SCHOOL OF MANAGEMENT STUDIES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY

Assessment of Time and Cost Overruns in Construction Projects
(Case Study at Defense Construction Enterprise)

By
MERID TAYE

September, 2016
Addis Ababa, Ethiopia

PROJECT REPORT FOR THE COURSE OF MS-100

On

Assessment of Time and Cost Overruns in Construction Projects (Case Study at Defense Construction Enterprise)

By
MERID TAYE
ENROLLMENT No: ID1410038

Submitted to the coordinator (projects), School of Management Studies, Indira Gandhi National Open university-IGNOU, Maidan Garhi, New Delhi, 110068, in partial fulfillment of the requirement for the Degree of Master of Business Administration in Operation Management

ADVISOR: TEKLEGIORGIS ASSEFA (Asst. Prof.)

September, 2016
Addis Ababa, Ethiopia

CERTIFICATE OF ORIGINALITY

This is to certify that the project titled **"Assessment of Time and Cost Overruns in Construction Projects (Case Study at Defense Construction Enterprise)"** is an original work of the Student and is being submitted in partial fulfillment for the award of the Master's Degree in Business Administration of Indira Gandhi National Open University. This report has not been submitted earlier either to this University or to any other University/Institution for the fulfillment of the requirement of a course of study.

SIGNATURE OF GUIDE	SIGNATURE OF STUDENT
Place:	Place:
Date:	Date :

ACKNOWLEDGEMENTS

First of all I would like to thank the Almighty God, who gave me the potential and patience to pass various obstacles and come up to the accomplishment of this thesis.

I would like to express my deepest appreciation to my advisor, Asst. Professor Teklegiorgis Assefa, for his supervision and excellent advice and also for spending his precious time for improving the quality of this research.

Special thanks are forwarded to DCE managers, team leaders and experts who sacrificed their time in filling the questionnaire. I would particularly like to thank Ato Wolday Berhe, General Manager of DCE.

Lastly but not least, I would like to extend my deepest gratitude to my wife and children (Mesi, Aluka, Tsion and Meklu), without their care and love this thesis would not have been realized.

TABLE OF CONTENT

List of tables

List of figures

Abbreviations

DCE: Defense Construction Enterprise

GDP: Growth Domestic Product

LC: Letter of Credit

MoWUD: Ministry of Works and Urban Development

MS: Mean Score

ABSTRACT

In DCE the number of construction projects is increasing from time to time. However, it becomes difficult to complete projects in the allocated cost and time. Taking this into consideration, time and cost overruns is one of the major problems in the construction projects. Therefore, this research is carried out to make assessment on the factors that cause time and cost overruns of construction projects, their effects and resolutions. Questionnaire survey together with desk study was used to collect data on time and cost overruns.

Desk studies of 10 completed construction projects were investigated, and from the analysis it was found that 100% of the construction projects suffered by both time and cost overruns. The rate of time overrun ranges from a minimum of 13% to the maximum of 181% of the contract time, and cost overrun ranges from a minimum of 1% to the maximum of 47% of the contract amount.

A total of 48 questionnaires were distributed and collected from DCE managers, team leaders and experts. From the analysis of the questionnaire response, the top main significant causes of time and cost overruns are less emphasis to planning (MS: 2.92), poor contract management (MS: 2.88) and poor pre planning process (MS: 2.88). The top ranked effects of time and cost overruns identified by this research are the contribution of the construction industry to the growth of national economy of the country will be less (MS: 2.75), delayed payments to contractor (MS: 2.75) and inability to deliver value for money (MS: 2.67).

The top ranked resolution methods recognized by the respondents are timely progress control, schedule control, cost control, resource control by comparing with the completion date and cost (MS: 3.33), assign competent personnel (MS: 3.13) and effective strategic planning (MS: 3.00).

Finally, the study recommended DCE to have committed leadership and management, timely decision process, advanced contract and project management, systematic control mechanism and effective and efficient strategic planning and management

Key words: time overrun, cost overrun, cause, effect, resolution,

CHAPTER ONE

Introduction

This chapter is explaining about the general idea and relevance of the study. It defines the background, the problem statement, the objectives, the scope and limitation as well as the organization of the thesis.

1.1 Background of the study

Current practice of the construction industry shows that it is a rare event most construction projects are completed on the scheduled time, budgeted cost and desired quality. The main reason behind is that construction projects are unique in nature, time consuming, cost demanding and they are full of uncertainties. As a result, claims and disputes become common phenomena especially on large civil engineering contracts.

Generally in Ethiopia and particularly in Defense Construction Enterprise (DCE), the number of construction projects is increasing from time to time. However it became very difficult to complete a project in a stipulated time and cost given in the initial contract document. Time and cost overruns are the common phenomenon in almost all construction projects. Number of unexpected problems and changes from original design arise during construction phase, leading to time and cost overruns.

Frequent causes of time and cost overruns such as inappropriate choice of site, changes in design, delayed approval of payments, excessive change orders and absence of site staff are investigated to be faults of consultants.

Delayed disbursing of payments to the contractor, additional work order, shortening of contract periods, finance and payment arrangements and client initiated variations are found to be causes for which the project owners are responsible.

Causes for which the contractors are responsible include setting of unrealistic time schedule, shortage of materials on site, failure to update schedules on time, poor qualification of staffs and communication with consultants.

Time and cost overruns in this context is found to be extremely significant and serious problem in DCE, and also in other construction companies in Ethiopia compared to other countries. Most of the projects exceed their completion time and cost higher than their allocated contract time and budget.

1.2 Statement of the problem

The triple constraints to be considered during construction are time, cost and quality of projects. This needs proper planning of time and cost with their acceptable application. But time and cost overruns is created due to different factors by stakeholders, which affects delivery of construction projects to the client on the allocated budget and estimated time. The problem statement is completion and handover of construction projects with in the contract amount and time, or improving time and cost management in DCE.

Major questions that need to be raised are:

- What are the causes of time and cost overruns?
- How could the time and cost overruns can be avoided or minimized?
- What is the trend of projects completion and handover in DCE concerning with time and cost?

1.3 Objectives of the study

The main objective of this project is to determine the causes of time and cost overruns in DCE construction projects, and to mitigate their impacts associated with time and cost claim as well as disputes.

It has been repeatedly debated that time delays in completion time of construction projects are a frequent problem in DCE. Therefore, this project analyses the principal cause of delay, their overall effect, and resolution methods and also the responsible parties will be identified based on the causes assessed. This study is undertaken with the following four specific objectives.

- ✓ To assess the extent of time and cost overruns in construction projects with respect to the projects original duration and contract amount.
- ✓ To evaluate the existing problems associated with construction projects completion time and cost.
- ✓ To identify the responsible parties those contribute to critical causes of time and cost overruns.
- ✓ And finally to forward recommendation about minimizing or avoiding time and cost overruns, and hence to reduce its consequential effects in DCE.

1.4 Significance of the study

The primary objectives of construction projects are to optimize quality, cost and time; and hence this thesis studies the causes and presents the resolutions of time and cost overruns. It also assesses how to minimize or avoid additional cost and time in the construction projects of DCE.

In DCE, where the necessary databases do not yet exist and the level of construction technology and its management is at infant stage, fulfilling at least one of the requirements is difficult. Therefore, this study focuses on two of the basic requirements i.e. time and cost.

To make the issue specific, only projects constructed by DCE are considered. Consequences of delays in construction projects are discussed and hence identification of causes, their relative impact in delaying projects based on contract time and cost are analyzed in detail.

Therefore, the significance of this study is to recommend practices, procedures and methods that can be used to minimize or avoid time and cost overruns of construction projects; and to handover or deliver construction projects to the client within the given time and cost entitled on the contract document.

1.5 Scope and Limitation of the study

The scope of this thesis is to carry out the conceptual and practical review on time and cost overruns of construction projects. When construction projects are performed, time and cost overruns arise due to different causes by stakeholders. These risen overruns need time and cost management requirements, such as preventive and resolution. If these overruns can be controlled smoothly, it can minimize wastage of resources.

This thesis, as a result, takes this context into consideration to develop the preventive and resolution methods to come up with a researchable problem, its methodology together with identifying information sources for the thesis.

The limitation of this study is that, it is conducted only on construction projects that are carried out by DCE in different parts of Ethiopia. However the established principle of formulation could be applied for similar construction companies.

1.6 Organization of the study

The research is logically organized into five (5) chapters and references. Chapter one deals with the introduction, which talks about the general idea and relevance of the study. It defines the background, the problem statement, the objectives, the scope and limitation as well as the organization of the thesis.

Chapter two comprises of literature review, and quotes the various related works done in this area of study. Chapter three attempts to describe in detail the methodology of the project followed in this research study. Chapter four contains data presentation, analysis of the information gathered through the data survey, summary of findings and interpretation. Chapter five provides conclusions and recommendations of the study.

CHAPTER TWO

Literature Review

This chapter identifies previous literature on the subject of time and cost overruns and provides a brief discussion of past findings. Also, the chapter reviews standard classification that has been used in this area. The definitions, causes, effects and resolutions for time and cost overruns, as found in the previous studies are provided and discussed.

2.1 Overview

The Construction industry has a great influence on the economy of all countries. It is one of the parts that provide vital factors for the development of any economy. According to World Bank, the share of construction industry in developing countries is approximately between 6-9% of the GDP. (Unit, South Asia Sustainable Development, 2007). In Ethiopia its percentage of GDP amounts to 3%, considerably lower than the sub Saharan average of 6%, MoWUD (2006).

The construction industry is an important part of the economy and has a considerable impact on the efficiency and output of other industries. It is not possible having extensive investment in manufacturing, agriculture or service sectors without construction of infrastructure facilities in place. One of the main objectives and policies of any public or private sectors dealing with the execution of projects is to upgrade project performance through minimization of costs, completion of projects within their assigned budget and time limits and improve quality.

The loss of control on time and cost leads to failure of projects and the shortage of control may be caused as a result of lack of knowledge and awareness. Completing projects within the time is an indicator of an efficient construction industry, Chan and Kumaraswamy (1997).

According to Chan and Kumaraswamy (1995), the ability to estimate the completion time is normally dependent on the individual intuition, skill and experience of the planning engineer.

Reaching to the end of any project is not a kind of success for the project owner. For the client or owner of the project, success of a project depends on many factors; the most important factors are finishing the project within the budgeted cost and reaching to the closing date of project without delay with a good quality of work and creating no health and safety problems, Abd. Majid & McCaffer (1998), Shi et. al. (2001), Ng et. al. (2001), Aibinu & Jogboro (2002), Choudhury & Rajan (2003), Koushki et. al. (2005).

Ismael (1996), reported time overrun is endemic to construction projects in Ethiopia. He expressed the range of delays in percentage and he said he has examined 13 projects in Ethiopia and obtained the delays encountered in most of the projects range between 100% and 460% of the original contract time. Projects delay is the major cause of claims of time extension and associated cost overrun.

In Ethiopia, the present state of the construction industry falls short of meeting domestic and international quality standards and the performance demand expected from the sector, MoWUD (2006).

Construction projects have problems with construction techniques and management as well as limitation of funds and time. The critical problems are inability to complete the projects on schedule, low quality work and cost overrun. In general, most (if not all) construction projects experience time and cost overruns during their execution phase.

An examination of the records of more than four thousand construction projects by Moris et. al. (1998), showed that projects were rarely finished on time or within the allocated budget. Other researchers have also observed that time and cost overruns are common in the construction industry worldwide, Arditi et. al. (1985).

A study undertaken by Odeck (2004), for Norwegian Public Roads Administration showed that cost overrun ranged from -59% to 183% and this was more predominant on smaller projects compared with larger ones. Aibinu & Jogboro (2002), study indicated that Nigerian construction industry experienced a mean percentage cost overrun of 17.34%. Kaming et. al. (1997), found cost overrun to be more common than time overrun on high rise projects in Indonesia and consequently suggested a need for method studies and dissemination of the research results to both large and small firms.

Research by Flyvberg et. al. (2002), concluded that nine out of ten transportation infrastructure projects costs are underestimated and that for all project types the actual costs are on average 28% higher than estimated costs. Forty four percent (44%) of the respondents in the research undertaken on the Nigerian construction industry by Elinwa & Joshua (2001), indicate that time overrun often occurred. Another research conducted by Barrick, cited by Jackson (2002), on the United Kingdom construction industry found that nearly one third of the clients complaint that their projects generally overrun budget.

Abd. Majid and McCaffer (1998), Al- Khalil and Al-Ghafly (1999), have all show that time overrun occur on the majority of major civil engineering contracts and that is a most common problem.

Mezher & Tawil (1998), however noted that time overrun in Lebanon construction industry are costing the country a lot of money and that there is a need to find more effective methods to overcome the problem.

2.2 Definitions of time and cost overruns

2.2.1 Time overrun

- Choudhry (2004) and Chan (2001), defined time overrun as the difference between the actual completion time and the estimated completion time. It is measured in number of days.
- Construction project time overrun can be defined as an extension of time beyond the contractual time agreed during the tender, Al- Gahtani and Mohan (2007).
- According to Kaming et. al. (1997) and Trigunarsyah (2004), time overrun is the extension of time beyond planned completion dates usually traceable to contractors.
- Elinwa and Joshua (2001), defined it as the time lapse between the agreed estimation or completion date and the actual date of completion.
- Bramble and Callahan (1987), describe time overrun as the time during which some part of construction project is completed beyond the project completion date or not performed as planned due to an unanticipated circumstance.
- Dolage and Rathnamali (1992) defined time overrun as the non-completion of the project within the original or stipulated or agreed contract period.

