



**ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**FACTORS AFFECTING TIME AND COST OVERRUN OF
THE ADDIS ABABA DISTRIBUTION REHABILITATION
AND UPGRADING PROJECT: THE CASE OF
ETHIOPIAN ELECTRIC UTILITY**

**BY
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**AUGUST 2020
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Advisor: Dereje Tecklemeriam (PhD)

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Declaration

I declare that this thesis entitled **“FACTORS AFFECTING TIME AND COST OVERRUN OF THE ADDIS ABABA DISTRIBUTION REHABILITATION AND UPGRADING PROJECT: THE CASE OF ETHIOPIAN ELECTRIC UTILITY“** is my original work. This thesis has not been presented for any other university is not concurrently submitted in candidature of any other degree, and that all source of materials used for the thesis have been duly acknowledged.

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ABREVIATIONS

AADRUP:	Addis Ababa Distribution Rehabilitation and Upgrading Project
AATRUP:	Addis Ababa Transmission Rehabilitation and Upgrading Project
AC:	Actual Cost
CPI:	Cost Performance Index
EEP :	Ethiopian Electric Power
EEPCo:	Ethiopian Electric Power Corporation
EEU:	Ethiopian Electric Utility
ERP:	Enterprise Resource Planning
EPC :	Engineering Procurement and Construction
ETB:	Ethiopian Birr
FAIR :	Fixed Asset Registration Index
FDRE :	Federal Democratic Republic of Ethiopia
PCC :	Power Construction Corporation of China
RII :	Relative Importance Index
SPI:	Schedule Performance Index
USD:	United States Dollar

ABSTRACT

One of the most common problems in the infrastructure project is delay. Delay could be defined as the time overrun either beyond the contract date or beyond the date that the parties agreed upon for delivery of project outcomes. Delays which could have a negative effect on projects in terms of performance and cost, can be caused by several factors such as owners, contractors, consultants, Labor and supply of material. Therefore, identifying cause of delay, responsible parties which contributed for major causes and proposing minimizing strategies is required to be achieved. In this study quantitative method of research approach was used to capture quantitative data and mainly open ended questionnaires were developed and distributed for data collection purpose to identify the major causes of delay and cost overrun in the project selected. A total of 65 questionnaires were distributed and 48 of them were filled and returned by stakeholders involved. In addition, a short discussion was made with the project manager on the project's current status, challenges faced and actions taken to bring the project back to track during its life cycle. Data collected were analyzed using SPSS software and ranking of the mean score of major causes using relative importance index (RII) was adopted to identify the most important factors which contributed to the delay and cost overrun. Moreover, variance analysis using SPI and CPI was performed to evaluate the performance efficiency of the project and it was revealed that the project lagged behind the schedule and utilized above budget compared with contract amount. The analyzed data and desk-study, showed that this project experienced a time delay of more than 400% and cost overrun of 4.39%. Unrealistic project duration, cost under estimation, slowness in decision making by the owner, change in scope of the work and frequent design change were found to be the top factors that contributed to time and cost overrun.

Key words: Time overrun, cost overrun,

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

In construction projects, delay could be defined as the time overrun either beyond the contract date or beyond the date that the parties agreed upon for delivery of project outcomes (Assaf and Al-Hejji, 2006). They stated that only 30% construction projects were completed within the scheduled completion date globally. The average time overrun lies between 10% and 30%. Delays have a negative effect on projects in terms of performance, time and cost. Delays can be caused by several factors; owner, contractors, Labor and supply of material. Therefore, identifying delay responsibility among parties and proposing minimizing strategies is required to be achieved. Concurrency in delay sometimes occurs and lead the parties into complicated situations. Thus, understanding the causes and identifying the types of delays are essential. From different points of view delays can be broadly classified into two as: compensable delays or excusable delays (caused by the client) and non-excusable delays (caused by the contractor), critical or noncritical delays, and concurrent or non-concurrent delays. Mitigation of delays can be achieved by adopting the process of knowledge management and project learning which gives insight into the various problems and their solutions. Prevention of delays by adopting innovative and teamwork helps in planning and analyzing the requirements in detail which will allow the mapping of resources and identifying the risks (Hasseb *et al.*, 2011).

In addition to project completion time success of a project could be measured by analyzing its budget utilization. Some projects encounter a budget overrun if the project did not properly managed. A cost overrun, also known as a cost increase or budget overrun, involves unforeseen costs incurred in excess of estimated amount due to an underestimation of the actual cost during budgeting, scope definition problem, design change or other problems. According to a very comprehensive research done by Flyvbjerg (2003) in global construction, it was found that 9 out of 10 projects had cost overrun. A cost overrun is a major problem in both developed and developing countries (Angelo and Reina 2002). Hence, problem of cost overruns is a critical factor to be studied to alleviate the issue in the future.

In developing countries the trend is more severe where the cost overruns sometimes exceed 100% of the estimated cost of the project. The reason of overrun is due to poor management of the resources. It is essential to have control on cost performance of projects to ensure if the

construction cost is within the estimated budget. Therefore, project cost management is needed to keep the project within its defined budget.

Categories of project cost management include project resource planning, cost estimating, cost control and cost budgeting. Cost control has two important components namely, cash flow management and project accounting for determining the projected final cost to consider the projections of future cost involving scope, time and quality. According to Morris (1990) Factors that influence cost overrun of construction projects are inadequate project planning, delay in construction, change in scope of the project, planning and implementation, supply of raw materials and equipment by contractors, resource constraint: power, funds, associated auxiliaries, foreign trade not ready and delay in decision making by government, failure of specific coordinating bodies. Thus this paper aimed at identifying major factors influencing the causes of cost and time overrun for Addis Ababa distribution network upgrading and rehabilitation project (AADRUP) and proposed minimizing strategies for future projects the will be implemented by Ethiopian Electric Utility.

