flow and financial difficulties faced by contractors, poor financial control on site, labour productivity, shortage of site workers, shortage of technical personnel (skilled labour), high cost of labour, labour absenteeism, fluctuation of price of materials, shortages of materials, late delivery of materials and equipment, equipment availability and failure, inaccurate time and cost estimates, frequent design changes, mistakes and errors in design, , poor design and delays in design, delay preparation and approval of drawings, financial difficulties of owner, delay in progress payment by owner, contractual claims such as extension of time with cost claims, poor project management, change in the scope of the project, delays in decisions making, inaccurate quantity take-off, lack of coordination between parties, slow information flow between parties, and lack of communication between parties, design discrepancies, and buildability problems (Polat *et al.*, 2014). Another major factors identified were optimism bias, strategic deception and misrepresentation issues and land litigations.”

These factors were grouped into the following categories;

2.6.1 Design and tender related factors

This is one of the critical areas in which consultants that are responsible for the designing and tendering activities are seen to be factors to these problems. “ Contractors in Qatar consider risks related to the consultants as one of the most critical in construction projects

(Jarkas & Haupt, 2015)’. It is also indicated that ‘approximately 73% of construction professionals believe that design management is essential to ensure timely and quality design within the specified budget (Elmualim & Gilder, 2014)’. Early and accurate information is usually seen as primary input at the design stage if total duration and amount of rework is to be reduced.(Hossain & Chua, 2014). (Hwang & Yang, 2014), in his study indicated that, ‘the most common reasons for rework and subsequent delays in Singapore were also found out to be design related changes, and poor design coordination, which lengthens the project duration to an average of 25%’. It is the responsibility of the design team or the consultant to ensure that tender documentations are very clear and designs are coordinated well, as noted from the study by (Jarkas &Younes, 2014; Memon et al, 2014; Jamaluddin et al., 2014),

‘Poor design coordination and unclear tender drawings and specifications are major contributing factors to cost overruns and schedule delays of construction projects in Qatar’.

It is also very important to control change orders that comes from the client. In Sweden, as indicated from the study of (Lind & Brunes, 2015). ‘ most cost overruns in infrastructure projects in Sweden occur at any time from the planning phase to final design stage because of the uncontrolled change orders and the ensuing input required for technical and administrative reasons’. Problems of design of all over the globe have become one of the most critical factors causing overruns. In Turkey, (Polat et al.,2014), in his study, associated design changes, late design approvals, design discrepancies, and buildability problems as some causes of schedule and cost overrun.

The scope of every project is one of the most important areas of considerations in dealing with overrun. When scope of work is not defined well it eventually affects cost and schedule.

‘The poor and often ambiguous project scope outlined in the contract is another leading cause for project failure, along with cost overruns and schedule delays (Cheng, 2014;

Harding, 2012)”, and also “project designers and contractors need to develop utterly clear scope in their contracts with the client to reduce overrun and schedule delays (Cheng, 2014; Harding, 2012)”.

It is also important that all the requirements in the design are understood very well. Without proper understanding of the details, translating it practically will generate so many issues of overrun. This also highlighted in the work of (Alinaitwe et al., 2013), “lack of understanding the design requirements of authorities and end-users creates rework and subsequent cost overruns and schedule delays”, and “continually improving the pre-design stage to provide more accurate estimations and more value for money is important” (Azman et al., 2013).

2.6.2 Client related factors

Clients to a large extent are the major contributing factors to schedule and cost overrun. If owners of the project fail to perform their responsibilities other stakeholders have no cause than to follow suit. Several reasons contribute to cost overruns and schedule delays by the client. As indicated in his study that, “the lack of budget planning by clients results in cost overruns and schedule delays in construction projects” (Amoatey et al., 2015; Choudhry, et al, 2014; Harding, 2012)., is absolutely true and I agree with him in that sence. This then means that clients must define their budget well in their early planning, so as to be guided be any further activities. “A late payment to contractors is another factor contributing to schedule delays because the subsequent effect is the contractor inability to pay subcontractors and suppliers on time” (Alinaitwe et al., 2013; Amoatey et al., 2015; Shehu et al., 2014). Contractors must be paid early for any work done, and they intend pay their

subcontractors as well. (Jarkas &Younes, 2014), in his research found out that, ‘‘most of the financial difficulties that contractors face in the construction business in Qatar are the result of a late payment made by the client because of the lengthy process while releasing the claimed funds’’. Another important client related factor is the criteria adopted for the selection of vendors. Owners are supposed to ensure that selection of bidders conform to the standard regulation to be followed, this will enable them to select a competent bidder that is capable of executing the job on cost and on schedule. As indicated, ‘‘the selection criteria decided by the client to the project bidders affects the quality and reliability of cost estimate’’ (Dominic & Smith, 2014).

2.6.3 Other stakeholder related factors

To every project there are stakeholders who matter most and their engagement is one of the most critical project success factor (PSF) that always have a positive effect on minimizing cost overruns and schedule delays (Turner & Zolin, 2012).

There is the need to know how to properly manage them so that they can be in tune with the cause of project pace. This is indicated in the work of (Storvang & Clarke, 2014), which says ‘‘senior managers should consider six aspects while managing the stakeholders’’. This six aspects include identifying the stakeholders to the project, what influence they have or can exert and what they can do when they are involved, at which stages can they be involved, how to involve them, how to create a space for meeting them, and identifying their useful information and input needed to enhance the development process.

2.6.4 Land litigations

Most project delays in the MMDA's was as well found to come as a result of insecurity of lands which has been made available by the traditional rulers and the opinion leaders for such projects. Most of these lands are later found to have been leased out already to other people.

This situation results in delaying the project until another/new land is allocated for the project

2.6.5 Optimism bias

“The problem of estimation bias resulting from being overly optimistic about the prospect of a project in terms of cost and schedule is one of the major factors causing cost over-runs and schedule delays”, Flyvbjerg (2005). Political pressure which is always put on project planners by the project promoters and seen as a result of political and competitive pressure on project incentives always causes them to over-estimate the actual project cost. In infrastructure project planning, it simply means the tendency to overestimate the project completion time while underestimating the project costs and risks. According to Flyvbjerg (2005), “over-optimism often arises from cognitive biases in the information processing mechanism of the human mind thereby leading to poor project forecasts and wrong estimates stemming from technical inefficiencies and systematic misrepresentation”.

The main causes of biased estimates are: incomplete and unreliable data, as well as poor estimation and forecasting techniques.

2.6.6 Strategic Deception and Misrepresentation Issues

“Strategic deception and misrepresentation has been seen by scholars and policymakers as one of the leading causative factors of project cost overruns and schedule delays” (Wachs, 1989; Flyvbjerg, et al, 2002). This means that project schedule and cost overrun can occur

due to the deliberate action by project planners and their promoters miss-informing or misrepresenting the actual facts to the people with the sole aim of deceiving them. The actual benefit or cost of the project projections and its schedule are deliberately and wrongly misrepresented in a bid to win the contract award over other competitors and to quickly start the project.