- Lo, Fung & Tung (2006) and Assaf & Al-Hejji (2006), mentioned that time overrun is either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project.

2.2.2 Cost overrun

- Cost overrun is defined as excess of actual cost over budget. Cost overrun is also sometimes called "cost escalation," "cost increase," or "budget overrun", Zhu et. al. (2004).
- Cost overrun is defined as the change in contract amount divided by the original contract award amount .This calculation can be converted to a percentage for ease of comparison, Jackson (1990).
- Choudhry (2004), defined the cost overrun as the difference between the original cost estimate of project and actual construction cost on completion of works of construction project.
- Cost overrun occurs when the final cost of the project exceeds the initial estimate or budget, Yehen Rosenfield (2002).
- The amount by which actual costs exceed the baseline or approved costs, Widman (2002).
- The difference between the original cost and the actual cost when the project is completed, Avotts (1983). Actually, Avotts (1983), used the word cost growth instead of cost overrun.
- It is perceived to be the difference between the final project cost and the original contract amount, Hinze and Selstead (1991).

2.3 Causes of time and cost overruns

2.3.1 Time overrun

In the construction industry, the aim of project control is to ensure the projects to finish on time, within budget and achieving other project objectives. It is a complex task undertaken by project managers in practice, which involves constantly measuring progress, evaluating plans and taking corrective actions when required, Kerzner (2003). During the last few decades, numerous project control methods, such as Gantt Bar Chart, Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM), have been developed, Nicholas (2001) and Lester (2000).

A variety of software packages have become available to support the application of these project control methods; for example Microsoft Project, Primavera and etc. Despite the wide use of these methods and software packages in practice, many construction projects still suffer time overrun. In recent years, there have been numerous studies on the identification of influencing factors of project time overrun worldwide.

Mansfield et. al. (1994), carried out a questionnaire survey amongst 50 contractor, consultant and client organizations in Nigeria and found out that the most important variables causing construction delays are poor contract management, financing and payment of completed works, changes in site conditions, shortage of materials, imported materials and plant items, design changes, subcontractors and nominated suppliers..

Kaming et. al. (1997), identified factors influencing construction time overrun on high rise building projects in Indonesia through a questionnaire survey administered on 31 project managers.

Design changes, poor labour productivity, inadequate planning, material shortages, inaccuracy of material estimate, skilled labour shortage and etc. were identified for time overrun.

Kumaraswamy and Chan (1998), conducted a more extensive study in Hong Kong using 400 questionnaires after which follow up interviews were held. The study revealed the top causes of construction delays from the contractors' point of view are delays in design information, long waiting time for approval of drawings, poor site management and supervision, mistakes and discrepancies in design documents, etc.

Al-Momani (2000), examined 130 public projects in Jordan and concluded that the main causes of delays include changes initiated by designers, client requirement, weather, site conditions, late deliveries, economic conditions and etc. Yogeswaran et. al. (1998), scrutinized 67 civil engineering projects in Hong Kong and suggested that at least 15-20% time overrun was due to inclement weather.

Walker (1995: PP269), surveyed Australian project representatives and found that the most important factors that affect time delays are the ability of the organization to manage risk, planning capabilities and effective resource coordination.

Faridi & El-Sayegh (2006: PP1172), studied project delays in the United Arab Emirates and found that the three main causes of project delays were preparation and approval of drawings, inadequate early planning of the project and slowness of owner's decision making processes.

2.3.2 Cost overrun

Angelo and Reina (2002), stated that cost overrun is a major problem in both developed and developing countries. Several studies of major projects show that cost overrun is common. The causes of cost overrun in construction projects are varied, some are not only hard to predict but also difficult to manage.

According to a study made in Turkey by Arditi, et. al. (1985), the important sources for cost overrun were found to be inflationary pressures, increase in materials price and workmen's wages, difficulties in obtaining construction materials, construction delays, deficiencies in cost estimation prepared by public agencies and unexpected sub soil conditions.

Kaming, et. al. (1997), studied the factors influencing construction cost overrun for high rise projects in Indonesia, and pointed out that the major factors influencing cost overrun were material cost increase due to inflation, inaccurate material estimating and the degree of project complexity.

Mansfield, Ugwuand and Doran (1994), found that cost overrun is attributed to problems in finance and payment arrangements, poor contract management, materials shortage, changes in site conditions, design changes, mistakes and discrepancies in contract documents, mistakes during constructions, price fluctuations, inaccurate estimating, delays, additional work, shortening of contract period and fraudulent practices and kickbacks.

Stewart (1982), attributes cost overrun to several factors that are either not controllable or that to a varying degree is unmanageable. They include the accuracy of original cost estimation, degree of government regulation and control, construction completion delays, number of design changes, labor related matters such as their availability, skills and increases in fringe benefits.

According to Robert F. Cox (2007), project owners identified five reasons for project cost overrun; these reasons were, incomplete drawings, poor pre planning process, escalating cost of materials, lack of timely decisions and excessive change orders.

According to User's Guide (2005), the following are the factors that change the cost of the construction projects through time; poor project management, design changes, unexpected ground conditions, inflation, shortages of materials, change in exchange rates, inappropriate contractors, funding problems and force majeure.

In developing countries the lack of proper phasing of construction projects can contribute to the economy to become 'overheated'. This leads to shortage of construction materials as the demand will exceed the supply, this in turn leads to a climb in the cost of construction materials; this inevitably gives rise to project cost overrun, with consequential effects on inflation and a decline on efficient activity in the construction industry, Mansfield, Ugwu and Doran (1994).

According to Jahren, et al. (1990), on their research on predictors of cost overrun rates they found the following factors to influence the cost overrun rates; the size of the project, the difference between lowest bid and engineer's cost estimate, the type of delivery method, the method of competition, quality of contract documents and the nature of interpersonal relations on the project.

From the 1980s various studies have investigated the causes for project cost overrun on construction projects. Kaming, Olomolaiye, Holt & Harris (1997), who studied 31 construction projects in Indonesia, found that from contractor's point of view, cost overrun were mainly caused by inaccuracy of material take off, increase in material costs and cost increase due to environmental restrictions.

S. Shanmugapriya, Dr. K. Subramanian (2013), who found reasons for cost overrun were high transportation cost, change in material specification, escalation of material price, frequent breakdown of construction plants and equipment and rework.

T. Subramani, P S Sruthi , M. Kavitha (2014), who found slow decision making, poor schedule management, increase in material/machine/ prices, poor contract management, poor design/ delay in providing design/, rework due to wrong work, problems in land acquisition, wrong estimation/ estimation method/, and long period between design and time of bidding/tendering/ are the major causes of cost overrun.

Reviewing public sector construction projects in Nigeria, Dlakwa & Culpin (1990), found that the three main reasons for cost overrun are fluctuations in material, labour and plant costs, construction delays and inadequate pre-planning.

In another study on construction projects in Nigeria, conducted by Okpala & Aniekwu (1988), it was found that architects, consultants and clients agreed that shortage of materials, finance and payment of completed works and poor contract management were the most important causes of cost overrun.

During extensive studies on construction project performance in European countries, Morris & Hough (1987), as well as Flyvbjerg, Bruzelius & Rothengatter (2003), found that fluctuations in material cost and additional work contributed most to cost overrun. While the top variables causing only cost overrun were revealed as price fluctuation, inaccurate estimates, delays, additional work, materials cost increased by inflation, inaccurate quantity take off, lack of experience of project location, lack of experience of project type and etc.

While all the above studies, to various extents, helped with the better understanding of the problems associated with cost overrun in construction projects, previous research has attempted discover reasons for the disparity between the tender sum and the final account. Four factors were identified from the existing research findings of Morris et al (1990), Kaming et. al. (1997) and Chimwaso (2001). These are design changes, inadequate planning, unpredictable weather conditions and fluctuations in the cost of construction materials.

Morris (1990), was mentioned ten factors that influencing cost overrun of construction projects. These factors are inadequate project preparation, planning and implementation and delay in construction as the first cause of cost overrun. The second factor was supply of raw materials and equipment by contractors. The third one was change in the scope of the project. The fourth factor of cost overrun was resources constraint, funds, foreign exchange, power and associated auxiliaries not ready.

The delays in decisions making by government and failure of specific coordinating bodies was the fifth factor. The sixth cause was wrong /inappropriate/ choice of site. The seventh one was technical incompetence and poor organizational structure. The labour unrest was the eighth one. The ninth factor or cause of cost overrun was natural calamities and the last one was the lack of experience of technical consultants, inadequacy of foreign collaboration agreements and monopoly of technology.

2.4 Responsible parties for causes of time and cost overruns

Studying the significant factors that cause delay of construction projects in Malaysia, Alaghbari, Kadir, Salim & Ernawati (2007: PP199- 200), used four categories for analysis, namely contractor, consultant, owner and external. As far as causes related to contractor actions are concerned, financial problems, shortage of materials and poor site management were ranked among the top three. Owner causes included delayed payments, slow decision making and contract scope changes.

The top three consultant causes were poor supervision, slowness to give instructions and lack of experience. Finally, external causes of delay included shortage of materials, poor site conditions and lack of equipment and tools in the market.

Similarly, Sambasivan & Soon (2007), divided their findings into client, contractor and consultant categories, with all three categories listing poor site management, inadequate contractor experience and poor subcontractors are among the top causes for time delays on construction projects.

Ogunlana, Promkuntong & Jearkjirm (1996), investigated 12 high rise buildings and differentiated their findings into client, consultant, contractor related and external causes for time delays. The weighted findings among these three categories indicated that material shortages, overstretching of technical personnel and design changes were the most important causes for project delays.

Assaf, Al-Khalil & Al-Hazmi (1995), used 56 questions in three categories, namely owner, architects/engineers/ and contractors, to determine the main causes of delays on large building projects in Saudi Arabia. Their survey showed that contractors believed that preparation of shop drawings, delays in contractor's progress and payment by owners were the most important factors contributing to time delays.

According to architects/engineers/ cash flow, sub-contractors schedules and slowness of owner decision making caused the most delays. Finally, owners' opinion is that design errors, excessive bureaucracy in project owner organization and labour shortages contributed most to time delays.

Owners believed that poor early planning, scope changes and financial difficulties by the contractors were the major causes of delay. The consultants somehow supported the owner's views by indicating financial difficulties by the contractor, improper contract knowledge and ineffective planning as the most significant delay factors.

Ahmed et. al. (2003) and Theodore (2009), identified the following factors causing delays in construction projects. They have categorized the factors that cause delays in the four categories, those are due to;

Contractor's responsibility

The factors that are related to contractor's responsibility are:

- ✓ Poor qualification of the technical staffs
- ✓ Shortage of materials on site
- ✓ Construction mistakes and defective work
- ✓ Poor skills and experience of labor
- ✓ Shortage of site labor
- ✓ Low productivity of labor
- ✓ Financial problems
- ✓ Coordination and communication problems with others
- ✓ Conflicts in sub-contractors schedule in execution of project
- ✓ Poor site management
- ✓ Delays in site mobilization.

Consultant's responsibility

The factors that are related to consultant's responsibility are:

- ✓ absence of site staff
- ✓ lack /inadequate/ of experience
- ✓ Delay in approving major changes in the scope of work
- ✓ Mistakes and discrepancies in design documents

Owner's responsibility

The factors that are related to owner's responsibility are:

- ✓ Delay to furnish and deliver the site
- ✓ Lack of working knowledge
- ✓ Change orders during construction (replacement and addition of new work to the project and change in specifications)
- ✓ Financial problems (delayed payments, financial difficulties and economic problems)
- ✓ Slowness in decision making process
- ✓ Poor communication and coordination

External factors

The factors that are related to external are:

- ✓ Delay in obtaining permits from municipality
- ✓ Lack of labour, materials, equipment and tools in the market
- ✓ Weather conditions
- ✓ Poor site conditions (location, ground and etc.)
- ✓ Poor economic conditions (currency, inflation rate, LC and etc.)
- ✓ Changes in laws and regulations
- ✓ High transportation cost
- ✓ Delay in providing services from utilities (such as water, electricity and etc.)

2.5 Effect or impact of time and cost overruns

2.5.1 Time overrun

Because of time delay, the owner and/or the user loses both tangible and intangible benefits during extended time. In Ethiopia these problems are not given due attention and are affecting the whole parties in the sector, including the construction industry itself. In some cases, for public projects, consultants or owners accept requests by contractors to extend time that is free of the compensations. Contractors on the other side tolerate delayed payments by the owner. Each party provides unconvincing reasons for the nonperformance of the contract that leads to excessive delays.

The contracting parties are either negligent or not aware of the problem. They focus on setting unsubstantiated claims from each party by extending time without giving attention to its negative impact that are frequently noticed later. Sometime contractors wouldn't blame the owners for delayed payments so as not to affect their future business relationship. Time overrun in construction projects prevent the planned increase in property and service production from taking place, and this phenomenon in turn affects, in a negative way, the rate of national growth, Arditi, et. al. (1985).

Aibinu and Jagboro (2002), studied the effects of construction delays on project delivery in Nigerian construction industry.