1.2. Statement of the Problem

In the electric energy sector, there are construction projects in the generation of electricity, in substation & transmission line construction, and in the distribution network construction. This study covered construction projects in the distribution networks that aimed at upgrading and rehabilitating the distribution network in the capital city, Addis Ababa. The Ethiopian Electric Utility is established in December 2013 following the unbundling of the former Ethiopian Electric Power Corporation (EPCO) into two companies namely Ethiopian Electric Utility (EEU) and Ethiopian Electric Power (EEP). The mission of EEU as presented in the Council of Minister Regulation No.303/2013, is to construct and maintain electric distribution networks, to purchase bulk electric power and sell electric energy to customers (FDRE, 2013). To increase quality of power delivered to customers, to decrease the frequency and duration of power interruption and maximize revenue collected. The company undergoes different projects on the distribution network with aid of domestic and foreign development agents. AADRUP, Eight towns distribution rehabilitation, Six town distribution rehabilitation, Finfine Zuria Distribution rehabilitation, AATRP, ERP and FAIR projects are among the most important projects currently running by the company. The Addis Ababa distribution rehabilitation and upgrading project which the researcher focused is being constructed with the aid of Chinese Exim bank and is one of these projects with the aim of reduction in power interruption, decreasing high line loss and increasing the automation level

of the distribution network in Addis Ababa city. The project was planned to be completed within 12 months from the commencement date and was believed to significantly reduce the power interruption in Addis Ababa city (Contract Agreement b/n employer and contractor was made on June 6, 2014). However, even though it has been more than nearly four years since the project was signed (April 27, 2016) as of today the project performance achieved is only 98.3% of its plan. It showed implementation delay of nearly three years for which the causes needs to be studied.

In most discussions with stakeholders it has been raised that most of similar projects undertaken by the utility suffered a serious time delay and incurred cost overrun while customers are not satisfied by the service delivered, electric energy is being wasted due to poor distribution network, frequent power interruption is a major problem in the city and the company is investing more than its revenue to work under subsidy from the government.

As an evidence they claimed that the eight town project being implemented at eight different towns of Addis Ababa, Dire Dawa, Bahir Dar, Awassa, Mekele, Dessie, Jimma and Adama by the utility to rehabilitate the low voltage distribution network is still under construction 10 years after commencement. Even though this projects was implemented as a solution for shortage of power to serve new customers and to give a reliable power supply to connected customers when the project was started due to a prolonged delay in the implementation of the project, the existing load in these towns already surpass the forecasted load during feasibility study before completion of the project proposed. And hence, it is claimed that its impact in bringing customer satisfaction, reliable power supply and revenue collection will not be as expected during planning stage.

In case of AADUR Project, delays due to contractor's performance, right of way issues, consultant experience and delay in management decision making processes, scope definition problems and cost estimation problems were raised in different project review meetings. However, research was not conducted to assess important factors that can be the cause of time delay and cost overrun in most distribution line construction projects specifically the AADRUP undertaken by Ethiopian Electric Utility project management office. Sadi Assaf et al. (2006) identified seventy three causes of schedule delay exist in Saudi construction projects. They found that the most important causes of schedule delay as seen by contractors were: delay in progress payments by owner, late approving design documents by owner, change orders by owner during construction. . Abd El-Razek et al. (2008) identified the thirty two causes of delay in construction projects in Egypt. The overall results indicated that the most important causes are: financing by contractor during construction, delays in contractors

payment by owner and non utilization of professional contractual management. This research is therefore aimed at investigating the major sources of delay and cost overrun, indentifying responsible parties who contributed for the delay and over budget in the case of Addis Ababa Distribution Rehabilitation and Upgrading project.

1.3. Research Questions

The study is going to be guided by the following research questions:

- ✓ What is the project management level of understanding of project managers and supervisors in Ethiopian Electric Utility?
- ✓ What is the extent of AADRUP's delay and cost overrun compared with its contractual agreement?
- ✓ What are the major causes which forced AADRUP to experience cost and time overrun?
- ✓ What are the responsible parties which contributed to major causes of cost and time overrun in AADRUP?

1.4. Research Objective

1.4.1. General objective

The overall objective of the study is to assess the important causes of project implementation delay and cost overrun of AADUR project and to draw conclusions about what needs to be done to improved to minimize project implementation delay and cost overrun.

1.4.2. Specific Objectives

Specifically the study tries to address the following key research objectives:

- To assess the existence of time and cost overruns in AADRUP with respect to the project's original duration and contract amount.
- To evaluate the significance of the factors causing time and cost overrun
- To identify the responsible parties which contributed to major causes of time and cost overruns in AADRUP.
- To make propositions for each party in the contract to mitigate the individual contribution to time and cost overrun

1.5. Significance of the Study

Most of the projects which the Ethiopian Electric Utility has been under taking experience a time and cost overrun. However, only limited number of studies were under taken in assessing factors that causes delay in project implementation specially in rural electrification access programs. Therefore, this study will figure out the most important factors related with causes of time and cost overrun in AADRUP project which will have a significant benefit to decision makers and top management for future projects.

1.6. Scope of the Study

Ethiopian Electric Utility is under taking a number of projects which are believed to bring operational excellence, increase customer satisfaction and revenue collection capacity of the enterprise and as a result increase power supply capability to new customers. However, the scope of this study was limited to identifying and proposing mitigating solutions to the factors causing project implementation delay and cost overrun of the Addis Ababa Distribution Upgrading and Rehabilitation project being implemented in the capital city.

1.7. Limitations of the Study

Even though it has been more than four years since the project was started, the project which the researcher was studying is still running or on progress. Therefore, it is expected that there will be limitation on the quality of data collected. Especially financial reports were not properly organized as needed by the researcher. Moreover, due to the Covid-19 pandemic it made very difficult to get respondents fiscally and data collected through open ended questionnaire had been filled with their understandings of what it was to be meant which might have effect on the output of the analysis.

1.8. Organization of the Research Report

This thesis will be organized with the following major categories.