This conceptual notion traces to two theories; agency theory and the theory of strategic deception. Flyvbjerg *et. al.* (2004) explained that: ‘in infrastructure procurement, agency problems arise when there is separation of project sponsors (ultimately tax payers) and infrastructure procurement by a chain of intermediaries at every phase of the project comprising promoters, engineers and procurement contractors, project management consultants, municipal authorities and state ministries, departments and agencies. They argued that deception and misrepresentation can occur at every interface between the principal (project sponsors) and agents (project planners, promoters and contractors, etc.) due to number of reasons including the presence of information asymmetry, divergent self-interest, etc.’

The divergent self-interest is the most common practical area this deception and misrepresenting issues occur. Our politician have a common interest in making sure that people see them working so as to be convinced and win their votes. So they quickly roll project and wish it gets started quickly before they go to the next polls and after winning you see that everything comes to a halt until the next election time and so on. The politician then sees it as a strong- incentive for him to get the project approved. He then tends to put pressure to get the job rolled on. ‘This pressure influences the decision of the deciding officer to forecast overestimated cost to impress the senior management while providing misleading information of completing the project within the projected budget’ (Azman *et al.*, 2013)

2.7 Recommended control Measures

From the review, several ways of preventing or eliminating cost and schedule overrun had been proposed by expects to be adopted. Among these are those indicated below?

2.7.1 Measures of accountability:

By introducing measures of accountability in infrastructure procurement whereby any party found to have deliberately deceived project sponsors and financiers is made liable for damages incurred is a good control measure.

2.7.2 Social and political dimensions

It was also suggested that better understanding of the technicalities as well as social and political dimensions of infrastructure procurement could provide a reality check, thus reducing the incidence of optimism bias.

2.7.3 Roles and responsibilities:

“ When roles and responsibilities are clear among stakeholders across the project life cycle, less chance exists for gaps in any stage of the project phases, which may introduce positive indicators of enhanced project control process and relationships” (Doloi, 2013).

This means that it always a good practice to define roles and responsibilities for every stakeholder who matters to the project.

It is also suggested that experienced professionals and suppliers must engaged in the estimation processes to help in improving the whole project cost estimation (Ochieng, et al, 2015)

Lands earmarked for developmental project from land owners and opinion leaders must properly be scrutinized to be sure that it is without any litigations whatsoever.

2.7.4 Project schedule management.

Upon review, project schedule can be managed well if the processes outlined in the 'pmbok guide' are adhered to. The project schedule requires seven tasks to manage the completion of projects within the planned date for completion. The tasks required are: *'plan schedule management, define activities, sequence activities, estimate activity resources, estimate activity durations, develop schedule and control schedule''*.

Following these processes will clearly outline the policies and procedures for the project schedule, it will identify actions to achieve deliverables, establishes the relationship among activities and the required resources, and develop the project program. This will also ensure that there is proper monitoring and scheduling updates to achieve the planned action.

2.7.5 Project cost management.

Cost overrun can as well be reduced when it is properly managed. The knowledge area of project cost management provided four processes to manage the cost and reduce overruns. The four processes are *'plan cost management, estimate costs, determine budget, and control costs''*. (PMBOK GUIDE)

This is an all-important process that must be followed since it will have an ultimate aim of monitoring and updating the project budget, and continuously managing changes to the projected cost.

2.7.6 Check contractor's capabilities before hiring.

The following must be considered before any vendor/contractor is hired:

- Find out their team's capabilities and check if that matches your project requirements.
- Improper skill-sets match can cause a significant drag in your projects.
- Find out if their cost estimates are realistic.
- Check how good they are at sticking to deadlines in their previous projects.

(project management.com)

2.7.7 Attempt to stay within the originally planned scope.

Scope is a common phenomenon in construction works and fighting it is a biggest challenge.

It normally happens when other features are added to the original plan. The developers sometimes want to add their design features to the original, while the client the client sometimes asks for things which were not initially planned. When some of the changes call for drastic scope creep it puts the project in danger. It is therefore very important to exert control and convince all the stakeholders why the increased scope can harm the project.

(project management.com)

2.7.8 Effective communication among stakeholders.

Effective communication can help reduce the delays by avoiding working on wrong things and making the scheduling work better. Efforts must therefore be made to keep the communication among the team members work seamlessly. (project management.com).

2.7.9 Constantly tracking and measuring progress.

The progress of the project tasks must be constantly tracked and should have various metrics to measure in the projects. This will provide early signals of project delays, and give you the opportunities to fix the issues.

2.7.10 Designs and Time

Based on Dayi (2010) study on “schedule delays analysis in construction projects”, it was recommended that to minimize or avoid the impacts of the construction delay: design of the project should be finalized with all details before tendering the work so as to avoid change orders by the owners. Owner should as well allocate sufficient time and adequate finances for the design stage of the project; Selection of the contractor should be done through a prequalification of the firms;

2.7.11 Chapter summary

This chapter began with discussions on contextualisation of schedule and cost overrun in our construction industry and the various risk factors that lead to the causes of these overrun.

Previous works on schedule and cost overrun in construction by researchers in other countries were also discussed with scenarios from the metropolitan, municipal and the district assemblies. It was finally concluded with discussions on the review of measures to be adopted to drastically reduce if not eliminated completely, this problem of overrun.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter is very vital to the conduct of this research as it is the pivot around which all activities of the research revolve. It comprises of the key strategy adopted for the research and its finding followed by the reason for the adoption of such a strategy. It is therefore a complete strategy of how you will approach the research main problem. It gives the overall structure for the procedure that the research should follow. It includes data sources which involves desk survey work which help in the identification of key research variables; development questionnaire, distribution and statistical tools for data analysis.

The purpose of the methodology and research design is to provide direction in the planning and implementation of the study in a way that is most likely to achieve the intended goal. The methodology therefor becomes the focal point for conducting the study. Similarly, Polit and Hungler (1999) ‘refer to it as the process of following the steps, procedures and strategies for gathering and analysing data in research investigation. According to Burns and Grove (1998)’, methodology includes design, setting, sample, methodological limitation and data collection and analysis techniques in a study. It is the know-how of the scientific methods and techniques employed to obtain the valid knowledge. ‘Thus, methodology is the way by which we gain knowledge about the world, trying to discover how we can go about the task of finding out what we believe to be true’ (Christou *et al.*, 2008).

3.2 RESEARCH STRATEGY

“The clarification of the orientation of the researcher to the conduct of research (Bryman 2005), as cited by Baiden, 2006 is of paramount importance”. The research strategy basically dwells on how the research objectives are questioned.” The three main strategies are quantitative, qualitative, and triangulation” (Baiden, 2008). “The purpose of the study always determines the choice of strategy to follow, the type and availability of information for the research (Naoum, 2002), cited by Baiden” (2006). This research follows both qualitative and quantitative approaches which are running concurrently by the formation of expert groups to evaluate the responses from the literature and the utilization of survey questionnaires to elicit data from respondents that will be used to measure their opinions using scientific basis approach. By using these strategies, the researcher is able to obtain a concise analytical solution from the views expressed that can eventually answer the research objectives.

3.3 RESEARCH DESIGN

This research adopts both quantitative and qualitative approaches which were running concurrently.