The five effects of delay identified were:

- Cost overrun
- Dispute
- Arbitration

- Total abandonment
- Litigation

In the study of Manavazhia and Adhikarib (2002), delays in the delivery of materials and equipment to construction sites are often a contributory cause to cost overrun in construction projects in developing countries. The actual impact of these delays on project costs was found to be on average about 0.5 per cent of the total budgeted cost of the projects.

Time overrun which subsequently lead to additional cost overrun, as the duration of a project is extended; the price of materials will rise which subsequently lead to additional costs, not only to the project owner but also to the contractor and to the consultant, which participate on that project until completion. And the contractor will incur an additional cost due to idle manpower and equipment.

The two major delay effects are time extension and liquidated damages. The contractor will claim for time extension or for additional cost or for both, and the owner will ask liquidated damage for late completion of the project.

The time extension is usually made to save the contractor from liquidated damages for late completion. The consequence of delay in construction projects is time overrun and the major impacts that have come out from the time overrun are:

- It significantly affects the economic development of a country
- It also affects the users' benefit that will be obtained if it has been completed on time

2.5.2 Cost overrun

Cost overrun has obvious effects for the key stakeholders in particular, and on the construction industry in general. To the client, cost overrun implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental/lease/ costs or prices. To the professionals, cost overrun implies inability to deliver value for money and could well tarnish their reputations and result in loss of confidence reposed in them by clients.

To the contractor, it implies loss of profit for non-completion, and defamation that could jeopardize his/her chances of winning further jobs, if it is at his fault. To the industry as a whole, cost overrun could bring about project abandonment and a drop in construction activities, bad reputation, and inability to secure project finance or securing it at higher costs due to added risks, Macho and Nkado (2004).

Although the degree of effects of cost overrun varies on the stakeholders in the construction industry, all the parties involved are affected by cost overrun. The first victim of cost overrun would be the project owner since he has envisaged his construction project to be realized within an allocated cost. Anything outside these stated frames are cost overrun to the client.

Cost overrun does not affect only those parties that are involved directly in the construction of a project, but its effect pass to the construction industry as a whole and consequently to the national economy of the country. Cost overrun for public clients, whose financial resources are scarce, has many effects and it will be a source of friction between the public client and the consultant.

When the cost overrun is due to financial constraints of clients, the construction projects suffer lots of problems which further aggravate the problems of cost overrun. For public projects cost overrun will lead to delay as the public clients do not have enough financial resources which are ready to be pumped to the construction project. They require new approval for these additional costs from higher public officials or Ministry of Finance and Economic Development (MoFED), in doing so time will go on and consequent delay on the project will crop up.

If a construction project is delayed for a long period of time it will be subjected to inflationary pressure and interests will be accumulated. One of the common effects of cost overrun is delay; this in turn affects clients, consultants and contractors. Furthermore, lengthy delays increase cost overrun tremendously.

Cost overrun will also be a source of dispute among stakeholders and it will lead to adversarial relationship among project participants. Project owners will lose confidence on consultant and on professionals in general. To the industry as a whole, cost overrun could bring about a drop in building activities, bad reputation, and inability to secure project finance easily form public authorities in the future.

Generally, the following are the main effects of cost overrun.

- Delay
- Supplementary agreement
- Additional cost
- Adversarial relationship between participants of the project

- Loss of reputation to the consultant, the consultant will be viewed as incompetent by project owners
- High cost of supervision and contract administration for consultants
- Delayed payments to contractors
- The contractor will suffer from budget short fall of the client
- Poor quality workmanship
- Dissatisfaction by project owners and consequently by end users
- Negative attitude towards the construction industry by the higher public authority and by the society as a whole
- The contribution of the construction industry to the growth of national economy of the country will be less
- Weakens the growth of the construction industry by eroding mutual trust
- Pours money unnecessarily to the project at hand at the expense of other new projects
- Distorts fair and equitable resource distribution
- Discourage investment, the investment on project construction by public clients will be less, hence the number of projects will decrease in the future
- Creates skeptical outlook on appraisal of other new construction projects
- Some project owners (clients) become reluctant to effect additional payments to contractors and they view the cost overrun as a fabricated thing. This will propel to delay the project and become a source of dispute among participants of the project
- Creates frustration on stakeholders

The global construction industry is plagued with cost overrun in project delivery. This development has brought about loss of clients' confidence in consultants, added investment risks, inability to deliver value to clients, and disinvestment in the construction industry, Macho and Nkado (2004).

According to Aridity, et. al, (1985), the effects of cost overrun is not confined to the construction industry but is reflected in the state of the overall economy of a country. They state that delays and cost overrun in construction projects prevent the planned increase in property and service production from taking place, and this phenomenon in turn affects in a negative way the rate of national growth. According to Ritz (1994), project cost overrun can cause sallower payout and reduce an early return on the client's or project owner's investment.

2.6 Resolutions of time and cost overruns

What is project time and cost management? Generally, time and cost management in construction project is defined as centralized of time and cost planning, organizing and controlling in the fieldwork or in the construction sites to meet the goals of schedule, cost and quality estimation, Ritz (1994).

PMBOK's (1996), defines project time management as the effective and efficient use of time to facilitate the execution of project, which starts from planning, scheduling and controlling the project to achieve the time objectives.

Degoff and Friedman (1999), defines project time management as the development of a project time schedule to manage that schedule, and to ensure the project completes within the approved time schedule.

Therefore, schedule is important to manage time, which involves defining project activities, sequencing the activities, developing the schedule, executing the schedule and controlling the plans during project execution. Project time management includes the processes required to ensure timely completion of the project, Duncan (1990).

Overviews of the major processes in project time management are as follows;

- **Activity definition:** identifying the specific activities that must be performed to produce the various project deliverables
- **Activity sequencing:** identifying and documenting interactivity dependencies
- **Activity duration estimating:** estimating the number of work periods which will be needed to complete individual activities
- **Schedule development:** analyzing activity sequences, activity durations and resources requirements to create the project schedule
- **Schedule control:** controlling changes to the project schedule

PMBOK's (1996), defines project cost management as a requirement for financial control of the project, which is accomplished through accumulating, organizing, analyzing data and reporting the cost information.

Clough, et. al. (2000), defines project cost management as the process of determining the total cost of the project, to manage that cost and to ensure that the project is completed within the approved budget or cost. Keeping within the budget, and knowing when and where the costs are deviating are the keys to efficient and effective cost management and profitable operations.

Project cost has been defined as the amount of commitment in terms of money that is required to produce a construction product such as building. Project cost represents all those items included under the heading of the expenditures, Ashworth (2004).

Project cost is quantitative assessments of the likely costs of the resources (labor, materials, supplies, etc.) required to complete all project activities. Project cost management includes the processes required to ensure that the project is completed within the approved budget, Duncan (1990).

2.6.1. Time overrun

Time Management

In construction all projects have time bound and the project time bound specifies the project completion time. Time delays results to penalties while early completion might earn rewards. However, in spite of one's best efforts to complete a project on time, changes from the original estimated project time plan do occur sometimes. There may be many reasons both foreseeable and unforeseeable, for non-completion of a project on time. However, the absence of a project time plan almost makes certain that a project cannot be completed on schedule without incurring extra costs.

A plan prepared well before the commencement of construction in a project can be instrumental in formulating directions, coordinating functions, setting targets, forecasting resources, budgeting costs, controlling performance and motivating people. It is for these reasons that the project planning starts with time planning as the first step. Planning is the devising of a workable scheme of operations to accomplish an established objective when put into action.

It requires an intimate knowledge of construction methods combined with the ability to visualize discrete work elements and to establish their mutual interdependencies. Construction planning is a fundamental and challenging activity in the management and execution of construction projects. It involves the choice of technology, the definition of work tasks, the estimation of the required resources and durations for individual tasks and the identification of any interactions among the different work tasks.

In addition to these technical aspects of construction planning, it may also be necessary to make organizational decisions about the relationship between project participants and even which organizations to include in a project. For example, the extent to which sub-contractors will be used on a project is often determined during construction planning. The construction planning may be said to consist of the following steps.

- Choice of technology and construction method
- Determination of the job steps or activities that must be performed to construct the project
- Ascertainment of the sequential relationships among these activities
- The presentation of this planning information in the form of a network

Planning involves setting visions, missions and goals of organizations, projects, or programs together with the activities to achieve them. All level of managers develops goals that correspond to the efforts of the top management over all goals and strategy. This requires operational plan aimed at administration and coordination of stakeholders, processes and resources.

Planning is beneficial in that it makes better coordination, focuses on forward thinking, and creates participator work environment and good for effective monitoring and feedback systems, Wubishet Jekale Dr.ing. (2004).

Construction managers should able to read the construction drawings and should able to analyze the site and environment where the project is going to be implemented so that s/he can plan good construction project with minimized risk of delay, claim and disputes. In addition, the project manager should set appropriate project controlling and evaluation so that the plan can meet the projects goal, Pa.Melas, Liews Stenge H. and Goodman Patricia (1998).

People who are experienced in and thoroughly familiar with the type of fieldwork involved must do construction planning as well as scheduling. It is especially important that those who will be expected to implement the plan in the field have an opportunity to participate in its development. The project network and the management data obtained from it will be realistic and useful only if the job plan is produced and updated by those who understand the job to be done, the ways in which it can be accomplished and the job site condition, Pa.Melas, Liews Stenge H. and Goodman Patricia (1998).

It was indicated from the survey findings derived from different levels of management that the major causes of delay are due to financial problems followed by manpower shortage and changes in the project requirements. All parties involved in the project also agreed that delay occurs mostly during the construction phase.

Therefore, in resolving those problems, the units of analysis suggested to increase the construction productivity, followed by increase the expertise and skill of human resources, and conducted site meetings more frequently.

Control is a very critical managerial function because the consequences of not meeting the standards of performance can be very negative for organization; for example poor control in construction may result in delay which finally leads in to claims and disputes. Poor construction control may result in poor quality construction output which results in angry to customers (owners), finally leads to claims.

In construction projects the progress of the work according to the plan can be controlled through progress report on site, schedule control, cost control, resource control and by comparing with the completion date and cost, J. Rilling Worth (1998).

Questionnaire survey findings showed that in Malaysia construction industry was significantly facing with the poor performance of construction time. Hence, interviews were conducted to develop mitigation measure to control time. Mitigation measures were classified into three categories in accordance with implementation strategy as pro-active, re-active and organizational measures.

These measures will be helpful in improving time performance at different stages from planning as proactive measure to construction as reactive measure. Some of the measures which may be fluid and applicable at both planning and execution stages are mentioned as below;

- Proper planning work
- Committed leadership and management

- Send clear and complete message to worker to ensure effective communication
- Hire skilled workers to achieve good progress, avoid poor quality of work, more rectification and double handling
- Close monitoring
- Training and development of all participants to support delivery process
- Focus on the quality, cost and delivery of the project
- Use new construction technologies (IBS-Industrialize Building System)
- Adoption of tools and techniques i.e.: Value Management, Total Quality Management and Business Process Reengineering.
- Provide knowledge/training/ to unskilled workers based on their scope of work
- Fully utilize the construction team
- Focus on client's need
- Measure performance against other projects

An analysis is needed to identify the impact of delay on time followed by taking the appropriate action to mitigate delay and minimize the time required. It is important to improve the estimated activity duration according to the actual skill levels, unexpected events, efficiency of work time, and mistakes and misunderstandings.

Mitigation efforts are necessary to minimize losses and this can be achieved by many procedures such as protection of uncompleted work, timely and reasonable re-procurement, and timely changing or cancellation of purchase orders. It is important to predict and identify the problems in the early stages of construction and diagnose the cause to find and implement the most appropriate and economical solutions, Abdul-Rahman et. al. (2006).

2.6.2 Cost overrun

Cost Management

For cost management and control on a project, the construction plan and the associated cash flow estimates can provide the baseline reference for subsequent project monitoring and control. Progress of individual activities and the achievement of milestone completions can be compared with the project schedule, to monitor the progress of activities. Contract and job specifications provide the criteria by which to assess and assure the required quality of construction.

The final or detailed cost estimate provides a baseline for the assessment of financial performance during the project. To the extent that costs are within the detailed cost estimate, then the project is thought to be under financial control.

Overrun in particular cost categories signal the possibility of problems and give an indication of exactly what problems are being encountered. Expense oriented construction planning and control focuses upon the categories included in the final cost estimation. Apart from the work plan and schedule for time management, contractors are required to show their budgetary forecast (cash flow diagram) indicating the gross and net cash requirements of projects.

Often projects are observed running into difficulties from short of cash flow. Projects by nature require to be financed from other financing securities especially during the early phases of the construction period until they reach a stage of self-financing date. Hence for successful performance of projects, one has to prepare a cash flow diagram and monitor progress during the contract period.

Contract budgets may be presented in graphical or tabular form. Graphical presentations highlight the relationship between budget and actual performance. The budget prepared is compared at weekly or monthly intervals with the actual performance achieved. This enables discrepancies to be assessed and management investigation and action implemented where adverse trends are evident. It can be concluded that project cost is the amount of money that is required to complete all project activities.

There are some measures which are found from the researchers' study to control the construction costs or to overcome the problems of cost overrun. The researchers have their own opinion on how to solve the problems, Kaliba et. al. (2009).