- Chapter I: Introduction
- Chapter II: Literature review
- Chapter III: Methodology and Research Design
- Chapter IV: Analysis and Discussion
- Chapter V: Conclusion and Recommendation

Each of the above sections will be presented in detail as below

Chapter I: In this chapter it is discussed about Introduction Section which includes background of the study, problem statement/ initiation, basic research questions, research objectives, significant of the study, scope of the study and its limitation.

Chapter II: presented literature review with a detailed description of the previous studies made on the subject matter.

Chapter III: This chapter also described research methodology, research design, data types and data collection instruments used to collect input data for the research.

Chapter IV: contained discussion and analysis part. It contained the findings on causes of time and cost overrun and the researcher made analysis of the data collected.

Chapter V: Finally this chapter also presented conclusion made and recommendation drawn for further research and managerial decision making by stakeholders based on findings of the research.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

This section reviewed previous works written by different authors and researches conducted by different scholars in relation to the study and presented a summary of project implementation delay and cost overrun literatures such as definitions of delay, definitions of cost overrun, classification of project implementation delay and major causes of delay. Finally, conceptual framework of the study is included by summarizing literature results.

2.1. Theoretical Review

2.1.1. Delay in construction projects

The inability to complete projects on time and within budget continues to be a chronic problem worldwide (Ahmed et al., 2000). According to Azhar and Farouqui (2008) observation that the trend of cost overruns is common worldwide. The debate in the construction industry on how to minimize or eliminate delays and cost overruns has been on for some time among professionals, clients and/or end users, and policy makers. As the construction industry continues to grow, so do planning and budgeting problems. This is because it is common for projects not to be completed on time and within the initial project budget. There are quite many examples at the national and international scene. For instance, most of the construction projects in Ethiopia have had problems with time and cost overruns and this has caused a lot of concern (Becker and Behailu, 2006). Because of construction delays and cost overruns, less and less work is performed despite the increase in construction budgets. It is common to see construction projects failing to achieve their mission within the specified cost and time. Hardly few projects get completed on time and within budget since construction projects are exposed to uncertain environments because of such factors as construction complexity; presence of various interest groups such as the project owners, end users, consultants, contractors, financiers; materials, equipment, project funding; climatic environment; the economic and political environment and statutory regulations. Time and cost overruns occur in most construction projects and the magnitude varies considerably from project to project. So, it is essential to define the actual causes of time and cost overruns to minimize and avoid the delays and increasing cost in any construction project (Ahmed et al.,

2000). Different researchers have studied the main causes of delay in the construction industry. Lo et al. (2006) summarized some of the studies that took place from 1971 to 2000, which is presented in the table below.

2.1.2. Classification of project implementation delay

According to Theodore (2009) delays can be categorized into four basic ways.

- Critical or non-critical
- Excusable or non excusable
- Compensable or non compensable
- Concurrent or non-concurrent

In the process of determining the effect of a delay on the Project, the analyst must determine whether the delay is critical or noncritical. The analyst must also assess if delays are concurrent. All delays that are identified in the analysis will be either excusable or non excusable. Delays can be further categorized into compensable or non compensable delays.

Critical Versus Non-Critical Delays: Delays that affect the project completion; or in some cases a milestone date; are considered as critical delays; and delays that do not affect the project completion; or a milestone date; are noncritical delays. If these activities are delayed, the project completion date or a milestone date will be delayed. The determining factor which activities truly control the project completion date depends on the following:

- The Project itself
- The Contractor's plan and schedule (particularly the critical path)
- The requirements of the Contract for sequence and phasing
- The physical constraints of the Project—how to build the job from a practical perspective

Excusable Versus Non-excusable Delays: All delays are either excusable or non-excusable. An excusable delay, in general, is a delay that is due to an unforeseeable event beyond the Contractor's or the Subcontractor's control. Normally, based on common general provisions in public agency specifications, delays resulting from the following events would be considered excusable:

- General labor strikes
- Fires
- Floods
- Acts of God

- Owner-directed changes
- Errors and omissions in the plans and specifications
- Differing site conditions or concealed conditions
- Unusually severe weather
- Intervention by outside agencies (such as the EPA)
- Lack of action by government bodies, such as building inspection

Non-excusable delays are events that are within the Contractor's control or that are foreseeable. These are some examples of non-excusable delays:

- Late performance of Subcontractors
- Untimely performance by suppliers
- Faulty workmanship by the Contractor or Subcontractors
- A Project-specific labor strike caused by either the Contractor's unwillingness to meet with labor representatives or by unfair labor practices

Compensable Delays versus Non-Compensable Delays: A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation. Relating back to the excusable and non-excusable delays, only excusable delays can be compensable. Non-compensable delays mean that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay. Thus, the question of whether a delay is compensable must be answered. Additionally, a non-excusable delay warrants neither additional compensation nor a time extension. Whether a delay is compensable depends primarily on the terms of the contract. In the most cases, a contract specifically notes the kinds of delays that are non-compensable, for which the contractor does not receive any additional money but may be allowed a time extension Categories (Theodore, 2009).

Concurrent Delays: The concept of concurrent delay has become a very common presentation as part of some analysis of construction delays. The concurrency argument is not just from the standpoint of determining the project's critical delays but from the standpoint of assigning responsibility for damages associated with delays to the critical path. Owners will often cite concurrent delays by the contractor as a reason for issuing a time extension without additional compensation. Contractors will often cite concurrent delays by the owner as a reason why liquidated damages should not be assessed for its delays. Unfortunately, few contract specifications include a definition of concurrent delay and how concurrent delays

affect a contractor's entitlement to additional compensation for time extension or responsibility for liquidated damages.

2.1.3. Causes of delay construction projects

Implementation of projects may be delayed due to failures of different stakeholders and scarcity of resource. Therefore, it is possible to categorize delays from the perspectives of contractors, client, material supply and labor contribution.