The risk factors affecting project schedule and cost overrun were initially identified through an intensive literature review and a comprehensive listing was established. A total of 35 risk factors were identified.

The nominal group technique (NGT) was adopted/used as an alternative to the focus group and the Delphi techniques. “The NGT is a consensus planning tool that helps to priorities issues (Delbecq et al.1986)”. Participants in NGT are brought together for a discussion

session. It presents more structure than focus group, but still takes advantage of the synergy created by group participants. It provides a constructive, problem solving approach that allow every person to equal participation as group members, and avoids disproportionate influence by some members. Potential people for this group were drawn/considered from within construction firms, consultancy firm, MMDA's. The selection of this grouping was based on experiences in public sector for that matter, MMDA's project. This stage at the end produced a reduced list of risk factors of schedule and cost overruns and their probabilities of occurring.

3.3.1 DATA SOURCES

The approach used for data collection involved review of literature and administration of structured questionnaires. ‘‘The literature review forms an important aspect of the research since it sets the pace for the development of the questionnaire (Fadhley, 1991)’’. The qualitative approach dealt with the collection of empirical data through the formation of nominal group and the quantitative approach to data gathering involved the use of the structured questionnaires. The review of literature (desk survey) enabled the identification of schedule and cost overrun and its mitigation variables which were subjected for thorough scrutiny through the adoption of the Nominal Group Technique (NGT) for a data based on empirical analysis. This information was then used in the development of questionnaires which was administered to respondents to seek their agreeability.

3.3.2 QUESTIONNAIRE DEVELOPMENT/DISTRIBUTION

‘‘It was essential to first establish the information to be gathered so that relevant questions are solicited (Oppenheim, 1996)’’. The format of the questionnaires was guided by considerations

of appeal to respondents and ease of reading and supplying the required data so that research participant's time were not wasted during the data collection. The questionnaires were designed to include; close ended questions and scaled response questions. The likert response scale of 1 to 5, where 1= strongly agree; 2= agree, 3= partially agree, 4= disagree and 5= strongly disagree were used to measure the strength or intensity of respondent's opinion. The diction of the questionnaire was simple as jargons and other technical terms were very minimal in the crafting of the questions. Similarly, the numbers of questions were kept minimal to encourage respondents to answer the questions quickly. The questionnaire consisted of four (4) questions:

- Section one was background information which was targeted at obtaining information on the general particulars of the respondents and their organization, such as the experience, their position within the organization, etc.
- The second section was questions on factors that lead to schedule overrun.
- The third section contained similar questions but specific to cost overrun.
- While the fourth section, respondents were asked to rate the relative importance of twelve (12) recommended mitigation / controlling measures that must be adopted in reducing the impact of those overrun on public project delivery.

Assistants who administered the questionnaires were given enough training to enable them carry out such activity. They were trained on how to administer, how to explain the reason for the project and what it means to the respondents to provide the needed responds on time. One set of questionnaires was to be giving to each respondent,

A total of 101 questionnaires were administered, 78 to the construction companies who are registered with the various MMDA's, obtained from the contractor's registration book from the MMDA's and 23 to key professionals.

3.3.3 Sampling and sample procedure/Techniques

From the contractor's registration register from these selected MMDA's, it was found that the number of contractors who has registered with them and are in good standing as at 9th January, 2014 when the medium-term development plan was implemented consisted of 360. To determine the minimum sample size of these registered contractors in these three MMDA's, the Kish (1965) formula which gives a procedure for calculating minimum sample size had to be applied:

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

Where n = Sample Size

$$n'' = S^2/V^2$$

N = Population size

V = Standard error of sampling distribution (0.05)

$$S^2 = P(1-P)$$

P = Proportion of population elements that belong to the defined class (50percent) was applied for the determination of the sample size

Using N = 360, V = 0.05 and P = 0.50

$$S^2 = P(1-P) = 0.50(1-0.50) = 0.25,$$

$$n'' = S^2/V^2 = 0.25/0.05^2 = 100$$

$$n = n''/(1 + n''/N) = 100/(1 + 100/360) = 78.12 \approx \mathbf{78 \text{ nr.}}$$

The number of contractors sampled for the study is 78.

Due to the nature of the responds the researcher expects from the respondents, two sample methods were adopted. Random sampling was used to select the contractors who are operating in the MMDA's. This sampling method is the probability whereby people, place or things are randomly selected. Construction firms were selected through random sampling.

□ Sample size for key professionals

Purposive sampling was used by the researcher subjectively for the determination of the sample for key professional group. In as much as purposive sampling is a non-probability selection, according to Walliman (2005) purposive sampling is a useful sampling method which allows a researcher to get information from a sample of the population that one think knows much about the subject matter. This is an attempt to get a sample to represent the total population. Three budget analyst, three development planning officer, three internal auditors, three engineers, three quantity surveyors, three procurement officers, two construction consultants, and three physical planning officers. Since the population size was found to be small census approach identified by Isreal (1992) for small population was adopted to obtain the sample size. This gives a total of (n= 23) questionnaires to the professional group.

□ Total sample size

From the two sample size determination, it was seen that 78 contractors were sample whereas 23 were also sampled from the professional group. This makes a total sample size of 101 for the study in these three selected MMDA's.

3.3.4 Data collection and analytical tools /procedure

After the questionnaires were retrieved they were prepared by coding and fed into the statistical

Packages for Social Sciences (SPSS version 16) for data aggregation and subsequent analysis.

The selection of an analytical tool is contingent on a thorough review of available analytical and statistical tool. The choice of test is dependent on the type of variables that one has i.e. whether variables are ordinal/nominal or interval/ratio, categorical and whether they are normally distributed. In this research since the data was ordinal data, the Chi square test was suitable for testing the hypothesis of the study.

Factor analysis was used by the nominal group of expect to analyse the interrelationships among the large number of factors identified in the literature and to explain these issues in terms of their common underlying dimensions. "It was used to condense the number of original variables into a smaller set of dimensions with a minimum loss of information (Hair *et al.*, 1992), cited in (DeCoster, 1998)". It therefore establishes which of the variables could be measuring the underlying phenomenon.

3.3.5 Risk matrix (Analysis procedure)

Probabilities were attached through brainstorming process by the nominal group formed to all the identified risks. The risks were then evaluated against their relevant probabilities of

occurrence scales. The results were further on transferred onto the risk mapping matrix to convert these values to their corresponding risk level.

We used the probability matrix to typically convert the probability of occurrence and the consequence occurrence scale values to a risk level. The dimension used was the usual (5x5) size.

PROBABILITY IMPACT MATRIX

Table 3.1 (calculation of the impact matrix)

Probability	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20

5	5	10	15	20	25
	Low	Very Low	Moderate	High	Extreme

Table 3.2 Probability Impact Matrix

LIKELIHOOD	CONSEQUENCE/IMPACT				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	High	High	Extreme	Extreme	Extreme
Likely	Moderate	Moderate	High	Extreme	Extreme
Possible	Low	Moderate	High	Extreme	Extreme
Unlikely	Low	Low	Moderate	High	Extreme

Rare	Low	Low	Moderate	High	High
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3.4 Chapter summary

This chapter presents the methodology used in achieving the research objectives. It is concerned with the selection of the right approach and analytical tool to discuss the data to achieve objectives. A nonparametric statistical analysis was adopted using the chi square which gave a descriptive statistic of the variables. Relative important index was finally used to analyse the relative importance of those variables. Risk factors were finally categorized into their various risk levels.