The measures are presented as below;

- **Proper Project Costing and Financing:** Kaliba et. al. (2009), stated that delays of schedule may occur because of delayed in payments due to complex financial processes in client organizations. Delay in payment would cause financial difficulties to contractors and subsequently delay the schedule to complete the activities on site. Interest could be charged on delayed payments hence inducing cost overrun in the project.
- **Competent Personnel:** Kaliba et. al. (2009), mentioned that contractors, consultants and clients should ensure that they have the right personnel with appropriate qualifications to manage their projects efficiently. It is better if construction manager have experience and qualifications in project or construction management.

- **Appropriate Scope Definition:** Nega (2008), agreed that only concern on the works required completing the project successfully. Guard against incomplete identification of scope is important to avoid frequent changes. Also, do not incorporate the works out of scope to avoid unnecessary works.
- **Proper Cost Control:** Ashworth (1994), mentioned that one of the client's requirements in respect of construction project is assessment of its expected cost. Proper cost control is important as it is the general trend towards greater cost effectiveness and ensures construction costs not solely in the context of initial costs, but in terms of life cycle costs or total cost appraisal.
- **Risk Management during Project Execution:** Peeters and Madauss (2008), found out some approach to avoid cost overrun. In any development project, there must be certain amount of risks. Therefore, a risk management function needed to be performed by project manager to determine and reduce the risks of the particular project. The aim of risk management is to minimize any risk that might result failure to meet the project requirements.
- **Appropriate Contractual Framework:** Peeters and Madauss (2008), has supported that once the objective of cost has been estimated, it is followed by choosing an appropriate contract model where there are techniques to make a relationship between the initial estimate and final price.
- **Increase Supply of Materials:** Frimpong et. al. (2003), found that there should be prepared adequate allowance for any emergency case in order to cover increasing in material cost due to inflation.

- **Realistic Cost Estimation:** The initial cost estimates should be as accurate as possible. Accuracy of cost estimation allows clients to check and determine the required funds for executing the project and made available when required, Kaliba et. al. (2009).
- **Efficient Management:** Gould (2002), stated that efficient management is important to produce a productive and cost efficient site. Scope may be changed due to inadequate planning and feasibility studies. In order to control the project effectively, the project manager must follow up the schedule to avoid additional costs and ensure the project can be occupied on time as planned.

Ismael Ibrahim (1996), the effectiveness of control depends on the accuracy of the original estimate done during planning stage. Cost control requires a detailed analysis of the project cost by splitting the project cost into direct cost, indirect cost and overhead cost and further into labor, material and equipment cost. Thus requires proper coding system and extensive data collection.

Managing construction cost is one of the important tasks in achieving successful project completion. Unfortunately it is very seldom achieving effective cost management and often experiencing significant amount of cost overrun. Based on a previous study, the respondents classified each measure based on three approaches of implementation strategies as proactive, reactive and organizational strategy, Olawale and Sun (2010).

Measures in Pro-active (Pro) strategy are the measures that must be adopted in the planning stage of project to predict and prevent from the cost overrun issues. Measures in Re-active (Re) strategy are the measures which can be adopted to mitigate the effect of inhibiting factors in project control as a remedy.

While measures in Organizational (Org) strategies are the measures which are normally in place because of the company's belief, orientation, management style or philosophy; they have a tendency of not being specific to one project but would normally affect all projects. Also some of the measures are fluid which can be classified in more than one strategy.

The results from interviews were analyzed and presented as follows;

Mitigation Measure to Improve Cost Performance

- Effective strategic planning
- Proper project planning and scheduling
- Effective site management
- Frequent progress meeting
- Proper emphasis on past experience
- Use of experience of subcontractors and suppliers
- Use of appropriate construction method
- Use up to date technology
- Clear information and communication channels
- Frequent coordination between the parties
- Perform a preconstruction planning of project tasks and resources needs
- Developing human resources in the construction industry

- Comprehensive contract administration
- Systematic control mechanism
- Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors

In order to achieve efficient and effective cost performance in construction project, owners are suggested to incorporate the mentioned measures as compulsory practices, and project managers are suggested to adopt particular measures to implement at planning stage to avoid the hindrances during project execution and achieve effective cost control assuring the completion of project within budgeted cost.

CHAPTER THREE

Research Methodology

3.1 Research design

The key task in research is to design research process so that the information obtained permits the assessment of their impact. The basic research design selected is an exploratory research methodology using both primary and secondary data. It is applied and exploratory because the research was initiated from practical problems and finds whether there exists time and cost overruns or not.

It is also descriptive and correlational because it tried to describe the actual rate of time and cost overruns and the variables of time and cost overruns and tries to draw relationship between contract document and rate of time and cost overruns in the DCE construction projects. This design is chosen, since it enables to assess the magnitude and scope of problems and facilitate for the suggestion of solutions. Generally, the research process is designed through defining the research problems, its objectives and questions.

Kumar, (1999), considers research as a process of collecting, analyzing and interpreting information to provide solutions to questions. For the purpose of this thesis, research is defined as a practical investigation or exploration to find out new facts or assemble old facts by scientific ways for the purpose of developing existing theory or its application for real problems.

To accomplish these objectives the research is made using the following methodologies.

- Desk study of literature review of different books, master's thesis, web sites of similar cases and sample project reports.

- Survey study: by collecting information and data through questionnaire and case studies.
- Data sources: Study population (DCE employees).
- Research instruments and data collection: Questionnaire and Archival records.
- Data Analysis: Quantitative and Qualitative Analysis.

Archival documents were mostly from completed projects, in which contract documents, project reports, correspondence letters and payment certificates were investigated thoroughly which were very important in identifying the recurrent problems.

Overall, the following procedures are conducted and followed throughout the thesis writing.

- Thesis proposal is developed, after background study
- Variables are identified through literature review
- Questionnaire are developed and distributed
- Questionnaire responses are collected from respondents
- The collected data are analyzed, discussed and findings are taken out

3.2 Sample and sampling techniques

Sampling design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt to select units for the sample. It will also indicate the number of units to be included in the sample also known as Sample size. The first step in developing any sampling design is to clearly define the aggregate of sampling units, namely the population.

The sampling unit must be identified before selection of a sample. A sampling unit may be a natural geographical unit such as a state, a district, a village, a constructed unit, or it may be a social entity such as a family or a school. It may also be an individual. Accordingly for this project study,

- The sample unit is a public enterprise which is called DCE.
- The population is DCE employees as a whole; and the population size is 1417 permanent and contract workers in number, as of February, 2016.
- The sample size is determined based on "sample size calculator", and it is needed to be 48 in number, which are 5 general and process managers, 10 team leaders, 15 project managers and 18 experts. I have selected these number of respondents based on the number of mangers present in DCE, but team leaders and experts are representatives just to fulfill the sample size. The basic technique or an instrument used in sampling is purposefully simple randomly selected team leaders and professionals of DCE.

The "sample size calculator" is presented as a public service of creative research systems survey software. It is used to determine how many sample size is needed in order to get results that reflect the target population as precisely as needed.

Before using the sample size calculator, there are two terms that is needed to be known. These are confidence interval and confidence level. The confidence interval (also called margin of error) is the plus-or-minus figure usually reported in newspaper or television opinion poll results.

The confidence level tells us how sure we can be. It is expressed as a percentage and represents how often the true percentage of the population who would pick an answer lies within the confidence interval.

3.3 Source of data and collection

Different types of construction projects, executed by DCE, with their contract and actual completion time and cost are included. This helps to understand how the actual completion time and cost deviates from the contract. Detailed questionnaire is designed for the assessment of cost and time overruns in construction projects. It is distributed to the managers, team leaders and professionals or experts that play dominant role in day to day construction activities.

There are approaches of data collection namely filed work (primary data collection) and deskwork (secondary data collection). In this research both fieldwork and deskwork are used. The literature survey is used to limit question that have been raised in the research. The questionnaire is structured to address time and cost overrun causes, impacts, resolution and responsible parties for causes of time and cost overruns.

Moreover, the questionnaire includes the following areas; General information (profile and experience in construction) of the respondents. In general, the data collected has been used to identify the root causes of time and cost overruns in construction projects, assess the impacts and forward solutions which will be applied by the DCE in mitigation of claims and disputes.

3.4 Data analysis

This deal with the analysis of the information gathered from the desk study and questionnaire survey, and includes identification of rate of occurrences and impacts of time and cost overruns, identification of responsible parties, identification of hypothesized causes and identification and analysis of case study projects.

The projects are recognized and analyzed while processing the questionnaire, and also analysis of the case of selected projects is carried out through document study. Analysis of the experience of respondents is carried out through questionnaire; and the analysis is carried out based on the responses of the participants, giving special attention to causes, impacts and resolutions of overruns.

Discussions are made based on the analysis done on the gathered data to draw conclusions and answering the question of the problem statement of the study. Conclusion is produced from the analysis made in the research and recommendations are given for avoiding and/or administrating time and cost overruns. The research is a practical problem developed from the observation of construction projects and the research questions are oriented to investigate the cause of time and cost overruns, their effects and resolutions.

A questionnaire of 68 questions of causes, 80 questions of responsible parties for the causes, 25 questions of effects and 35 questions of resolutions of time and cost overruns was carefully designed from literatures conducted in construction projects. It was organized in the form of a priority scaling (0 = not significant, 1 = slightly significant, 2 = moderately significant, 3 = very significant and 4 = extremely significant).

The procedure used in analyzing the results aimed at establishing the mean score of the various factors responsible for time and cost overruns. The score for each factor is calculated by summing up scores assigned to it by respondents.

Therefore, the level of importance as indicated by the respondents was used to measure the mean score of each factor. The mean score (MS) for each variable of time and cost overruns is computed by using the following formula;

$$MS = \frac{\Sigma (F \times S)}{N}$$

Where; **S** = score given to each variables by the respondents;

F = frequency of responses to each score for each variable;

N = total number of respondents.

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there is an appropriate method that can be applied and not for others. In this research, ordinal scales were used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement or degrees of influence (0, 1, 2, 3 and 4) do not indicate that the interval between scales is equal, nor do they indicate absolute quantities. They are merely numerical labels.

CHAPTER FOUR

Data Presentation, Analysis and Interpretation

4.1 Preliminary Remarks

This part mainly designed to provide general information about the respondents in terms of gender, relevant work experience, job status, educational qualification and distribution and return of the questionnaire.

Table 4.1 Summary of respondents' gender from the questionnaire survey

Gender	Occurrence	Rate of occurrence (%)
Male	40	83.33
Female	8	16.67
Total	48	100