Contractor Related Delays

There are several studies by numerous researchers identified the factors of contractor related delays. Murali *et al.* (2007) identified the improper planning contractor, poor site management and inadequate contractor experience problems with subcontractors contribute to causes of delays. Fong *et al.* (2006) note that delay in interior finishes (tiles, painting, ceiling), delay in handover of plant room/plinth/water tank, improper electrical and mechanical coordination and management contribute to causes of delays. Essam (2006) identified the subcontracting problems, contractor is not well organized, contractor financial problems and bad quality of contractor's work contribute to causes of delays.

Sadiet *et al.* (2006) identified the conflicts in subcontractors schedule in execution of project, rework due to errors during construction, conflicts between contractor and other parties (consultant and owner), poor site management and supervision by contractor, poor communication and coordination by contractor with other parties, ineffective planning and Scheduling of project by contractor, improper construction methods implemented by contractor, delays in sub-contractors work, inadequate contractor's work, frequent change of subcontractors because of their inefficient work, poor qualification of the contractor technical staff, delay in site mobilization contribute to causes of delays. Abdalla *et al.* (2002) identified the subcontractor, site management, construction method, improper planning and inadequate contractor experience contributes to causes of delays.

Client Related Delays

There are several studies by different researchers identified client related factors as causes of project implementation delays. According to Chabota *et al.* (2008) economic problems, and contract modification contributes to causes of delays. Murali *et al.* (2007) identified owner's interference, slow decision making, unrealistic contract duration and requirements imposed contribute to causes of delays from the client side. Fong *et al.* (2006) also identified the client type, lack of timely making decision; unrealistic imposed contract and client initiated

variations contribute to causes of delays. Additional study by Essam (2006) identified the change or variation orders, delay caused by owner, oral change orders by owner contribute to causes of delays. Another research made by Sadiet et al. (2006) identified the delays to furnish and deliver the site to the contractor by the owner, change orders by owner during construction owner, late in revising and approving design documents by owner, delay in approving shop drawings and sample materials, poor communication and coordination by owner and other parties, slowness in decision making process by owner, conflicts between joint-ownership of the project, unavailability of incentives for contractor for finishing ahead of schedule, suspension of work by owner contribute to causes of delays.

Most of the researchers agree that below are the factors that always happen relate to the client:

- Inference by the owner in the construction operations change orders during construction.
- Poor communication and coordination by owner and other parties.
- Slow decision making from owner.

Material Related delays

Several studies identified the factors of material related delays. According to Hyunjoon et al. (2007) the material delivery were identified as factors to causes of delays in construction projects. Murali et al. (2006) on the other hand identified the quality of material and shortage in material contributed to the cause. Koushki et al. (2004) revealed that the material selection duration contributes to causes of delays. Sweis et al. (2007) identified the shortage of materials, delay in materials delivery contribute to causes of delays. Aibinu et al. (2002) identify the material management problems as a cause for delay.

Abdalla et al. (2002) and Murali et al. (2007) concluded that poor quality of material and shortage are having high influence to causes of delays. Sadiet et al. (2006) identify the shortage of construction materials in market, changes in material types and specifications during construction, delay in material delivery, damage of sorted material while they are needed urgently, delay in manufacturing special building materials, late procurement of materials and late in selection of finishing materials due to availability of many types in market that contributes to causes of delays. Another study by Sweis et al. (2007) identified the shortage of materials, delay in materials delivery, modifications in materials specifications that contribute to causes of delays. There are a lot more factors that were get

from previous studies which causes the delay in construction project. Most of the researchers agree that below are the factors that always happen relation to the material:

- Shortage of construction materials in market.
- Unpunctual material delivery.
- Poor quality of material in construction.

Labor Related Delays

Several studies identified the factors of labor related delays. According to Murali et al. (2006) the labor supply and labor productivity are the two main factors that contribute to causes of delays. Abdalla et al. (2002) identified the labor supply and labor productivity contributes to causes of delays. Yaw et al. (2003) identified the labor shortages that contribute to causes of delays. Sadiet et al.(2006) identify the shortage of labors and low productivity level of labors that contribute to causes of delays. Sweis et al. (2007) identified the shortage of manpower (skilled, semi-skilled, unskilled labor) and presence of unskilled labor contributes to causes of delays.

2.2. Empirical review

2.2.1. Causes of time and cost overrun

Different scholars from different corners of the world investigated the causes of project implementation delay and cost overrun. In this section findings of different scholars on the case are reviewed.

A study conducted by Meaza (December 2015) on project implementation of 41 projects at Universal Electric Access Program (Ethiopia) indicated that an average of 2.48 years time delay was observed while they were expected to be completed in 8 months. Those projects also found to be encountered a 44% cost overrun compared to their initial budget plans. According to Fahad S. Allahaim and Li Liu (2015) the top five causes of cost overrun in infrastructure projects in Saudi Arabia were market conditions (materials and labor), design changes, the practice of assigning a contract to the lowest bidder, delays in decision making and approval of drawings, and design error. Another study made in Peninsular Malaysia by Aftab et al (2014) found that the significant factors contributing to construction time overrun are cash flow and financial difficulties faced by contractor, poor site management and supervision, incompetent subcontractor, shortage of workers and financial difficulties of the owner. In their study recommended that proper planning of work, committed leadership and

management, and effective communication system can be very helpful in improving time performance.

A study made at Kenya Electricity Generating company limited by David K. Gituro W. (2013) also identified variables significantly contributed to time and cost overruns and have a chance of recurring in future projects. These included delayed payments to contractor, employer's cash flow problems, delay in disbursement of funds by financiers, bureaucracy of government agencies, complex interfaces of various work packages, length of implementation of the project, delay in procurement of materials and equipment, inadequate planning by employer before commencement of construction, late design changes, delays in approval by engineer, delays in the release of drawings, increased scope of work, disputes between parties and delay in getting access to site.