CHAPTER FOUR

4.0 DATA ANALYSIS AND DISCUSSION OR RESULTS

4.1 Introduction

This chapter focuses comprehensively on the analysis of the results gathered through data collection. It concentrates on the profile of the respondents, the descriptive analysis of results together with their respective discussions. It includes also the inferential aspect which is hypothesis testing and other analysis intended to identify the latent characteristics and its relative importance.

4.2 Respondents profile

Having proper knowledge of the respondent's background helps to enhance the credibility of the results. Respondents were then asked to indicate their choices to help produce credible results. These firms were found to be legally registered since it's a requirement for the acquisition of Government of Ghana works. According to Owusu-Manu (2008) *cited in Otu-Nyarko* (2010), it is argued that the nature of legal organization affects the behaviour of the firm's activity.

4.2.1 Percentage Responses

To obtain credible information that can guarantee a valid analysis, responses must obtain a certain level of experiences. Table 1 presents the respondent's percentage years of experience it had worked in the MMDA's as contractor or a technocrat. The table shows that 25% respondents are within the class of 1-5 years, 44% representing those with 6-10 years'

experience, 23% for those with 11-20 years' experience. Few of the responds were in the class of over 20years of experience and recorded 8% responds.

Table 4.1 Showing level of experience

S/N	YEARS OF EXPERIENCE	PERCENTAGE response
1	1-5 YEARS	25%
2	6-10 YEARS	44%
3	11-20 YEARS	23%
4	OVER 20YEARS	8%

Table 4.2 Cumulative percentage responds

S/N	CONTRACTORS	QUESTIO NAIRE SENT	QUESTIO NAIRE RECEIVE D	TOTAL	CUM. PERCENT AGE
1	General contractor	65	52	52	51.5%
2	specialist contractor	13	5	5	4.9%
3	Professionals	23	21	21	20.8%
				78	77.2%

For the one hundred and one (101) questionnaires that were administered, seventy-eight (78) were received representing 77.2%. The outcome could be bias if the rate of response is less than 30% (Moser and Aibinu, 2006). The response rate of the study was 77.2%, which makes it not bias.

4.3 DESCRIPTIVE STATISTICS ON COST AND SCHEDULE OVERRUN VARIABLES

Mean score analysis was conducted to assist in providing understanding of the responses from the survey, and the results are tabulated in **Table 6**. The standard error is the standard deviation of sample means and it indicate a measure of how representative a sample is likely to be of the population (Field, 2005). A large standard error reflects a lot of variability between means of different samples and a small standard error suggests that most sample means are similar to the population mean and so the sample is likely to be an accurate reflection of the population (Field, 2005).

Having a mean value to be acceptable population mean, it is therefore reasonable to conclude that they are good variables contributes to schedule and cost overrun in the public sector project delivery (MMDA's) in Ghana. Finally, it is seen from the results in the table that, the standard deviations of a large majority are less than 1.0 implying that, there is little variability in the data collected and consistency in agreement among the respondents.

Table 4.3 Descriptive statistics schedule and cost overrun factors

Factors of cost overrun	N	Mean	Std. Error	Std. Deviation
Incompetent vendor/contractor	78	1.8974	.07653	.67593
Mistakes during construction	78	1.8974	.08479	.74885
Poor site management and supervision	78	1.7308	.06496	.57373
Optimism biases (being overly optimistic on estimates	78	1.7051	.06854	.60537
Inadequate monitoring and control	78	1.5000	.05983	.52841
Poor financial control on site	78	1.6282	.06854	.60537
Vendor/contractor selection criteria	78	2.6026	.11733	1.03622
Inaccurate time and cost estimates	78	1.5897	.06435	.56834
Extension of time with cost claims	78	2.2821	.08539	.75416
Unforeseen conditions	78	1.9615	.08251	.72868
Faulty execution	78	1.9103	.08199	.72409
Labour productivity	78	1.7179	.07501	.66249
Factors schedule overrun				
Frequent design changes	78	1.6667	.06989	.61721

Poor site supervision	78	1.7821	.07218	.63752
Inadequate planning and scheduling	78	1.6154	.06884	.60797
Inadequate monitoring and supervision	78	1.3462	.05422	.47882
Strategic deception and misrepresenting issues	78	2.0641	.08025	.70875
Land insecurity and accompanying litigation	78	1.5000	.06516	.57547
Mistakes and error in design	78	1.7179	.07276	.64259
Incompetent contractor	78	2.1154	.07950	.70214
Lack of communication between stakeholders	78	1.6795	.07632	.67408
Unforeseen conditions and circumstances	78	2.0256	.07949	.70203
Construction complexity	78	3.3077	.09536	.84219
Contractor's Financial distress	78	1.6923	.06903	.60961
Delay in payment certificate	78	1.3205	.05623	.49658

4.3.1 Statistical test of significance

A non-parametric test using the chi square was conducted on schedule and cost overrun variables obtained from the review to see how significant those factors are to solve the two research objectives. The significance of a factor is decided using the chi square with a conventional p-values of $p \leq 0.05$. The rule for the acceptance or rejection of a factor is that,

if a p-value ≤ 0.05 is achieved, the factor is accepted and if a p-value > 0.05 is achieved, the factor is rejected. The results of the chi square tests presented in **Table 8** indicated that, all the twenty-five variables identified recorded p-values of ≤ 0.05 . It therefore means that all the factors identified to be risk factors that contribute to schedule and cost overrun in the delivery of projects in the MMDA's were critical.

Table 4.4 Test of significance

S/N	Factors (cost overrun)	Chi square	df	Asymp.Sig. p value	Decision
1	Incompetent vendor/contractor	16.000a	2	0.000	Accept
2	Poor site management and supervision	33.923a	2	0.000	Accept
3	Mistakes during construction	4.923a	2	0.000	Accept
4	Optimism biases (being overly optimistic on estimates)	26.846a	2	0.000	Accept
5	Inadequate monitoring and control	36.231a	2	0.000	Accept
6	Poor financial control on site	25.923a	2	0.000	Accept
7	Vendor/contractor selection criteria	32.641b	4	0.000	Accept
8	Inaccurate time and cost estimates	31.000a	2	0.000	Accept

9	Extension of time with cost claims	36.256c	3	0.000	Accept
10	Unforeseen conditions	7.154a	2	0.028	Accept
11	Faulty execution	7.923a	2	0.019	Accept
12	Labour productivity	7.615a	2	0.000	Accept
	Schedule overrun factors				
1	Frequent design changes	24.308a	2	0.000	Accept
2	Poor site management and supervision	22.231a	2	0.000	Accept
3	Inadequate planning and scheduling	25.615a	2	0.000	Accept
4	Inadequate monitoring and supervision	7.385d	1	0.007	Accept
5	Strategic deception and misrepresenting issues	10.231a	2	0.006	Accept
6	Land insecurity and accompanying litigation	32.077a	2	0.000	Accept
7	Mistakes and error in design	20.615a	2	0.000	Accept

8	Incompetent vendor/contractor	45.179c	3	0.000	Accept
9	Lack of communication between stakeholders	53.795c	3	0.000	Accept
10	Unforeseen conditions	11.385a	2	0.003	Accept
11	Construction complexity	23.846c	3	0.000	Accept
12	Contractor's Financial distress	25.846a	2	0.000	Accept
13	Delay of payment certificate	54.538a	2	0.000	Accept

- a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 26.0
- b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.6.
- c. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.5
- d. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 39.0.