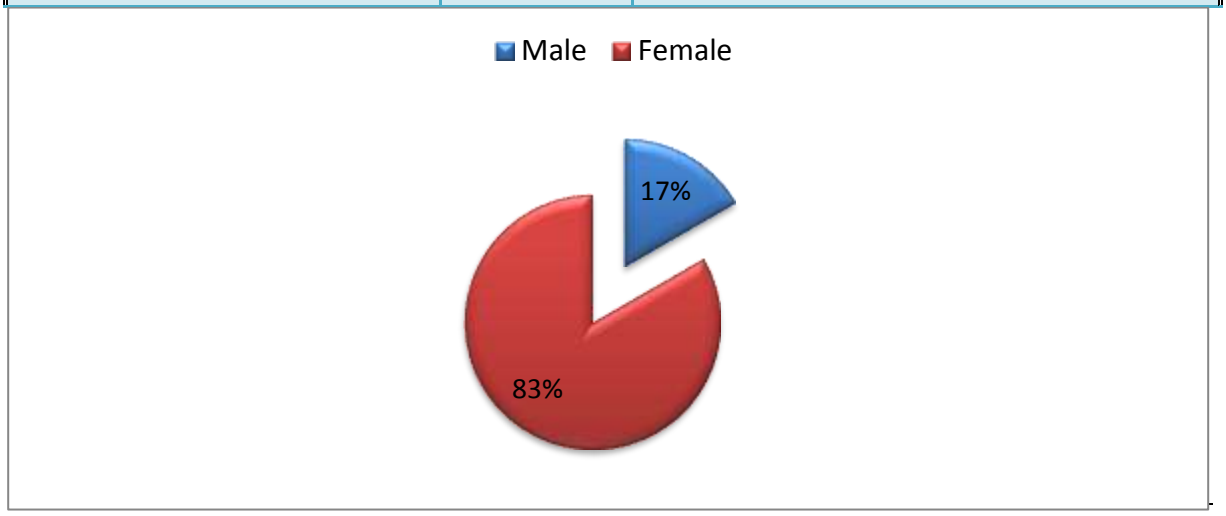


Figure 4.1 Summary of respondents' gender from the questionnaire survey

Figure 4.2 Summary of respondents' job status from the questionnaire survey

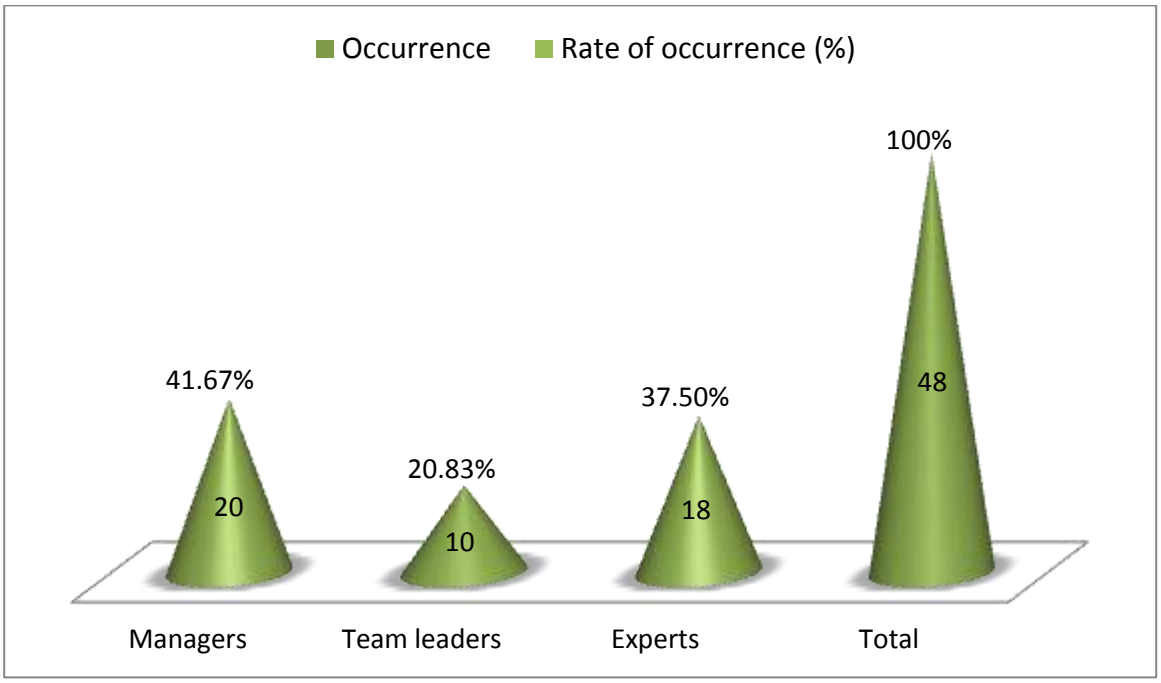


Figure 4.2 shows that 41.67 % (20) of respondents were managers, 20.83 % (10) were team leaders and 37.5 % (18) were experts.

Table 4.2 Summary of respondents' work experience from the questionnaire survey

Experience (years)	Occurrence	Rate of occurrence (%)
Up to 5	16	33.33
5-10	13	27.08
10-15	5	10.42
Above 15	14	29.17
Total	48	100

Table 4.2 shows that 33.33 % (16) of the respondents have experience up to 5 years, 27.08 % (13) of the respondents experience is between 5 to 10 years, 10.42 % (5) of respondents have experience from 10 to 15 years and 29.17 % (14) are with service year of above 15 years .

Figure 4.3 Summary of respondents' educational qualification from the questionnaire survey

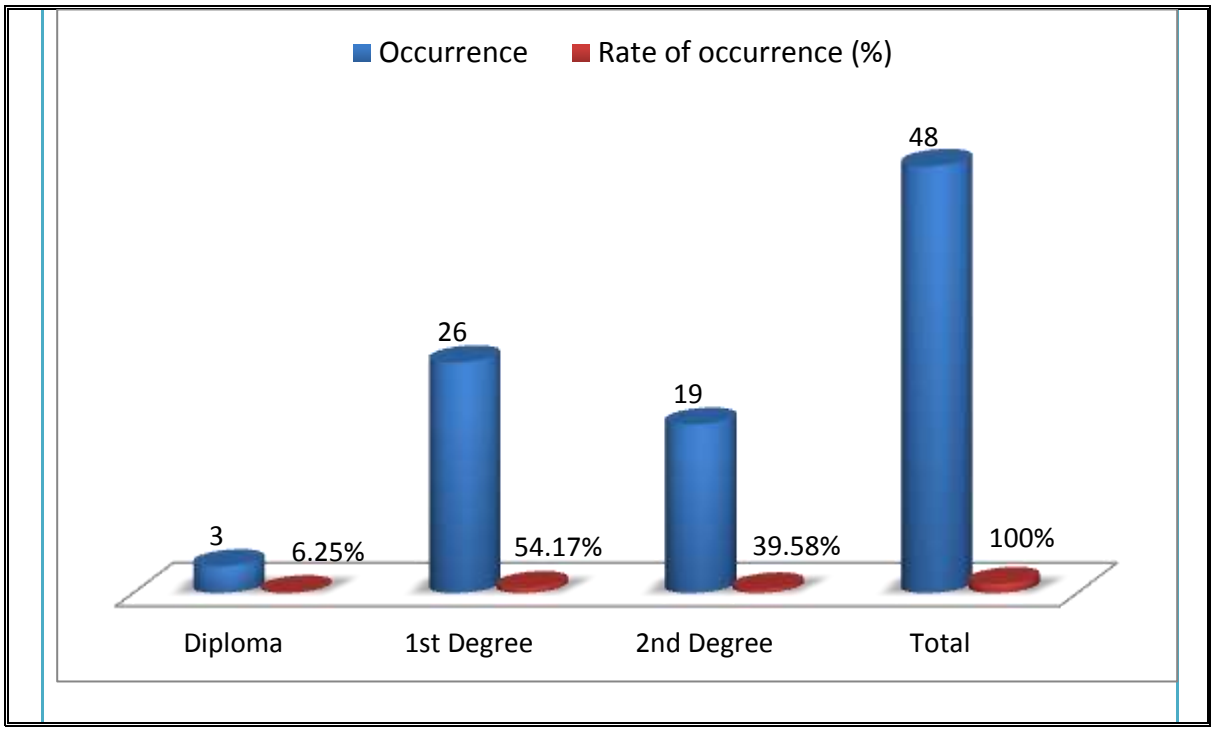
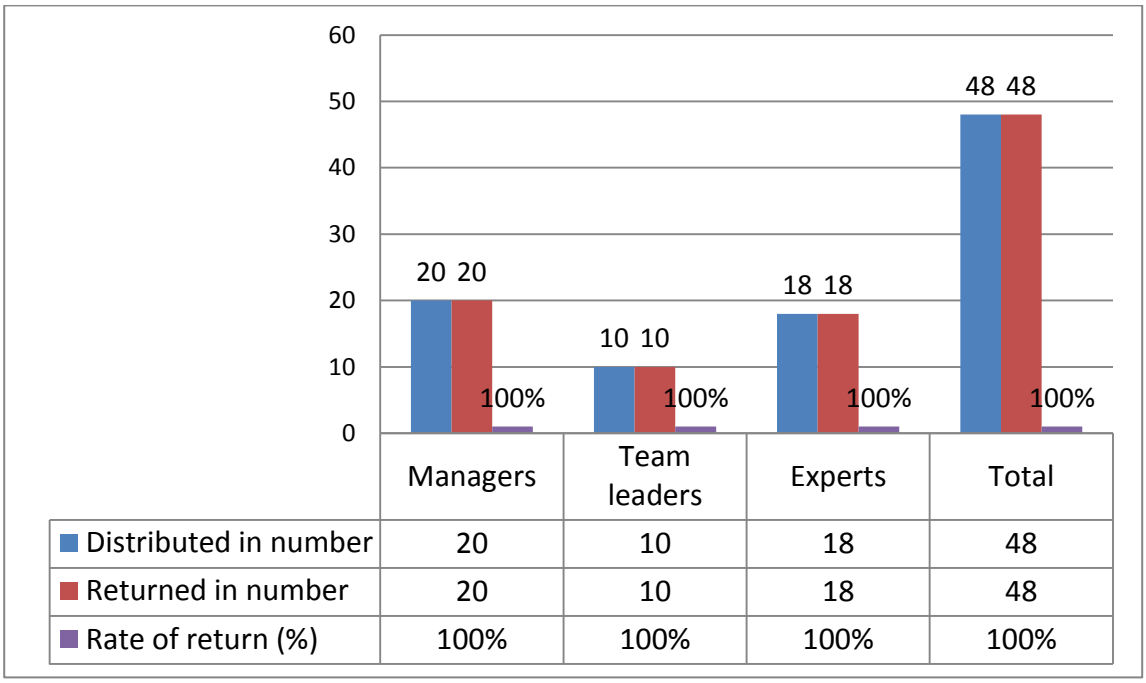


Figure 4.3 shows that 6.25 % (3) of the respondents have diploma, 54.17 % (26) of the respondents' qualification is 1st degree and 39.58 % (19) of respondents have educational background of 2nd degree.

Figure 4.4 Summary of questionnaire responses from the questionnaire survey



	Managers	Team leaders	Experts	Total
Distributed in number	20	10	18	48
Returned in number	20	10	18	48
Rate of return (%)	100%	100%	100%	100%

Figure 4.4 shows the general response rate for respondents is 100 % and the total number of respondents for the four categories was 48 out of 48 respondents. The response rate of managers is 100 % (20 out of 20 respondents), team leaders 100 % (10 out of 10 respondents, 100 % (18 out of 18 respondents) for experts.

4.2 Results of desk study

Before analysis and discussion of the causes of time and cost overruns, the third major question of the statement of the problem i.e. 'what is the trend of projects completion and handover in DCE concerning with time and cost?' has to be answered. During desk study ten construction projects were selected and evaluated their contract and actual completion time. This is also done for cost overrun in the same approach.

The data was collected via reviewing project documents. The rate of time overrun ranges from a minimum of 13% to the maximum of 181% of the contract time; and cost overrun ranges from a minimum of 1% to the maximum of 47% of the contract amount.

Based on the data found in desk study; name of selected projects, contract and actual completion time and cost, rate of time overrun and cost overrun are described as shown in Table 4.3.

Table 4.3 Summary of construction projects data from the desk study

S/no	Name of projects	Contract compl. time (days)	Actual completion time (days)	Contract compl. cost in million (Birr)	Actual completion cost in million (Birr)	Rate of time overrun (%)	Rate of cost overrun (%)
1	Shire Apartment	1040	1279	93.63	98.1	23	5
2	Janmeda Staff college	365	892	42.00	56.39	144	34
3	Mekelle Staff coll.	2180	2454	234.90	345.13	13	47
4	Kality Apartment	1010	1651	85.49	97.37	63	14

S/no	Name of projects	Contract compl. time (days)	Actual completion time (days)	Contract compl. cost in million (Birr)	Actual completion cost in million (Birr)	Rate of time overrun (%)	Rate of cost overrun (%)
5	Harar Apartment	720	1172	123.41	124.68	63	1
6	Awash Arba Apartment	1090	1683	82.55	94.70	54	15
7	Mekele Apartment	1095	1761	176.83	195.81	61	11
8	Agula berhale road	1095	1690	969.92	1279.53	54	32
9	Berhale dallul road	1095	1895	1245.26	1435.1	73	15
10	A/A post office	300	842	14.94	15.9	181	6

4.3 Causes and responsible parties of time and cost overruns

Causes of time and cost overruns are the first major question of the statement of problem, i.e. 'what are the causes of time and cost overruns?' In order to get answer in detail from the respondents this question has been further subdivided into two questions. The first question indicates identification of significance rate of different types of causes and the second question is empathy of the significance rate of causes related to responsible parties.

4.3.1 Causes of time and cost overruns

The causes of time and cost overruns that are included in the literature review are tested with the questionnaire. And hence, after calculation the mean score result of each cause is found out as indicated in the table below. Accordingly, Table 4.4 below indicates the mean score and rank of the top 15 causes of time and cost overruns in DCE construction projects.

Table 4.4 Mean score and rank for causes of time and cost overruns from the questionnaire survey

S/ no.	Causes	MS	Rank
1	Less emphasis to planning	2.92	1
2	Poor contract management	2.88	2
3	Poor pre planning process	2.88	2
4	Lack of timely decisions	2.83	4
5	Changes in design	2.83	4
6	Failure to update schedules on time	2.79	6
7	Long waiting time for approval of drawings and materials sample	2.75	7
8	Incomplete drawings	2.75	7

9	Frequent breakdown of construction plants and equipment	2.75	7
10	Excessive change orders	2.58	10
11	Inadequate early planning of the project	2.58	10
12	Setting unrealistic time schedule	2.58	10
13	Contractual claims, such as extension of time with cost claims	2.58	10
14	Delays in site mobilization	2.54	14
15	Rework due to wrong work	2.54	14

4.3.2 Responsible parties for causes of time and cost overruns

This part consists of discussion and results of responsible parties for the causes of time and cost overruns. These factors include: contractors' responsibility, consultants' responsibility, clients responsibilities and external factors.

After calculation the mean score of each causes from the questionnaire responses, the result is as indicated in the table below. Accordingly, Table 4.5 below indicates the mean score and rank of the main or top causes of time and cost overruns for each responsible party.