Ramabathan et al. (2011) stated that high demand on the resources such as labor, material and equipment may cause scarce, and this will hamper to the project execution. If this situation prolonged and left unchecked, it may affecting the project progress. They also concluded that mismanagement of the project by contractor, consultant and owner will lead to time overrun. From seven case studies, the risk factor causing time overrun were found as shortage and lack in quality materials and appropriate equipments in the local market, no material delivery schedule prepared by the contractor; delay in materials, drawing and proposal approvals by consultant; Bad weather conditions; fluctuation in raw material prices and fossil fuels; delay in dealing with land and property acquisition causing delay to construction work; the distance between each project site posed challenges in logistic planning to distribute the resources; and reworks due to poor quality work standards.

A research made by Abebit (2013) identified the top ten most important factors that contributed to the causes of delays include shortage of equity contribution , miss utilization of the disbursed fund ,ineffective planning and scheduling of project by the owners, conditions for effectiveness of the loan are not fulfilled in time to enable disbursement of the loan, lack of prudent pre- credit risk assessment low capacity of the promoter to cover unforeseen costs while planning the project, lack of comprehensiveness of feasibility study submitted by the promoter, delays in the procurement machineries i.e. delay in supply of equipment by suppliers late procurement of machineries and materials, lack of sufficient knowledge of project management, the occurrence of lots of missed out items (machineries and equipment) and civil works resulted from absence of securing final plan and design ahead of processing the loan, and to go by the terminal dates of opening L/Cs and disbursements resulting in

frequent extension of these dates. She also found that to minimize delays in projects the top five effective methods are: effective strategic planning, use of adequate application screening criteria, verifying reliable source of equity contribution, through pre-credit risk assessment, revision of the policy & procedure of the Bank and to be certain on comprehensiveness of feasibility study and proper emphasis on past experience.

A questionnaire survey was carried out by Ali.A.S. et al (2010) and the most serious factor contributed to cost overrun was inaccurate or poor estimation of original cost. The most significant method to control construction cost is proper project costing and financing. He concluded that the problem of cost overrun is not a small issue and it could cause serious problems to the construction industry.

Serdar Durdyev (2012) identified 40 factors in Turkey that causes cost overrun in construction of residential projects. The major factors are improper planning, inaccurate project cost estimation, high cost of needed resources, lack of skilled workforce, price of construction materials and high land prices.

Olawale et al (2010) identified 21 major factors causing cost overruns in UK. The major factors were found to be design changes, incorrect evaluation of projects time and cost, risk and uncertainty related with projects, non- performance of subcontractors, conflict between project parties, fluctuation of rates, low skilled manpower, financing and payment, unstable interest rate, complexity of works, lack of proper training and experience of project manager, disagreement in contract documentation, lack of appropriate software, inflation of prices, contract and specification interpretation disagreement, dependency on imported materials, unpredictable weather condition, projects fraud and corruption, weak regulation and control and unstable government policies.

Table 2.1: Summary of Previous Studies on the Causes of Delays

Researchers	Country	Major causes of delay
Baldwin et al. (1971)	United States	<ul style="list-style-type: none"> • inclement weather • shortages of labor supply • subcontracting system
Arditi et al. (1985)	Turkey	<ul style="list-style-type: none"> • shortages of resources • financial difficulties faced by public agencies and contractors • organizational deficiencies • delays in design work

		<ul style="list-style-type: none"> • frequent changes in orders/design • considerable additional work
Okpala and Aniekwu (1988)	Nigeria	<ul style="list-style-type: none"> • shortages of materials • failure to pay for completed work • poor contract management
Mansfield et al. (1994)	Nigeria	<ul style="list-style-type: none"> • improper financial and payment arrangements • poor contract management • shortages of materials • inaccurate cost estimates • fluctuations in cost
Semple et al. (1994)	Canada	<ul style="list-style-type: none"> • increases in the scope of the work • inclement weather • restricted access
Al-Khal and Al-Ghafly (1999)	Saudi Arabia	<ul style="list-style-type: none"> • cash flow problems/financial difficulties • difficulties in obtaining permits • “lowest bid wins” system
Al-Momani (2000)	Jordan	<ul style="list-style-type: none"> • poor design • changes in orders/design • inclement weather • unforeseen site conditions • late deliveries
Lo et al. (2006)	Hong Kong	<ul style="list-style-type: none"> • inadequate resources • unforeseen ground conditions • exceptionally low bids • inexperienced contractor • work in conflict with existing utilities • poor site management and supervision • unrealistic contract duration
Abubeker (2015)	Ethiopia	<ul style="list-style-type: none"> • Delay to deliver the site (Right of way problem)

		<ul style="list-style-type: none"> • Financial problems • Improper planning • Weather condition • unrealistically imposed contract duration
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2.3. Conceptual Framework

A conceptual framework is a structure which the researcher believes can best explain the natural progression of the phenomenon to be studied (Camp, 2001). It is linked with the concepts, empirical research and important theories used in promoting and systemizing the knowledge espoused by the researcher (Peshkin,1993). It is the researcher’s explanation of how the research problem would be explored. The conceptual framework presents an integrated way of looking at a problem under study (Liehr & Smith, 1999). The conceptual framework of this research is developed from the findings of different researchers who worked in Kenya, Ethiopia and Malaysia to investigate important causes of project implementation delay and cost overrun. The findings of the researchers had been taken as an independent variable whose contribution to change the behavior of the dependent variable were studied. Therefore, project implementation delay and cost overrun are a dependant variable and the others are independent.