Table 4.5 Descriptive statistics on control measures

Factors	N	Mean	Std. Error	Std.Deviation
Adopting prequalification of firm in the selection process	78	3.3974	0.1563	1.38019
Ensuring that lands for development are acquired and documented properly	78	3.5385	0.149	1.31616
Clarifying roles and responsibilities and effective communication among stake holders across project life cycle	78	3.9615	0.1383	1.22148
Attempting to stay within the planned scope	78	3.8462	0.1291	1.14048
Properly checking the capability of vendors/contractors before hiring	78	4.1538	0.105	0.92669
Finalizing all design details before tendering the work	78	4.1923	0.1017	0.89816
Planned projects to be executed within a fiscal year must be sizable enough to meet the budget available	78	4.2821	0.0929	0.82016
Constantly tracking and monitoring progress	78	4.3846	0.8408	0.7426
Honouring prompt certification for work done	78	4.5128	0.8108	0.71611
Understanding the technicalities as well as the social and political dimensions	78	3.7949	0.1441	0.27268
Adopting the principles of project cost management	78	3.6923	0.1357	0.19857

Adopting the principles of project schedule management	78	3.7308	0.1273	0.12438
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4.4 Test of The Research Question

The observations made may rather not be the true reflection of the entire population. It was therefore necessary to test the data with an appropriate statistical method. The chi-square test (a non-parametric test) was chosen because of uncertainty about the nature of the distribution of the population. The chi-square test of significance was conducted for the identified variables. The research question stated that, “How can cost and schedule overrun be eliminated from public projects in MMDA’s in Ghana”. Below are the details of the test

RESEARCH QUESTION

The variables to answer the research question were tested using the Chi Square test at the conventional p-values of $p \leq 0.05$. The rule for the acceptance or rejection of a variable is that if a p-value < 0.05 is achieved, the variable is accepted and if a p-value > 0.05 is achieved, the variable is rejected. The results of the chi square tests presented in **Table 9** indicate that, out of the twelve variables identified, ten recorded p-values of ≤ 0.05 with only two having p-value ≤ 0.05 and were therefore rejected as a measure. The test has therefore proven that the identified variables are those that must be implemented to eliminate or reduce these overrun. The table below shows this result.

Table 4.6 Test statistics on control measures

Factors	Chi square	df	Asymp.Sig. p value	Decision
Understanding the technicalities as well as the social and political dimensions	26.362a	4	0.000	Accept
Clarifying roles and responsibilities and effective communication among stakeholders	40.462a	4	0.000	Accept
Adopting the principles of project schedule management	25.462a	4	0.000	Accept
Adopting the principles of project cost management	19.308a	4	0.001	Accept
Properly checking the capability of vendors/contractors before hiring	26.821a	3	0.000	Accept
Attempt to stay within the original planned scope	28.282a	4	0.000	Accept
Constantly tracking and monitoring progress	17.538c	2	0.000	Accept
Honouring prompt certification for work done	34.462c	2	0.000	Accept

Ensuring that lands for development are acquired and documented properly	13.154a	4	0.11	Reject
Planned projects to be executed within the fiscal year must be sizable enough to meet the budget available	39.949b	3	0.000	Accept
Finalizing all design details before tendering works	31.436b	3	0.000	Accept
Adopting prequalification of firms in the selection process	6.615a	4	0.158	Reject

4.5 RANKING OF FACTORS USING RELATIVE IMPORTANCE INDEX (RII)

The relative importance index method was then used to rank the factors which were accepted with a p- value of less than 0.05 from the statistical test to be the practical measures to be adopted in controlling or minimizing these overrun. Adna, et al (June2007), used the relative importance index formula to rank all the factors in his research work. The formula for calculating the relative importance index is shown below:

$$RII = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5(n_1 + n_2 + n_3 + n_4 + n_5)} \times 100.$$

Where RII=Relative importance index

N1=Number of respondents who answered “**not important**”

N2 = Number of respondents who answered “**less important**”

N3= Number of respondents who answered “**averagely important**”

N4= Number of respondents who answered “**important**”

N5= Number of respondents who answered “**very important**”

Table 4.7 Scale of responses

CODE	VARIABLES	1	2	3	4	5	RII	RANKING
F1	Understanding the technicalities as well as the social and political dimensions	6	8	12	22	30	0.75 8	8th
F2	Clarifying roles and responsibilities and effective communications among stakeholders across project life cycle	5	6	10	22	35	0.79 4	6th
F3	Adopting the principles of project schedule management	2	9	23	18	26	0.74 6	9th
F4	Adopting the principles of project cost management	3	1 2	17	20	26	0.73 8	10th

F5	Properly checking the capability of vendors/contractor before hiring	0	5	13	25	35	0.83 0	5 th
F6	Attempting to stay within the original planned scope	3	8	15	24	28	0.76 9	7 th
F7	Constantly tracking and monitoring progress	0	0	12	24	42	0.87 6	2 nd
F8	Honouring prompt certification for work done	0	0	10	18	50	0.90 2	1 st
F9	Planned project to be executed within a fiscal year must be sizable enough to meet the budgeted available	0	3	9	29	37	0.85 6	3 rd
F10	Finalizing all design details before tendering the work	0	5	10	28	35	0.83 8	4 th

CODE	VARIABLE	VALID	RII	RANKING
F8	Honouring prompt certification for work done	78	0.902	1 st
F7	Constantly tracking and monitoring progress	78	0.876	2 nd
F10	Planned project to be executed within a fiscal year must be sizable enough to meet the budgeted available	78	0.856	3 rd
F11	Finalizing all design details before tendering the work	78	0.838	4 th
F5	Properly checking the capability of vendors/contractor before hiring	78	0.830	5 th
F2	Understanding the technicalities as well as the social and political dimensions	78	0.794	6 th
F6	Attempting to stay within the original planned scope	78	.0769	7 th
F1	Understanding the technicalities as well as the social and political dimensions	78	0.758	8 th
F3	Adopting the principles of project schedule management	78	0.746	9 th
F4	Adopting the principles of project cost management	78	0.738	10 th

4.6 Analysis of relative important index

From the table above, it can be seen that high to low ranking is adopted, this therefore means that, the factor with the highest is ranked the most important. Having identified the variable factor that must be put in place to avert the issues of overrun, respondents were asked to rank them in order of importance to know which of them critically needs to be looked at. These measures were identified to be twelve. Relative index of 70 percent and above was considered to be highly important measure to be considered. As observed from **Table:10** above, eleven out of the twelve measures were found to record an index of more than 70 percent. This therefore means that all the factors identified were of critical concern and when implemented can help reduce if not eliminated completely the issue of overrun. It is seen that honouring prompt certification for work done with an index of (0.902), constantly tracking and monitoring progress with an index of (0.876), Planned project to be executed within a fiscal year must be sizable enough to meet the budgeted available with an index of (0.856), Finalizing all design details before tendering the work with an index of (0.838) and Properly checking the capability of vendors/contractor before hiring with an index of (0.830) were the five most important factors that must be taking into consideration if this phenomenon can be minimized or eliminated. It is therefore seen to be issues that come from the client for that matter the MMDA's, this means that most of the schedule and cost overrun occur due to inability of the MMDA's to perform certain functions.