Table 4.5 Mean score and rank for causes of time and cost overruns of responsible parties from the questionnaire survey

S/ no.	Causes	MS	Rank
I	**CONTRACTOR**		
1	Frequent breakdown of construction plants and equipment	2.88	1
2	The method of competition in procurement	2.88	1
3	Contractual claims	2.83	3
4	Poor schedule management	2.83	3
5	Poor project management	2.83	3
II	**CONSULTANT**		
1	Long waiting time for approval of drawings and materials samples	3.00	1
2	Fraudulent practices and kickbacks	2.96	2
3	Poor site supervision	2.79	3
4	Excessive change orders	2.71	4
5	Changes in design	2.71	4
6	Lack of timely decisions	2.71	4
III	**CLIENT**		
1	Changes in site locations	2.67	1
2	Additional works	2.46	2
3	Slowness of decision making process	2.46	2
4	Finance and payment arrangements	2.42	4
5	Lack /poor/ of communication and coordination with contractors	2.38	5

IV	EXTERNAL		
1	Escalation of material price	2.33	1
2	Inclement weather	2.25	2
3	Unexpected sub soil conditions	2.21	3
4	Unexpected problem	2.13	4
5	Poor economic conditions (currency, inflation rate and LC.)	2.13	4
6	Fraudulent practices and kickbacks	2.13	4
7	Increase in workmen's wage	2.13	4

4.4 Effects of time and cost overruns

One of the objectives of this study is to evaluate the existing problems associated with construction projects completion time and cost; and hence this part consists of discussion and results of impacts of time and cost.

After calculation the mean score of each impacts, it was found out as indicated in the table below. Accordingly, Table 4.6 below indicates the mean score and rank of the main or top effects of time and cost overruns in construction projects.

Table 4.6 Mean score and rank for effects of time and cost overruns from the questionnaire survey

S/ no.	Effects	MS	Rank
1	The contribution of the construction industry to the growth of national economy of the country will be less	2.75	1
2	Delayed payments to contractor	2.75	1

3	Inability to deliver value for money	2.67	3
4	Negative attitude towards the construction industry by the higher public authority and by the society as a whole	2.58	4
5	Time extension	2.56	5
6	Bad reputation and inability to secure project finance or securing it at higher costs due to added risks	2.54	6
7	Loss of confidence reposed by client	2.54	6
8	Project abandonment and a drop in construction activities	2.54	6
9	Arbitration	2.54	6
10	Litigation	2.54	6

4.5 Resolution of time and cost overruns

The second major question of the statement of the problem is, 'how could the time and cost overruns can be avoided or minimized?' and hence this part consists of discussion and results of resolution of time and cost overruns.

After calculation the mean score of each resolution methods, the result is found out as indicated in the table below. Accordingly, Table 4.7 below indicates the mean score and rank of the main or top 10 resolution methods of time and cost overruns in DCE construction projects.

Table 4.7 Mean score and rank for resolution methods of time and cost overruns from the questionnaire survey

S/ no.	Resolutions	MS	Rank
1	Timely progress control, schedule control, cost control, resource control by comparing with the completion date and cost	3.33	1
2	Assign competent personnel	3.13	2
3	Effective strategic planning	3.00	3
4	Provide knowledge/training/ to unskilled workers based on their scope of work	3.00	3
5	Committed leadership and management	2.96	5
6	Increase the construction productivity	2.96	5
7	Systematic control mechanism	2.92	7
8	Efficient management	2.88	8
9	Proper project planning and scheduling	2.88	8
10	Focus on quality, cost and delivery of the project	2.88	8
11	Increase the expertise and skill of human resources	2.83	11
12	Use of appropriate construction method	2.83	11
13	Use of experience of subcontractors and suppliers	2.83	11
14	Prepare a cash flow diagram and monitor progress during the contract period	2.83	11
15	Avoid poor quality of work, more rectification and double handling	2.79	15

CHAPTER FIVE

Conclusion and recommendation

5.1 Conclusion

Based on the results of the analysis of desk study and respondents' responses of the questionnaire the following conclusions are drawn.

1. Ten out of ten (100%), projects investigated in the research suffered with time and cost overruns in their execution and completion. For these construction projects, the actual time overruns ranges from 13% to 181% of the contract completion time and the cost overrun ranges from 1% to 47% of the contract completion cost.

2. The first major question of the statement problem was to identify causes of time and cost overruns in construction projects of DCE. After analysis, less emphasis to planning (MS: 2.92), poor contract management (MS: 2.88) and Poor pre planning process (MS: 2.88) has been ranked in the first, second and third position as the causes of time and cost overruns.

3. MS analysis and result indicated that, frequent breakdown of construction plants and equipment (MS: 2.88), the method of competition in procurement (MS: 2.88) and contractual claims (MS: 2.83) has been ranked in the first, second and third position as contractors responsibility; and in the same manner long waiting time for approval of drawings and materials samples (MS: 3.00), fraudulent practices and kickbacks (MS: 2.96) and poor site supervision (MS: 2.79) are consultants' responsibility.

Similarly changes in site locations (MS: 2.67), additional works (MS: 2.46) and slowness of decision making process (MS: 2.46) are clients responsibility; and escalation of material price (MS: 2.33), inclement weather (MS: 2.25) and unexpected subsoil conditions (MS: 2.13) are external causes of time and cost overruns.

4. One of the specific objectives was to identify the effect of time and cost overruns in construction projects of DCE. There are many effects of time and cost overruns to stakeholders in the construction industry. But, during analysis MS results indicated that the contribution of the construction industry to the growth of national economy of the country will be less (MS: 2.75), delayed payments to contractor (MS: 2.75) and inability to deliver value for money (MS: 2.67) has been ranked in the first, second and third position as effects of time and cost overruns.

5. The second major question of the problem statement was to forward the resolution methods to minimize or avoid time and cost overruns in DCE construction projects. And hence, during analysis MS results indicated that timely progress control, schedule control, cost control, resource control by comparing with the completion date and cost (MS: 3.33), assign competent personnel (MS: 3.13) and effective strategic planning (MS: 3.00) has been ranked in the first, second and third position as resolution methods of time and cost overruns.

5.2 Recommendation

The following points are suggested to DCE in order to control, minimize and avoid time and cost overruns in construction projects.

1. DCE ought to assign competent and complete administrative and technical staff as soon as project is awarded to make arrangements to achieve completion within contract time, cost and with the required quality.
2. DCE had better to use advance payment properly to avoid the financial problems; and it is advised to conduct breakeven analysis from time to time.
3. DCE is guided to use planning and scheduling**,** which are continuing processes during construction and match with the resources and time to develop the work and to avoid time and cost overruns.
4. DCE has to be aware about best construction materials procurement competition, so it is advised to purchase the construction materials at the beginning of work. It is also better to have time schedule for material delivery process to the site in order to avoid shortage or lack of materials.
5. DCE is advised to setup realistic time schedule and preventive and periodic maintenance of plants and equipment.
6. DCE had better monitor the quality of activities continuously and to set the required quality system in the different activities of the project so as to avoid any mistakes that may lead to rework of activities, and finally time and cost overruns.

7. DCE must have committed leadership and management, timely decision process, advanced contract and project management, systematic control mechanism and effective and efficient strategic planning and management.

8. DCE would set up a computerized system to perform documentation process for all the activities in the site, so they would be able to detect performance in the work and to follow the time schedule continuously.

9. DCE need to have appropriate construction method and increase productivity to control or to avoid the greatest rate of time overrun of construction projects.

5.3 Directions for further research

This study investigated causes, effects and resolutions of time and cost overruns of construction projects for DCE and other construction companies. From the study it is clear that there is much scope for further research in the following areas:

- ✓ The impact of interrelationships/causalities/ between two or more factors. Although listed as standalone factor in this research, some factors could be the result of another. For example, 'wrong material take-offs' could be the result of 'design changes'. 'Poor skills levels' could impact on 'site supervision'.
- ✓ The skills level of DCE construction labour and subsequent levels of productivity.
- ✓ The impact of architectural novelty on the design phase duration of projects. These designs posed major challenges regarding constructability which could have had an impact on the number of design changes.
- ✓ The impact of geographical positioning on construction performance.

……THE END……..

REFERENCES

- Abd. Majid, M.Z.A., & Mc Caffer, R. (1998). Factors of non-excusable delays that influence contractors' performance. Journal of Management in Engineering, 14(3), 42-48
- Abudul-Rahman H., Berawi A., Mohamed O., Othman M. and Yahya I., 2006. Delay mitigation in the Malaysian construction industry. Journal of Construction Engineering and Management, Vol. 132, No. 2, pp.125 -133
- Ahmed, S. M. Azhar, S., Kappagantula, P., and Gollapudi, D., 2003. A brief study of the Florida construction industry. Proceeding of the 39th Annual Conference of the Associated Schools of Construction. Clemson, South Carolina: Clemson University. Final report, Miami, F1 33174, USA
- Arditi D, Akan GT, Gurdamar S. Cost overrun in public projects Project Management 1985;3(4):218–24
- Alaghbari, W.M.A., Kadir, M.R.A., Salim, A. & Ernawati, 2007. The significant factors causing delay of building construction projects in Malaysia. Engineering Construction and Architectural Management, 14(2), pp. 192-206
- Al-Khalil, M.I. & Al-Ghafly, M.A. 1999. Important causes of delay in public utility projects in Saudi Arabia. Construction Management and Economics, 17(5), pp. 647-655
- Al-Momani, A.H. 2000. Construction delay: A quantitative analysis. International Journal of Project Management, 18(1), pp. 51-59

- Assaf, S.A., Al-Khalil, M. & Al-Hazmi, M. 1995. Causes of delay in large building construction projects. Journal of Management in Engineering, 11(2), pp. 45-50
- Aibinu A.A and Jagboro G.O., 2002, The effects of construction delays on project delivery in Nigerian construction industry. International Journal of Project Management, Vol. 20, No. 8, pp. 593-599
- Al- Gahtani K. and Mohan S., 2007, Total float management for delay analysis Journal of Cost Engineering, Vol. 49, No. 2, pp. 32-37
- Al- Khalil M. and AL-Ghafly M., 1999, Delay in public utility projects in Saudi Arabia. International Journal of Project Management, Vol.17, No.2, pp.101-106
- Assaf S. and AL-Hejji S., 2006, Causes of delay in large construction projects, International Journal of Project Management, Vol. 24, No. 4, pp. 349-357
- Avots, I. (1983). Cost relevance analysis for overrun control. International Journal of Project Management, 1(3): 142–148
- Construction method and planning first edition [J. Rilling Worth]
- Chan Albert P.C., 2001, Time cost relationship of public sector projects in Malaysia
- Choudhury I., and Phatak O., 2004, Correlates of time overrun in commercial construction, ASC proceeding of 4th Annual Conference, Brigham Young University- provo-Utah, April 8-10. Creative research systems, 2001, www.cdb.riken.jp
- Choudhury I., & Rajan S.S., (2003), Time-cost relationship for residential construction in Texas, Construction Informatics Digital Library http://itc.scix.net/ paper w78-2003-73

- Chan, D. W. M. and Kumaraswamy, M. M. (1997) A comparative study of causes of time overrun
- Chan P., Ho. D., Tam C. (2001) Design and build project success
- Chimwaso, K.D., 2001, An Evaluation of cost performance of public projects; case of Botswana. Department of Architecture and Building Services, Private Bag 0025, Gaborone, Botswana
- Clough, R. H., Sears, G. A., and Sears, S. K. (2000). Construction Project Management 4th edition
- Degoff, R. A., and Friedman H. A. (1999). Construction Management, Basic Principle for Architects, Engineers and Owners. A Wiley Series in Construction Management and Engineering
- Duncan, J.M (1990) in Xiao, H., and Proverbs, D. (2002b). The Performance of Contractors in Japan
- Dlakwa MM, Culpin MF. Reasons for overruns in public sector construction projects in Nigeria. International Journal of Project Management 1990;8(4):2 37–41
- Doctrinal thesis [Wubishet Jakele dr. ing.2004]
- Fetene Nega, F., 2008. Causes and Effects of Cost Overrun on Public Building Construction Projects
- Faridi, A.S. & El-Sayegh, S.M. 2006. Significant factors causing delay in the UAE construction industry. Construction Management and Economics, 24(11), pp. 1167-1176

- Flyvbjerg, B., Bruzelius, N. & Rothengatter, W. 2003. Megaprojects and risk: An anatomy of ambition. Cambridge: Cambridge University Press
- Frimpong, Y., Oluwoye, J & Crawford, L. 2003. Causes of delay and cost overrun in construction of groundwater projects in developing countries; Ghana as the case study. International Journal of Project Management, 21(5), pp. 321-326
- Hinze, J., Selstead, G. A. (1991) Analysis of WSDOT Construction Cost Overrun. Washington State Department of Transportation, Report No WA-RD 218.1, Olympia, WA. 236
- Jahren, C. T. & Ashe, A. M., 1990. Predictors of cost overrun rates. Journal of Construction Engineering and Management, 116(3), pp. 548-552
- Jackson. J., 1999, Facility construction cost overrun: Analysis for Navy construction contracts. A Report for CE675-civil Engineering Department, North Carolina state university, Raleigh, N.C.
- Jonathan Jingsheng Shi, S. O. Cheung, and David Arditi; Journal of Construction Engineering and Management, pp. 60-65, 2001.
- Jackson, S. (2002). Project cost overrun and risk management. In Proceedings of Association of Researchers in Construction Management 18th Annual ARCOM Conference, Newcastle, Northumber University, UK (pp. 2–4)
- Kumaraswamy, M. M. & Chan, D. W. M. (1995). Determinants of construction duration. Construction Management and Economics, 13, page 209-217