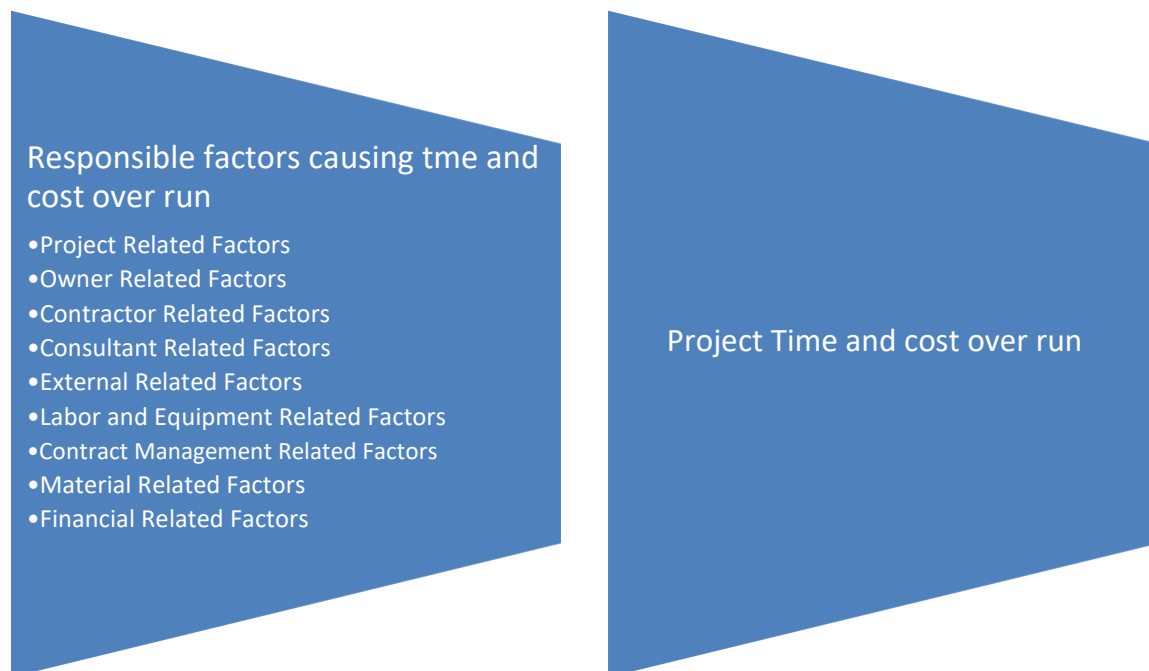


Figure 2.1: Conceptual Frame work of the study

Source: Adapted from Tadesse (2017)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Research Approach and Design

There are two basic approaches to research: quantitative and qualitative (Leedy et al. 2005). Quantitative research methods are characterized by the collection of information which can be analyzed numerically, the results of which are typically presented using statistics, tables and graphs. The aim of the quantitative research method is to test pre-determined hypotheses and produce generalizable results. Using statistical methods, the results of quantitative analysis can confirm or refute hypotheses about the impact of a disaster and ensuing needs of the affected population. Conclusions made from the analysis of quantitative data indicate how many are affected, where the greatest area of impact is, and what are the key sector needed. Qualitative research on the other hand is used when we don't know what to expect, how to define the issues, or lack an understanding of why and how affected populations are impacted by an emergency. Qualitative data like quantitative data is based on empiric investigation and evidence. However, qualitative research explores information from the perspective of both groups and individuals and generates case studies and summaries rather than lists of numeric data (ACAPS 2012).

According to Patto (1993) both qualitative and quantitative approaches have advantages and disadvantages. Quantitative approaches lack flexibility and doesn't enable one to get in-depth information as the data is mostly collected through close format questionnaire. In addition, it doesn't consider the respondents natural context during data collection process. On the other hand, qualitative approach provides little base for scientific generalization since randomly selected sample is not used. Therefore, the researcher used both approach in order to tackle the limitation of each and benefited from their strengths.

Different types of research design like descriptive, correlation, explanatory or exploratory could be applicable based on the interests of the researcher and objective expected from the research. However, due to the fact that descriptive type of research design helps to describe perfectly the characteristics of individual, situation and a group (Zikmund, 2003), a descriptive research design was adopted in this study.

3.2. Data Type and Source

3.2.1. Data type

Depending on its closeness to the event recorded data can be divided into two types, primary and secondary data. According to Nicholas William (2011) Data that has been observed, experienced or recorded close to the event are the nearest one can get to the truth, and are called primary data. Written sources that interpret or record primary data are called secondary data, which tend to be less reliable than primary data.

Even though primary data collected is more reliable than secondary data it is time consuming, costly to organize large surveys and other studies and not always possible to get direct access to the subject of research. The quality of the data collected from secondary sources depends on the source and the methods of presentation. The researcher used both primary and secondary data types as source of information in doing this research.

3.2.2. Data source

The researcher used both primary and secondary data sources. The primary data was collected through structured questionnaire and discussion. The secondary data was collected from relevant documents, newspapers and magazines of the enterprise that are related to the study. The organization's project management manuals and policy documents, newsletters, website and monthly, quarterly and annual reports was used to obtain reliable information that which helped for the study. For this research, structured questionnaire with both a closed and opened format questions was designed, distributed and filled by the sample respondents to collect primary data. Because, the questionnaire survey method is usually cheap, easy to administer to many respondents, and normally gets more consistent and reliable results. The structured questionnaire was employed with five ranking scale (from 1 to 5). Discussions were conducted with concerned management bodies of the employer and contractors to gather additional relevant data during desk study.

3.3. Target population and Sample

3.3.1. Target population

Target population is defined as the entire group a researcher is interested in. According to Zikmund (2003) the definition of population was the entire set of a case from which sample is drawn in by a researcher. Leedy (1997) also defined that the population can be viewed as a group or individual or object that would illustrate common feature that would be

advantageous to the researcher's interest. The target population for the study was professional staffs who are working in Ethiopian Electric Utility and distribution management office and the contractors' staff.

Stratified random sampling is a method of sampling that involves the division of a population into smaller sub-groups known as strata. In stratified random sampling, or stratification, the strata are formed based on members' shared attributes or characteristics such as income or educational attainment, work condition etc (web sources). Therefore, in this study a stratified random sampling technique was applied as the researcher planned to take samples from the employer, consultant and contractor staffs whose responsibility in the project is different..