4.7 Discussion of overrun scenario from the selected MMDA's

Table 4.8 Ahanta west district Assembly

Project Name	Contract sum (GHC)	New contract sum (GHC)	Percentage change (%)	Remarks
Construction of 3 units classroom block with ancillary facilities	138,000.00	165,200.00	19.7% (ongoing)	Cost and schedule overrun
Construction of district police head quarters	285,510.82	332,150.00	16.3% (ongoing)	Cost and schedule overrun
Construction of two storey boy's dormitory	236,627.66	278,176.89	17.6% (ongoing)	Schedule and Cost overrun
Construction of CHIPS compound	129,540.18	129,540.18	nil	schedule overrun
Construction of 1 no. 2 units KG block with ancillary facilities	79,981.58	79,981.58	nil	schedule overrun

Discussions:

From the table above, it is clear that all the five selected projects have some magnitude of cost and schedule overrun. The construction of 3 units classroom block started on 16/01/2012 and was supposed to be completed in 15/06/2013 with a contract sum of GHC 138,000.00. This project has been reviewed to a new sum of GHC 165,200.00 recording a

cost overrun of 19.7% and is still ongoing. The construction of district police head quarters and the construction of a 2-storey boy's dormitory were seen to have overrun it cost/budget by 16.3% and 17.6% respectively. This project which was supposed to have been completed in 2016 is still ongoing as at 2018. The construction of chips compound and the construction of 1no. 2-units KG block with ancillary facilities seem not to have attracted any additional cost increase. These two projects were supposed to be completed in 2016 and 2013 respectively. They have overrun their schedule and is still not completed.

Table 4.9 Sekondi Takoradi Metropolitan Assembly

Project Name	Contract sum (GHC)	New contract sum	Percentage change (%)	Remarks
Supply & installation of pole and wall mount street naming signage	625,000.00	767,124.21	22%	Cost and schedule overrun
Rehabilitation of two storey 14 units classroom block	161,892.45	192,437.78	19.6%	Cost overrun
Construction of two storey commercial block, Auditorium block and utility facility	339,998.45	398,065.22	17%	Cost overrun
Supply and installation of pole and wall mount street names signages	583,863.25	695,762.85	19.1%	Cost and schedule overrun
Construction of library complex (phase 1)	1,296,340.61	1,487,620.12	14.7%	Cost and schedule overrun

Discussions:

The situation from the Ahanta west municipal assembly is not different from that of the Sekondi Takoradi metropolitan assembly. The supply and installation of poles and wall mount street naming signage project has gone beyond the budget by 22%. This project was awarded in June 2016 and was to be completed in 6 calendar months is still not completed, indicating schedule overrun. A similar project was also awarded cover other areas of the metropolis in June 2016 and was also expected to be completed in 6 calendar months. This project as at now is yet to start and contract sum has been reviewed by 19.1% increase. Rehabilitation of 2-storey 14 units classroom block, the construction of 2- storey commercial building and the construction of library complex (phase 1) projects have all recorded an overrun in cost by 19.6%,17% and 14.7% respectively.

Table 4.10 Shama District Assembly

Project Name	Contract sum (GHC)	New contract sum	Percentage change (%)	Remarks
Construction of 6 units classroom block with offices	222,320.64	296,427.51	33.3% (ongoing)	Cost overrun
Construction of 8-seater water closet	33,048.00	nil	50% (abandoned)	Half of contract sum wasted
Continuation and completion of community centre	507,775.73	703,672.92	38.6% (ongoing)	Schedule and Cost overrun

Construction and completion of dressing room and fence wall around football park	234,383.49	285,453.57	21.7%	schedule overrun
Continuation and completion of lower inchaban market and lorry park	344,7441.35	nil	Only 35% completed	schedule overrun

Discussions:

From the table above, the construction of 8-seater water closet was abandoned when it was half way to completion. This means that the public funds which was committed to that project is wasted. Also the construction of 6-units classroom block with offices, the continuation and completion of dressing room and fence wall for a football park have all exceeded their budget as at now by 33.3%,38.6% and 21.7% respectively. The final project in this district is the continuation and completion of lower inchaban market and lorry park which was awarded in July 2016 and expected to be completed in April 2017 is only 35% complete as at now, recording a high level of schedule delay and will certainly attract extra cost by the time it will be completed.

Looking at these three MMDA's, it is clear that cost and schedule overrun in our public construction projects is on the increase and waste a significant amount of the tax payers which could have been used for other developmental needs. It is therefore important that measures are put in place to avert or reduce this menace from the system.

4.7 RISK ANALYSIS.

Brainstorming Analysis for the establishment of probabilities

Nine (9) members were selected to form the group with a moderator. The members were made up of contractors and some key technocrats of the assembly. They agreed on given probabilities to the various risk variables according to the following order.

- 1 very high consequence
- 2 high consequence
- 3 moderately high
- 4 low consequence

From empirical analysis each member of the group was asked to freely attach probabilities to the variables and explain the reason for that choice. Below is a table of their response on the variables with their probabilities.

Table 4.11 probability factors

Group members	Factors/variables	Probabilities				Remarks
		1/0.1	2/0.2	3/0.3	4/0.4	
9	Incompetent vendor/contractor	2	1	6	nil	6 people agreed to the probability of 3 for the variable
9	Mistakes during construction	5	2	1	1	5 people agreed to the probability of 1 for the variable
9	Poor site management and supervision	3	4	1	1	4 people agreed to the probability of 2

						for the variable
9	Optimism Biases	1	1	6	1	6 people agreed to the probability of 3 for the variable
9	Inadequate Monitoring and Control	nil	7	1	1	7 people agreed to the probability of 2 for the variable
9	Poor Financial Control on Site	5	2	1	1	5 people agreed to the probability of 1 for the variable
9	vendor(contractor) selection criteria	2	4	2	1	4 people agreed to the probability of 2 for the variable
9	Inaccurate time and cost estimates	1	6	1	1	6 people agreed to the probability of 2 for the variable
9	Extension of time with cost claims	1	1	5	2	5 people agreed to the probability of 3 for the variable
9	Unforeseen conditions	5	1	2	1	5 people agreed to the probability of 1 for the variable
9	Faulty execution	7	nil	nil	2	7 people agreed to the probability of 1 for the variable
9	Labour productivity	1	1	1	6	6 people agreed to the probability of 4 for the variable
9	Frequent design changes	1	5	1	2	5 people agreed to the probability of 2 for the variable
9	Poor site management and supervision	7	1	nil	nil	7 people agreed to the probability of 1