- Kaming, P.F., Olomolaiye, P.O., Holt, G.D. & Harris, F.C. 1997. Factors influencing construction time and cost overruns on high rise projects in Indonesia. Construction Management Economics, 15(1), pp. 83-94
- Kumaraswamy, M.M. & Chan, D.W.M. 1998. Contributors to construction delays. Construction Management and Economics, 16(1), pp. 17-29
- Kerzner, H. (2003) Project Management, A Systems Approach to Planning, Scheduling and Controlling. John Wiley and Sons Inc., New Jersey
- Koushki, P.A, AL-Rashid, Khalid and Kartam, Nabil., 2005, Delays and cost increases in the construction of private residential projects in Kuwait, Journal of Construction Management and Economics. Vol. 23, No.3, pp. 285-294
- Kaming Peter, Olomolaiye Paul, Holt Gary, and Harris Frank C., 1997, Factors influencing construction time and cost overruns on high-rise projects in Indonesia, Journal of Construction Management and Economic. Vol. 15, No.1, pp. 83-94
- Lester, A. (2000) Project Planning and Control. Butterworth Heinemann, Oxford
- Ling, F. (2004) how project managers can better control the performance of design build projects. International Journal of Project Management, 22 (6), 477-488
- Lo. T. Y., Fung, I. W. H., Tung, K. C. F. (2006) Construction Delays in Hong Kong Civil Engineering Projects. Journal of Construction Engineering and Management, Vol. 132, No. 6, 636-649
- Managing construction projects (M.Sc. thesis) [Ismael Ibrahim 1996]

- Mansfield NR, Ugwu OO, Doran T. Causes of delay and cost overrun in Nigeria construction projects. International Journal of Project Management 1994; 12(4):2 54–60
- Mezher, T.C. and Tawil, W., 1998, Causes of delay in the construction industry in Lebanon, Engineering Construction and Architectural Management, Vol. 5, No.3, pp. 252-260
- Morris, P.W.G. & Hough, G.H. 1987. The anatomy of major projects: A study of the reality of project management. Chichester, England: John Wiley & Sons
- Morris S., 1990, Cost and time overruns in public sector projects. Economic and Political weekly, Nov.24,1990, Vol. xxv, No.47, PP. M 154 to M 168
- Manavazhia MR, Adhikarib DK. (2002) Material and Equipment Procurement Delays in Highway Projects in Nepal. International Journal Project Management; 20: 27-32
- Ministry of Work and Urban Development (MoWUD). (2006). Urban development policy. Addis Ababa
- Nicholas, J. (2001) Project Management for Business and Technology. Prentice Hall, New Jersey
- Olawale, Y. A., & Sun, M. (2010). Cost and time control of construction projects: inhibiting factors and mitigating measures in practice. Construction Management and Economics, 28(5), 509–526
- Olomolaiye, G.D. Holt and F.C. Harris, 1997. Factors influencing construction time and cost overruns on high-rise projects in Indonesia

- Odeck, J. (2004) Cost Overrun in Road Construction. What are their Sizes and Determinants? Transport Policy, 11, 43-53.
- Ogunlana SO, Promkuntong K, Vithool J. Construction delays in a fast growing economy: comparing Thailand with other economies. International Journal of Project Management 1996; 14(1):37–45
- Okpala DC, Aniekwu AC. Causes of high costs of construction in Nigeria. Journal of Management in Engineering, ASCE 1988; 114:233–44
- Principle of management [Pa. Melas, Liews Stenge H., Goodman Patricia, Fanest]
- (PMBOK® Guide) (3rd ed.). Newtown Square, PA, USA: Project Management Institute (PMI)
- Ritz, G. J. (1994).Total Construction Project Management. McGraww-Hill, Printed in Sinagapore
- S. Shanmugapriya (2013) Investigation of Significant Factors Influencing Time and Cost Overruns in Indian Construction Projects, International Journal of emerging
- Sambasivan, M. & Soon, Y.W. 2007. Causes and effects of delays in Malaysian construction industry. International Journal of Project Management, 25(5), pp. 517-526
- Trigunarsyah, B. (2004). Constructability practices among construction contractors in Indonesia. Journal of Construction Engineering and Management, 130(5), 656-665
- T. Subramani, P. S. Sruthi, M. Kavitha (2014), Causes of Cost Overrun in Construction, IOSR Journal of Engineering (IOSRJEN), 06(04), pp.01-07

- Theodore J. Trauner Jr. et al. (2009). Types of Construction Delays. Construction Delays (Second Edition), 2009, Pages 25-36
- Walker, D.H.T. 1995. An investigation into construction time performance. Construction Management and Economics, 13(3), pp. 263-274
- Yogeswaran, K., Kumaraswamy, M. M., & Miller, D. R. A. (1998). Claims for extensions of time in civil engineering projects. Construction Management and Economics, 16(3), 283–293
- Zhu. K. and Lin.L. 2004, A stage by stage factor control frame work for cost estimation of construction projects, Owners Driving Innovation International Conference. http:/ flybjerg. Plan.aau.dk / Japaas Published ED. pdf

APPENDICES

A) QUESTIONNARE

Questionnaire for data collection

Dear respondents,

I am studying Master's degree program of Business Administration (MBA), specialization in Operation Management; which is conducted by Indira Gandhi National Open University (IGNOU) integrated with St. Mary's University (SMU).

The main purpose of this questionnaire survey is to collect information on "assessment of time and cost overruns in construction projects" (case study at Defense Construction Enterprise). You / DCE employees / are asked to answer the questions in the questionnaire based on your personal knowledge and experience regarding the research title in DCE construction projects.

The questionnaire has four sections. The first section (Section A) consists of questions aimed at collecting General information (profile and experience in construction) of the respondents.

The second section (Section B) is aimed at finding out the causes of time and cost overruns and responsible parties. The third section (Section C) is focused on the impacts or effects of time and cost overruns. The fourth section (Section D) is aimed to collect information on the resolution methods of time and cost overruns.

Hence, I request you kindly to fill up this questionnaire which will be of immense help in my study. I assure you that, this study is solely intended for academic purposes and confidentiality of your response is guaranteed.

Please take a look at the required information and try to answer correctly and accurately, as many project information as possible. Please provide information as soon as you can, as timely reply is very crucial for the analysis.

Finally, Thank you very much for your kind cooperation and time required information.

QUESTIONS

SECTION – A (General Information)

Q.1 Name of Respondent (optional) ----------

Q.2 Gender

☐ Male ☐ Female

Q.3 Job status

☐ Manager ☐ Team leader ☐ Expert ☐ Others, -----

Q.4 Relevant work experience (Years)

☐ Up to 5 ☐ 5 - 10 ☐ 10 – 15 ☐ Above 15

Q.5 Educational qualification

☐ Diploma ☐ 1st Degree ☐ 2nd Degree ☐ PHD

Please indicate the significance rate of each factor by ticking the appropriate box. Add any remark relating to each factor on the last column.

E.S. = extremely significant (**4**)

V.S. = very significant (**3**)

M.S. = moderately significant (**2**)

S.S. = slightly significant (**1**)

N.S. = not significant (**0**)

SECTION B: Q.6 CAUSES OF TIME and COST OVERRUNS OF CONSTRUCTION PROJECTS IN DEFENCE CONSTRUCTION ENTERPRISE

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Unexpected problems						
Changes in design						
Delayed approval of payment by consultant						
Delayed disbursing of payments to the contractor by client						
Less emphasis to planning						
Client initiated variations						
Setting unrealistic time schedule						
Failure to update schedules on time						
Poor skills, experience and labour productivity						
Shortage of materials in site						
Inaccuracy of material estimate						
Skilled labour shortage						
Long waiting time for approval of drawings and materials sample						
Poor contract management						
Changes in site conditions						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Poor site management and supervision						
Mistakes and discrepancies in design documents						
Inclement weather						
The ability of the organization to manage risk						
Ineffective resource coordination						
Inadequate early planning of the project						
Increases in workmen's wage						
Deficiencies in cost estimate and preparation						
Deficiencies in Engineer’s cost estimate preparation						
Unexpected sub soil conditions						
The degree of project complexity						
Finance and payment arrangements						
Changes in laws, regulations and taxes						
Additional work						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Mistakes and discrepancies in contract documents						
Constructions mistakes and defective works						
Changes in owner's belief						
Shortening of contract period						
Fraudulent practices and kickbacks						
Incomplete drawings						
Poor pre planning process						
Lack of timely decisions						
Excessive change orders						
Poor project management						
Changes in exchange rate						
Inappropriate sub-contractors						
Force majeure						
The size of the project						
The difference between lowest bid and engineer’s cost estimate						
The type of project delivery method						
Delays in site mobilization						
Wrong /inappropriate/ choice of site						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
The method of competition in procurement						
The nature of interpersonal relations in the project						
Cost increase due to environmental restrictions						
High transportation cost						
Changes in material specification						
Escalation of material price						
Frequent breakdown of construction plants and equipment						
Poor schedule management						
Rework due to wrong work						
Problems in land acquisition						
Incomplete design at the time of tender						
Poor qualification of technical staffs						
Contractual claims, such as extension of time with cost claims						
Lack of experience						
Change in the scope of the project						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Delay in providing services from utilities (such as water, electricity and etc.)						
Technical incompetence and poor organizational structure						
Inadequacy of foreign collaboration agreements and monopoly of technology						
Delay in obtaining permits from municipality						
Lack of labour, materials, equipment and tools in the market						
Poor economic conditions (currency, inflation rate, LC and etc.)						

Responsible parties for causes of time and cost overruns

I) Contractor

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Less emphasis to planning						
Setting unrealistic time schedule						
Failure to update schedules on time						
Poor skills, experience and labour productivity						
Shortage of materials in site						
Inaccuracy of material estimate						
Poor site management and supervision						
Skilled labour shortage						
The ability of the organization to manage risk						
Ineffective resource coordination						
Poor qualification of the technical staffs						
Inadequate early planning of the project						
Deficiencies in cost estimation and preparation						
Finance and payment arrangements						
Poor contract management						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Constructions mistakes and defective works						
Fraudulent practices and kickbacks						
Poor pre planning process						
Lack of timely decisions						
Poor project management						
Inappropriate sub-contractors						
The nature of interpersonal relations in the project						
High transportation cost						
Poor schedule management						
Delays in site mobilization						
Frequent breakdown of construction plants and equipment						
Contractual claims						
Rework due to wrong work						
Technical incompetence and poor organizational structure						
The method of competition in procurement						

II) Consultant

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Changes in design						
Delayed approval of payments						
Failure to approve updated schedules on time						
Long waiting time for approval of drawings and materials samples						
Poor site supervision						
Mistakes and discrepancies in design documents						
Lack of timely decisions						
The ability of the organization to manage risk						
Deficiencies in Engineer's cost estimate preparation						
Poor contract management						
Mistakes and discrepancies in contract documents						
Fraudulent practices and kickbacks						
Incomplete drawings						
Excessive change orders						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
The difference between lowest bid and engineer's cost estimate						
The method of competition in tendering						
The nature of interpersonal relations, communication and coordination in the project						
Changes in material specification						
Incomplete design at the time of tender						
Absence of staff in site						
Change in the scope of the project						
Lack / inadequate/ of technical experience						
Wrong /inappropriate/ choice of site						
Technical incompetence and poor organization structure						
Contractual claims such as, extension of time with cost.						

III) Client

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Delayed disbursing of payments						
Initiation of variations						
Slowness of decision making process						
Finance and payment arrangements						
Additional works						
Shortening of contract period						
Fraudulent practices and kickbacks						
Poor contract management						
Changes in site locations						
Lack /poor/ of communication and coordination with contractors						

IV) External

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Unexpected problems						
Inclement weather						
Increases in workmen's wage						
Unexpected sub soil conditions						
Changes in exchange rate						

CAUSES	N.S	S.S	M.S	V.S	E.S	Remark
Escalation of material price						
Fraudulent practices and kickbacks						
Inadequacy of foreign collaboration agreements and monopoly of technology						
Delay in obtaining permits from municipality						
Force majeure						
Lack of labour, materials, equipment and tools in the market						
Poor economic conditions (currency, inflation rate, LC and etc.)						
Changes in laws, regulations and taxes.						
High transport cost.						
Delay in providing services from utilities (such as water, electricity and etc.)						