3.3.2. Sample size determination

The researcher used the following formula to calculate sample size and a 95% confidence level and 0.05 sampling error was assumed for the equation (Yamane, 1967). $n = \frac{N}{1 + N(e)^2}$

Where

N=Population size

n=sample size

e=acceptable magnitude of error.

The total sample size (Population size) of the study the researcher worked on were incorporated staffs from PMO office, Contractor and EEU Head office having a total of 78 staffs. Using the above formula the sample size was calculated as follows. $n = \frac{N}{1 + N(e)^2}$

Substituting 78 for N and using a 0.05 marginal error $n = \frac{78}{1 + 78(0.05)^2}$

n= 65. Therefore, the sample size or number of respondents to whom the researcher distributed a questionnaire was 65.

3.3.3. Sampling selection procedure

Sampling techniques can be divided into two: Probability sampling / random sampling and non-probability or purposive sampling. Probability sampling means that every item in the population has an equal chance of being included in sample. It can further be classified as Simple random sampling, Stratified random sampling, Cluster sampling, Systematic sampling, Multi stage sampling.

Purposive sampling on the other hand is a sampling technique in which the researcher selects samples based on the subjective judgment of the researcher rather than random selection and can be categorized as Quota sampling, Snowball sampling, Judgment sampling and Convenience sampling (Zikmund , 2002). As a Stratified sampling technique enables to divide the population into strata (or subgroups) and ensure that every stratum could adequately be represented (Ackoff, 1953) the researcher will adopt a stratified sampling technique to select samples out of the total population.

3.4. Data Collection Methods and tool

There are different data collection methods. Questionnaires, Interviews, Focus Group discussion, Observation and Survey are some to be mentioned.

Questionnaire

According to Sir Francis Galton (who invented questioner) a questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. The other advantages of questionnaires are it enables the researcher to collect large amounts of information from a large number of people in a short period of time and in a relatively cost effective way, it can be carried out by the researcher or by any number of people with limited affect to its validity and reliability, The results of the questionnaires can usually be quickly and easily quantified by either a researcher or through the use of a software package.

Interview

Interviewing involves asking questions and getting answers from participants in a study. Interviewing has a variety of forms including: individual, face-to-face interviews and face-to-face group interviewing. It can be classified into Structured, semi structured and unstructured interview.

Structured Interview gives a chance to the researcher to ask each respondent the same series of questions, to use questions that are created prior to the interview with limited set of response categories, gives little room for variation in responses and there are few open-ended questions included in the interview guide, questioning is standardized and the ordering and phrasing of the questions are kept consistent from interview to interview, the interviewer plays a neutral role and acts casual and friendly but does not insert his or her opinion in the interview and are self-administered (Research methods).To utilize the help of aforementioned

advantages the researcher will use questionnaires with both closed and open format questions and structured interview as a tool in collecting data for this research.

3.5. Data Analysis and Presentation

3.5.1. Data analysis

Data collected was analyzed using Statistic Package for Social Science (SPSS) through use of Relative Importance Index (RII) to identify causes of time and cost overrun in AADRUP.(In the five Likert scale 1 stands for NS- Not significant, 2 stands for SS- Slightly significant, 3 stands for MS- Moderately significant, 4 stands for VS- Very significant and 5 stands for ES- Extremely significant)

The contributions of each of the factors to overall delays was examined and ranking of attributes in terms of their criticality as perceived by respondents was then made by use of Relative Importance Index (RII) which can be computed using the following equation.

$$RII = \frac{\sum W}{A * N}, \text{ where, } 0 \leq RII \leq 1)$$

W :is the weight given to each factor by the respondents and ranges from 1 to 5 A is the highest weight and N total is number of respondents.

In addition to the descriptive analysis use of SPSS variance analysis methods such as schedule variance and cost variance methods was applied during data analysis stage. Correlation among identified factors of cost overrun and time delay was also made and how each factors were related to each other and their significant level was determined.

3.5.2. Data Presentation

Once data has been collected, it has to be classified and organized in such a way that it becomes easily readable and interpretable. Presenting data involves the use of a variety of different graphical techniques to visually show the reader the relationship between different data sets, a tabular and textual description to emphasize the nature of a particular aspect of the data. In this research a tabular presentation followed by textual description of the data presented in the table is used during analysis. The level of importance as indicated by the respondents was used to measure the mean score and ranking method is adopted as mentioned above using relative importance index for each factor. The mean score (MS) for each variable of time and cost overruns is computed by using the following formula;

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

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 significance (1, 2, 3, 4 and 5) do not indicate that the interval between scales is equal, nor do they indicate absolute quantities. They are merely numerical labels.

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION

This chapter presents data from results of statistical tests and analysis carried out using SPSS and Relative Importance Index values of each factor with the aim of investigating the magnitude of project implementation delay in terms of schedule and cost variance and sources of delay and cost overrun. The results are discussed in the subsequent sections.

4.1. Reliability Test

Reliability concerns the extent to which a measurement of a phenomenon provides stable and consistent result. Reliability is also concerned with repeatability. For example, a scale or test is said to be reliable if repeat measurement made by it under constant conditions will give the same result. Testing for reliability is important as it refers to the consistency across the parts of a measuring instrument. A scale is said to have high internal consistency reliability if the items of a scale “hang together” and measure the same construct (web resources). The most commonly used internal consistency measure is the Cronbach Alpha coefficient (cronbach α). It is viewed by different scholars as the most appropriate measure of reliability when making use of Likert scales . No absolute rules exist for internal consistencies, however most agree on a minimum internal consistency coefficient of .70. For an exploratory or pilot study, it is suggested that reliability should be equal to or above 0.60. Researchers have suggested four cut-off points for reliability, which includes;

- excellent reliability (0.90 and above)
- high reliability (0.70-0.90)
- moderate reliability (0.50-0.70) and
- low reliability (0.50 and below) (Hinton et al., 2004).