						for the variable
9	Inadequate Planning and Scheduling	2	4	2	1	4 people agreed to the probability of 2 for the variable
9	Inadequate Monitoring and Supervision	1	1	2	5	5 people agreed to the probability of 4 for the variable
9	Strategic Deception and Misrepresenting Issues	3	1	1	4	4 people agreed to the probability of 4 for the variable
9	Land Insecurity and a Litigation	6	1	2	nil	6 people agreed to the probability of 1 for the variable
9	Mistakes and error in design	5	2	1	1	5 people agreed to the probability of 1 for the variable
9	Incompetent vendors/contractors	6	nil	1	2	6 people agreed to the probability of 1 for the variable
9	Lack of communication between stakeholders	5	1	1	2	5 people agreed to the probability of 1 for the variable
9	Unforeseen conditions	2	5	1	1	5 people agreed to the probability of 2 for the variable
9	Construction complexity	1	5	2	1	5 people agreed to the probability of 2 for the variable
9	Cash flow and financial difficulties faced by contractors	2	1	5	1	5 people agreed to the probability of 3 for the variable
9	Delay payment of certificates	7	2	nil	nil	7 people agreed to the probability of 1

						for the variable
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Table 4.12 Risk Analysis

N o	RISK	HI GH	MODER ATE	LO W	PROB.
1	Incompetent vendor/contractor		X		3
2	Mistakes during construction	X			1
3	Poor site management and supervision	X			2
4	Optimism Biases (Being overly optimistic on estimates}		X		3
5	Inadequate Monitoring and Control	X			2
6	Poor Financial Control on Site	X			1
7	vendor(contractors) selection criteria	X			2
8	Inaccurate time and cost estimates	X			2
9	Extension of time with cost claims		X		3
10	Unforeseen conditions	X			1
11	Faulty execution	X			1
12	Labour productivity			X	4

13	Frequent design changes	X			2
14	Poor site management and supervision	X			1
15	Inadequate Planning and Scheduling	X			2
16	Inadequate Monitoring and Supervision			X	4
17	Strategic Deception and Misrepresenting Issues			X	4
18	Land Insecurity and accompanying Litigation	X			1
19	Mistakes and error in design	X			1
20	Incompetent vendors/contractors	X			1
21	Lack of communication between stakeholders	X			1
22	Unforeseen conditions	X			2
23	Construction complexity	X			2
24	Cash flow and financial difficulties faced by contractors		X		3
25	Delay payment of certificates	X			1

4.9 Risk grouping

Table 4.13 (grouping of variables into risk categories)

s/n	High risk factors	Medium risk factors	Low risk factors
1	Mistakes during construction	Extension of time with cost claims	Inadequate Monitoring and Supervision
2	Poor site management and supervision	Incompetent vendor/contractor	Strategic Deception and Misrepresenting Issues
3	Inadequate Monitoring and Control	Cash flow and financial difficulties by contractors	Low productivity
4	Poor Financial Control on Site	Optimism biases	
5	vendor(contractors) selection criteria		
6	Inaccurate time and cost estimates		
7	Unforeseen conditions		
8	Faulty execution		

9	Frequent design changes		
10	Poor site management and supervision		
11	Inadequate Planning and Scheduling		
12	Land Insecurity and accompanying Litigation		
13	Mistakes and error in design		
14	Incompetent vendors/contractors		
15	Lack of communication between stakeholders		
16	Unforeseen conditions		
17	Construction complexity		
18	Delay payment of certificates		

4.9.1 Risk response

□ High Risk

They have substantial impact on cost, technical performance or schedule. Substantial action required is high priority management attention.

□ Medium Risk

This has the same impact on cost, technical performance or schedule. Additional management attention may be needed.

□ Low Risk

Has minimal impact on cost, technical impact on cost or schedule. Normal management oversight is satisfactory.

4.10 Discussion of research findings and its implications

The results of this research to a large extent have shown how important it is to take particular attention to those contributing factors which cause these overruns. Considering the first two findings, many researchers upon their work enumerated similar observations generally to public construction projects. Optimism biases and strategic misrepresenting issues were of much critical concern in the contract administration processes in the MMDA's in Ghana. Which must be stopped completely.

Contractor selection criteria is one of the major factors that has been found to have much effect on these overruns in the MMDA's. Contractors are giving contracts based on certain affiliations they towards their political parties or to the leadership of the assembly. Project execution always involves stakeholders. There is therefore the need to establish a very strong

communication link between them. Their level of influence and impact must be established on every project if the project is to run successfully. It was established from literature and agreed by respondents that, inadequate monitoring, supervision and control on the projects, inaccurate time and cost estimates from the consultants, faulty execution, frequent design changes, land insecurity and accompanying litigation, mistakes and errors in design produced, construction complexity, cash flow and financial difficulties, delay of payment certificate among others are the major risk factors that must be controlled to avoid such overruns.

It is therefore important for construction practitioners to know the contributions construction have on the economy and protect the public funds from going waste. This work has provided certain measures that must be implemented to help reduce if not eliminated completely this phenomenon.

4.11 SUMMARY

This chapter was devoted to the analyses and discussions of the results obtained from the field survey. It began with a brief discussion of the survey questionnaires and descriptive statistics of the results obtained from the field. The descriptive statistics, to a large extent confirmed the variables which were identified in the literature. It highlighted on the analyses of variables that must be implemented to ensure that overruns are reduced or completely eliminated and that project executed in the MMDA's are completed on budgeted cost and schedule. The chapter finally concludes by analysing the risk factors identified into their various risk levels.

CHAPTER FIVE

5.0. CONCLUSION AND RECOMMENDATION

5.1. Introduction

This dissertation focused on evaluation of risk factors that contribute to schedule and cost overrun in public sector project delivery, with specific focus on three MMDA's in Ghana and to recommend possible measures that must be put in place to reduce or eliminate this phenomenon. The research work is divided into five (5) independent but interrelated chapters. The main introduction was covered in Chapter One. Chapter two focused on the review of relevant literature limited to schedule and cost overrun. Chapter three discussed the methodological issues of the research and chapter four presented the analysis and discussion of the results. This chapter begins with a summary of how the research objectives were achieved, and concludes with recommendations for further research that can be conducted based on the conclusions and limitations of the study.

5.2 review of research objectives and its findings

This research was initiated with the primary aim of evaluating the risk factors that contributing to schedule and cost overrun in the delivery of public sector project in the MMDA's, and to find out measures that can be put in place to ensure that these projects can be completed within the budgeted cost and schedule. In order to achieve the stated aim, three research objectives were set:

First, to determine the risk factors that leads to cost overrun in the MMDA's. Second, to determine the risk factors that influence schedule overrun in the MMDA's. Third is

identifying ways public projects can be delivered on budgeted cost and schedule in the MMDA's.