SECTION C: Q.7 IMPACTS OF TIME and COST OVERRUNS OF CONSTRUCTION PROJECTS IN DEFENCE CONSTRUCTION ENTERPRISE

IMPACTS	N.S	S.S	M.S	V.S	E.S	Remark
Dissatisfaction by project owners and consequently by end users						
Poor quality workmanship						
Creates skeptical outlook on appraisal of other new construction projects						
Discourage investment, the investment on project construction by public clients will be less, hence the number of projects will decrease in the future						
Weakens the growth of the construction industry by eroding mutual trust						
High cost of supervision and contract administration for consultant						
Loss of confidence reposed by client						
Supplementary agreement						

IMPACTS	N.S	S.S	M.S	V.S	E.S	Remark
Additional cost						
Inability to deliver value for money						
The contractor will suffer from budget short fall of the client						
Negative attitude towards the construction industry by the higher public authority and by the society as a whole						
The contribution of the construction industry to the growth of national economy of the country will be less						
Delayed payments to contractor						
Added costs are passed on the user as higher rental/lease/ costs						
Lead to adversarial relationship among project participants						
Bad reputation and inability to secure project finance or securing it at higher costs due to added risks						
Project abandonment and a drop in construction activities						

IMPACTS	N.S	S.S	M.S	V.S	E.S	Remark
Loss of profit for non-completion to the contractor						
Loss of Users' benefit that will be obtained if it has been completed on time						
Liquidated damage						
Time extension						
Dispute						
Arbitration						
Litigation						

SECTION D: Q.8 RESOLUTION METHODS OF TIME and COST OVERRUNS OF CONSTRUCTION PROJECTS IN DCE

RESOLUTIONS	N.S	S.S	M.S	V.S	E.S	Remark
Provide knowledge/training/ to unskilled workers based on their scope of work						
Focus on client's need						
Prepare a cash flow diagram and monitor progress during the contract period						
Compare the budget prepared at weekly or monthly intervals with the actual performance achieved						
Conducted site meetings more frequently						
Systematic control mechanism						
Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of sub - contractors						
Use up to date technology						
Increase supply of materials						

RESOLUTIONS	N.S	S.S	M.S	V.S	E.S	Remark
Appropriate contractual framework						
Use of experience of subcontractors and suppliers						
Timely changing or cancellation of purchase orders						
Use of appropriate construction method						
Timely and reasonable procurement						
Realistic cost estimation						
Effective strategic planning						
Efficient management						
Fully utilization of the construction team						
Appropriate scope definition						
Proper project planning and scheduling						
Measure performance against other projects						
Protection of uncompleted work						
Close monitoring						
Assign Competent personnel						

RESOLUTIONS	N.S	S.S	M.S	V.S	E.S	Remark
Increase the expertise and skill of human resources						
Risk management during project execution						
Focus on the quality, cost and delivery of the project						
Adoption of tools and techniques i.e. Value Management, Total Quality, Management and Business Process Reengineering.						
Hire skilled workers to achieve good progress						
Training and development of all participant to support delivery process						
Avoid poor quality of work, more rectification and double handling						
Timely progress control, schedule control, cost control, resource control by comparing with the completion date and cost						

RESOLUTIONS	N.S	S.S	M.S	V.S	E.S	Remark
Send clear and complete message to workers to ensure effective communication						
Committed leadership and management						
Increase the construction productivity						

B) SUMMARY OF MEAN SCORE AND RANK

Causes of time and cost overruns of construction projects in DCE

CAUSES	MS	Rank
Unexpected problems	2.08	48
Changes in design	**2.83**	**4**
Delayed approval of payment by consultant	2.33	25
Delayed disbursing of payments to the contractor by client	2.42	19
Less emphasis to planning	**2.92**	**1**
Client initiated variations	2.33	25
Setting unrealistic time schedule	**2.58**	**10**
Failure to update schedules on time	**2.79**	**6**
Poor skills, experience and labour productivity	2.38	23
Shortage of materials in site	2.21	35
Inaccuracy of material estimate	2.33	25
Skilled labour shortage	2.25	32
Long waiting time for approval of drawings and materials sample	**2.75**	**7**
Poor contract management	**2.88**	**2**
Poor site management and supervision	2.42	19
Mistakes and discrepancies in design documents	2.21	35
Inclement weather	1.67	65
The ability of the organization to manage risk	2.38	23

CAUSES	MS	Rank
Ineffective resource coordination	2.33	25
Inadequate early planning of the project	**2.58**	**10**
Increases in workmen's wage	1.75	62
Deficiencies in cost estimate and preparation	2.13	44
Deficiencies in Engineer's cost estimate preparation	2.29	30
Unexpected sub soil conditions	2.17	40
The degree of project complexity	1.88	57
Finance and payment arrangements	1.75	63
Changes in laws, regulations and taxes	2.17	40
Additional work	2.08	48
Mistakes and discrepancies in contract documents	2.29	30
Constructions mistakes and defective works	2.21	35
Changes in owner's belief	1.79	61
Shortening of contract period	2.04	52
Fraudulent practices and kickbacks	2.13	44
Incomplete drawings	**2.75**	**7**
Poor pre planning process	**2.88**	**2**
Lack of timely decisions	**2.83**	**4**
Excessive change orders	**2.58**	**10**
Poor project management	2.25	32
Changes in exchange rate	2.00	54

CAUSES	MS	Rank
Inappropriate sub-contractors	2.25	32
Force majeure	1.83	60
The size of the project	1.88	57
The difference between lowest bid and engineer's cost estimate	2.08	48
The type of project delivery method	2.21	35
Delays in site mobilization	**2.54**	**14**
The method of competition in procurement	2.33	25
The nature of interpersonal relations in the project	1.67	65
Cost increase due to environmental restrictions	2.04	52
High transportation cost	2.13	44
Changes in material specification	2.50	16
Escalation of material price	2.42	19
Frequent breakdown of construction plants and equipment	**2.75**	**7**
Poor schedule management	2.13	44
Rework due to wrong work	**2.54**	**14**
Problems in land acquisition	2.17	40
Incomplete design at the time of tender	2.50	16
Poor qualification of technical staffs	2.42	19
Contractual claims, such as extension of time with cost claims	**2.58**	**10**
Lack of experience	2.50	16
Change in the scope of the project	2.21	35

CAUSES	MS	Rank
Delay in providing services from utilities (such as water, electricity and etc.)	2.08	48
Changes in site conditions	1.67	65
Wrong /inappropriate/ choice of site	1.71	64
Technical incompetence and poor organizational structure	1.92	55
Inadequacy of foreign collaboration agreements and monopoly of technology	1.88	57
Delay in obtaining permits from municipality	1.46	68
Lack of labour, materials, equipment and tools in the market	1.90	56
Poor economic conditions (currency, inflation rate and LC.)	2.17	40

Responsible parties for the causes of time and cost overruns

I) Contractor

CAUSES	MS	Rank
Less emphasis to planning	2.71	8
Setting unrealistic time schedule	2.44	19
Failure to update schedules on time	2.63	11
Poor skills, experience and labour productivity	2.58	13
Shortage of materials in site	2.00	28
Inaccuracy of material estimate	2.25	26
Poor site management and supervision	2.58	13
Skilled labour shortage	2.38	20
The ability of the organization to manage risk	2.33	22
Ineffective resource coordination	2.50	15
Poor qualification of the technical staffs	2.29	24
Inadequate early planning of the project	2.63	11
Deficiencies in cost estimation and preparation	2.15	27
Finance and payment arrangements	2.33	22
Poor contract management	2.67	9
Constructions mistakes and defective works	2.38	20
Fraudulent practices and kickbacks	2.29	24
Poor pre planning process	2.50	15

CAUSES	MS	Rank
Lack of timely decisions	2.75	6
Poor project management	**2.83**	**3**
Inappropriate sub-contractors	2.44	18
The nature of interpersonal relations in the project	1.98	29
High transportation cost	1.90	30
Poor schedule management	**2.83**	**3**
Delays in site mobilization	2.50	15
Frequent breakdown of construction plants and equipment	**2.88**	**1**
Contractual claims	**2.83**	**3**
Rework due to wrong work	2.75	6
Technical incompetence and poor organizational structure	2.67	9
The method of competition in procurement	**2.88**	**1**

II) Consultant

CAUSES	MS	Rank
Changes in design	**2.71**	**4**
Delayed approval of payments	2.67	8
Failure to approve updated schedules on time	2.67	8
Long waiting time for approval of drawings and materials samples	**3.00**	**1**
Poor site supervision	**2.79**	**3**

CAUSES	MS	Rank
Mistakes and discrepancies in design documents	2.69	7
Lack of timely decisions	**2.71**	**4**
The ability of the organization to manage risk	2.46	22
Deficiencies in Engineer's cost estimate preparation	2.50	19
Poor contract management	2.63	11
Mistakes and discrepancies in contract documents	2.67	8
Fraudulent practices and kickbacks	**2.96**	**2**
Incomplete drawings	2.54	17
Excessive change orders	**2.71**	**4**
The difference between lowest bid and engineer's cost estimate	2.58	14
The method of competition in tendering	2.54	17
The nature of interpersonal relations, communication and coordination in the project	2.58	14
Changes in material specification	2.58	14
Incomplete design at the time of tender	2.63	11
Absence of staff in site	2.04	25
Change in the scope of the project	2.50	19
Lack / inadequate/ of technical experience	2.38	23
Wrong /inappropriate/ choice of site	2.21	24
Technical incompetence and poor organization structure	2.50	19
Contractual claims such as, extension of time with cost.	2.63	11

III) Client

CAUSES	MS	Rank
Delayed disbursing of payments	2.33	6
Initiation of variations	2.17	8
Slowness of decision making process	**2.46**	**2**
Finance and payment arrangements	**2.42**	**4**
Additional works	**2.46**	**2**
Shortening of contract period	2.00	9
Fraudulent practices and kickbacks	1.90	10
Poor contract management	2.33	6
Changes in site locations	**2.67**	**1**
Lack /poor/ of communication and coordination with contractors	**2.38**	**5**

IV) External

CAUSES	MS	Rank
Unexpected problems	**2.13**	**4**
Inclement weather	**2.25**	**2**
Increases in workmen's wage	**2.13**	**4**
Unexpected sub soil conditions	**2.21**	**3**
Changes in exchange rate	2.00	9
Escalation of material price	**2.33**	**1**

CAUSES	MS	Rank
Fraudulent practices and kickbacks	**2.13**	**4**
Inadequacy of foreign collaboration agreements and monopoly of technology	1.96	11
Delay in obtaining permits from municipality	1.71	14
Force majeure	1.75	13
Lack of labour, materials, equipment and tools in the market	1.88	12
Poor economic conditions (currency, inflation rate and LC)	**2.13**	**4**
Changes in laws, regulations and taxes.	1.58	15
High transport cost.	2.00	9
Delay in providing services from utilities (such as water, electricity and etc.)	2.08	8

Impacts of time and cost overruns of construction projects in DCE

IMPACTS	MS	Rank
Dissatisfaction by project owners and consequently by end users	2.42	15
Poor quality workmanship	2.50	11
Creates skeptical outlook on appraisal of other new construction projects	2.08	23
Discourage investment, the investment on project construction by public clients will be less, hence the number of projects will decrease in the future	2.04	25
Weakens the growth of the construction industry by eroding mutual trust	2.21	21
High cost of supervision and contract administration for consultant	2.17	22
Loss of confidence reposed by client	**2.54**	**6**
Additional cost	2.38	17
Inability to deliver value for money	**2.67**	**3**
The contractor will suffer from budget short fall of the client	2.50	11
Negative attitude towards the construction industry by the higher public authority and by the society as a whole	**2.58**	**4**
The contribution of the construction industry to the growth of national economy of the country will be less	**2.75**	**1**
Delayed payments to contractor	**2.75**	**1**
Supplementary agreement	2.38	17
Lead to adversarial relationship among project participants	2.25	20
Loss of profit for non-completion to the contractor	2.08	23

IMPACTS	MS	Rank
Bad reputation and inability to secure project finance or securing it at higher costs due to added risks	**2.54**	**6**
Project abandonment and a drop in construction activities	**2.54**	**6**
Added costs are passed on the user as higher rental/lease/ costs	2.50	11
Loss of Users' benefit that will be obtained if it has been completed on time	2.38	17
Liquidated damage	2.42	15
Time extension	**2.56**	**5**
Dispute	2.46	14
Arbitration	**2.54**	**6**
Litigation	**2.54**	**6**

Resolution methods of time and cost overruns of construction projects in DCE

RESOLUTIONS	MS	Rank
Provide knowledge/training/ to unskilled workers based on their scope of work	**3.00**	**3**
Focus on client's need	2.67	23
Prepare a cash flow diagram and monitor progress during the contract period	**2.83**	**11**
Compare the budget prepared at weekly or monthly intervals with the actual performance achieved	2.71	18
Conducted site meetings more frequently	2.63	25
Systematic control mechanism	**2.92**	**7**
Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of sub - contractors	2.71	18
Use up to date technology	2.67	23
Appropriate contractual framework	2.54	27
Use of experience of subcontractors and suppliers	**2.83**	**11**
Timely changing or cancellation of purchase orders	2.63	25
Use of appropriate construction method	**2.83**	**11**
Timely and reasonable procurement	2.71	18
Realistic cost estimation	**2.79**	**15**

RESOLUTIONS	MS	Rank
Effective strategic planning	**3.00**	**3**
Efficient management	**2.88**	**8**
Fully utilization of the construction team	2.54	27
Appropriate scope definition	2.50	32
Proper project planning and scheduling	**2.88**	**8**
Measure performance against other projects	2.25	35
Protection of uncompleted work	2.31	34
Close monitoring	2.75	17
Increase supply of materials	2.71	18
Increase the expertise and skill of human resources	**2.83**	**11**
Risk management during project execution	2.50	32
Focus on the quality, cost and delivery of the project	**2.88**	**8**
Adoption of tools and techniques i.e. Value Management, Total Quality Management and Business Process Reengineering.	2.58	27
Hire skilled workers to achieve good progress	2.58	27
Training and development of all participant to support delivery process	2.54	27
Avoid poor quality of work, more rectification and double handling	**2.79**	**15**
Send clear and complete message to workers to ensure effective communication	2.71	18
Committed leadership and management	**2.96**	**5**
Increase the construction productivity	**2.96**	**5**

RESOLUTIONS	MS	Rank
Timely progress control, schedule control, cost control, resource control by comparing with the completion date and cost	**3.33**	**1**
Assign Competent personnel	**3.13**	**2**

APPROVED PROJECT PROPOSAL