For this to be achieved, a critical literature review was conducted to facilitate the contextualization of schedule and cost overrun in the context of public sector construction projects within the MMDA's. This review extensively aided in the identification of key risk variables for schedule and cost overrun, which were used in designing the survey questionnaire. The key findings in relation to these objectives are:

- **First Objective:** *Incompetent vendor/contractor, Mistakes during construction, Poor site management and supervision, Optimism biases (being overly optimistic on estimates, Inadequate monitoring and control, Poor financial control on site, Vendor selection criteria. Inaccurate time and cost estimates, Unforeseen conditions, Faulty execution and labour productivity.*
- **Second Objective:** *Frequent design changes, Poor site management and control, Inadequate monitoring and supervision, Strategic deception and misrepresenting issues, Land insecurity and accompanying litigation, Mistakes and error in design, Incompetent vendor/contractor, Lack of communication between stakeholders, Unforeseen conditions, Construction complexity, Cash flow and financial difficulties, Delay of payment certificate.*
- **Third Objective:** *Honouring prompt certification for work done, constantly tracking and monitoring progress, planned project to be executed within a fiscal year must be sizable enough to meet the budgeted cost available, finalizing all design details before tendering the work, and Properly checking the capability of vendors or contractors before hiring.*

5.3 Recommendations

Based on the findings of this research, the following recommendations are advanced for adoption, they comprise the following:

- Contractors must not be awarded based on political grounds, but their capabilities to perform the contract must be ascertained. This therefore means that, the procurement act that regulates how procurement of works must be conducted should be adhered to.
- The MMDA's must ensure that before any tendering advertisement is done, all design details are completed to enable accurate extraction of quantities and proper view of the design proposal.
- Monitoring and evaluating of work is important. This means that, there should be regular monitoring, tracking and evaluation of the work being performed by the contractors in order to be sure they are not going out of scope schedule.
- Prompt payment certification of work done by the contractors is a positive way of avoiding overrun. The MMDA's must ensure prompt payment of any work done by the contractors.
- It is also recommended that planned projects to be executed must be sizeable enough to meet the available budget allocation.
- It is also very important for contractors to note that, any contractor who wants to work with the MMDA's must first of all understand the technicalities as well as the social and political dimensions in such entities.
- The adoption of the principles of how to manage schedule and cost depicted from the PMBOK must as well be noted in all aspect of planning and costing.

- The MMDA's must ensure that any parcel of land that are leased out by the elders of communities for any developmental works are properly checked and legally documented before it is committed.

5.4 LIMITATIONS OF THE RESEARCH

The limitation of this research which must be seen as the main issues has to do with the scope and the process of this research. These shortfalls are as follows:

- The limitation of the survey to other public institutions that uses public funds for developmental projects other than the MMDA's in Ghana.
- The possibility of measurement and sampling errors and the consequences on the data collected, analysis undertaken and the conclusions drawn.

5.5 SUGGESTION FOR FURTHER RESEARCH

This research exposes a number of areas which need research attention. The following recommendations are therefore proposed for further research work:

- Strategies to be adopted to increase the revenue base and to stop the over dependence of funds from the central government.
- Ways to prevent leakages of public funds meant for developmental projects
- Evaluation of risk factors that contributes to cost and schedule overrun on all other public institution's construction projects in Ghana.

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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BUILDING TECHNOLOGY, (IDL).

TO BE COMPLETED BY GENERAL CONTRACTORS, CONSULTANTS AND KEY

TECHNOCRATES (PROFESSIONALS) IN THE MMDA'S

STUDENT/RESEARCHER: ROLAND EMMANUEL SACKY

**TOPIC: EVALUATION OF RISK FACTORS LEADING TO SCHEDULE AND COST
OVERRUN IN THE DELIVERY OF PUBLIC CONSTRUCTION PROJECTS IN THE
METROPOLITAN, MUNICIPAL AND THE DISTRICT ASSEMBLIES (MMDA'S) IN
GHANA.**

AIM: The aim of the study is to evaluate the risk factors that lead to schedule and cost overruns and how project can be delivered on budgeted cost and schedule. A study in the MMDA'S in Ghana.

Further instructions for completing this questionnaire:

1. This questionnaire will take less than 15 minutes to complete.
2. Please complete each question by following the instructions that precede it.
3. For some questions, your opinion or preferred action is being sought, so for individuals there are no "right" or "wrong" answers.
4. The answers to the questions will be analyzed collectively. An individual's responses will not be disclosed, so please feel free to answer without inhibition.

STRUCTURED QUESTIONNAIRE

Please tick [✓] in the spaces provided. Tick once for each question unless otherwise stated.

1. Which of the following ownership structures do you operate?

General Construction firm ☐ Specialist construction firm ☐, Consultancy firm ☐. Other
(please specify).....

2. which of these departments in the MMDA'S do you belong? Works ☐, Dev. Planning ☐,
Budget ☐. Physical Planning ☐, Accounts ☐, Audit ☐, Procurement ☐.

3. How long, have you been involved in construction projects in the MMDA'S in Ghana or
worked in that department

☐ ≤5 years ☐ 6 – 10 years ☐ 11 - 20 years ☐ over 20 years

4. In your opinion do you think public sector projects for that matter MMDA'S can be
delivered on budgeted cost and schedule if all the necessary measures are put in place to
check overruns?

Yes ☐ No ☐

Key; 1 = strongly agree, 2 = agree, 3= partially agree, 4= disagree, 5= strongly disagree

CODE	FACTORS LEADING TO COST OVERRUN	SCORE				
		1	2	3	4	5
1	Incompetent vendor/contractor					
2	Mistakes during construction					
3	Poor site management and supervision					
4	Optimism Biases (Being overly optimistic on estimates }					
5	Inadequate Monitoring and Control					
6	Poor Financial Control on Site					
7	vendor(contractor) selection criteria					
8	Inaccurate time and cost estimates					
9	Extension of time with cost claims					
10	Unforeseen conditions					
11	Faulty execution					
12	Labour productivity					

CODE	FACTORS LEADING TO SCHEDULE OVERRUN	SCORE				
		1	2	3	4	5
1	Frequent design changes					
2	Poor site management and supervision					
3	Inadequate Planning and Scheduling					
4	Inadequate Monitoring and Supervision					
5	Strategic Deception and Misrepresenting Issues					
6	Land Insecurity and accompanying Litigation					
7	Mistakes and error in design					
8	Incompetent vendors/contractors					
9	Lack of communication between stakeholders					
10	Unforeseen conditions					
11	Construction complexity					
12	Cash flow and financial difficulties faced by contractors					
13	Delay of payment certificate					

Key; 1 = not important, 2 = less important, 3= averagely important, 4= important, 5= very important

CODE	FACTORS CONTROL MEASURES	SCORE				
		1	2	3	4	5
1	Understanding the technicalities as well as the social and political dimensions					
2	Clarifying roles and responsibilities and effective communication among stakeholders across project life cycle					
3	Adopting the principles of project schedule management					
4	Adopting the principles of project cost management					
5	Properly checking the capability of vendors/contractor before hiring					
6	Attempt to stay within the original planned scope					
7	Constantly tracking and monitoring progress					
8	Honouring prompt certification for work done					
9	Ensuring that lands for development are acquired and documented properly					
10	Planned project to be executed within a fiscal year must be sizable enough to meet the budget available.					

11	Finalizing all design details before tendering the work					
12	Adopting prequalification of a firm in the selection process					
note	You can please specify if you think there are any/others					
13						
14						
15						