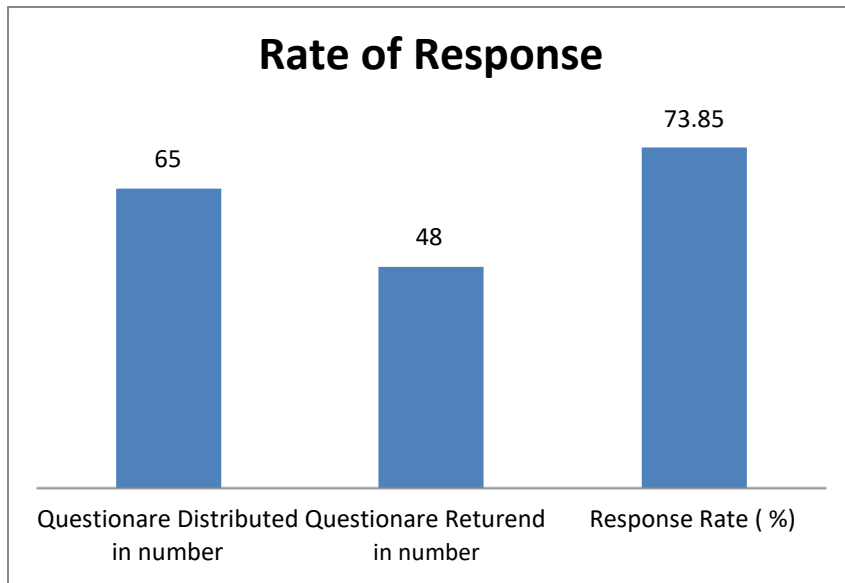
Using the above categories this study’s reliability is tested using internal consistency measure which is Cronbach Alpha coefficient, a number that tells us how likely one instrument is to be consistent over repeated administration prior to ranking of factors causing time and cost overrun. And hence Cronbach Alpha coefficient of overall and each variable is indicated in the table 4.1 below.

Figure 4.1: Cronbach Alpha coefficient for reliability measurement from questionnaire Survey

Group of Data	cronbach α
Overall	0.974
Project Related Factors	0.852
Owner's Related Factors	0.756
Contractors Related Factors	0.907
Consultant Related Factors	0.851
External Related Factors	0.773
Labor and Equipment Related Factors	0.921
Contract Management Related Factors	0.895
Material Related Factors	0.853
Financial Related Factors	0.876

From the table 4.1 it is observed that even though the overall reliability coefficient 0.974 falls within the range of excellent (Hinton et al., 2004), the results of other variables are in the range of 0.756 to 0.92. This results can be considered as high compared with the cut of value which is 0.7 (Hinton et al., 2004). This showed that the reliability of the questionnaire is assured and questionnaire data are valid and reliable.

Figure 4.2: Questionnaire rate of response



Source: Own Survey

Figure 4.2 shows that from the 65 questionnaires distributed to client, contractor and consultant staffs 48 questionnaires were filled and returned. Therefore, the response rate is 73.85 percent.

4.2. Background Characteristics of Respondents

This portion of the research is generally designed to provide general information about the respondent's age group, sex, educational qualification, relevant work experience, company type, job status or position in the company and response rate of questioners distributed to clients, consultants and contractors staffs.

Figure 4.3: Summary of respondent’s gender, age group, position and work experience in the organization from questionnaire Survey

		Work_Experience				Total	
		5-8	9-12	13-16	>16 years	Frequency	Percentage %
Gender	Men	7	17	9	6	39	81.3
	Female	5	1	3		9	18.8
	Total					48	
Age Group	18-24	2				2	4.2
	25-29		2			2	4.2
	30-40	3	7	1	4	15	31.3
	41-50	7	9	9	2	27	56.3
	51-60		2			2	4.2
	Total					48	
Position	Project Engineer	3	6	2	1	12	25.0
	Site Engineer		6	6		12	25.0
	Technicians	2				2	4.2
	Administrative	3	6	3		12	25.0
	Other	4		1	5	10	20.8
	Total					48	

Source: Own Survey

Figure 4.3 shows that 81.3% (39) of the respondents are male , 18.8% (9) of the respondents are female, survey results showed that respondents involved had several years of experience in handling construction works like AADRUP. Survey statistics showed that 25 % (12) of the respondents have 5 to 8 years of work experience ,37.5 % (18) have 9 to 12 years of work experience, 37.5 % (18) of the respondents have 13-16 years of work experience and only 12.5 % (6) of them have 16 and above years of work experience in their respective company. Regarding age of respondents it can be seen from the table above that 4.2 % (2) of

the respondents are 18 to 24 years old , 31.3% (15) are 25 to 29 years old, 56.3 % (27) are 30 to 40 years old ,4.2 % (2) of the respondents are 41 to 50 years old and 4.2 % (2) of the respondents are 61 years old and above. Moreover, 25 % (12) of respondents are working as project engineers, 25 % (12) are site engineers and 4.2 % (2) are technicians, 25 % (12) are administrative staffs who are working in the human resource and finance department of the project and 20.8 % (10) of the respondents are other staffs who are working in other operation departments which have functional and horizontal relationship with the project office.

Figure 4.4: Summary of respondent’s Company type, field of study and level of education from questionnaire Survey

		Company_type			Total	
		Client	Contractor	Consultant	Frequency	Percentage %
Field_of_Study	Electrical Engineer	20	5	7	32	66.7
	Civil Engineer		1	1	2	4.2
	Management	10			10	20.8
	Other	2	2		4	8.3
	Total				48	
Level_of_education	Diploma	2			2	4.2
	First Degree	25	8	7	40	83.3
	Second Degree	5		1	6	12.5
	Total				48	

Source: Own Survey

Figure 4.4 shows that 66.7 % (32) of the respondents involved in the study are from the client, 16.7 % (8) are from contractor side and 16.7 % (8) of the respondents are from consultant side. Classifying respondents with their field of study 66.7 % (32) of the respondents are Electrical engineers, 4.2 % (2) are civil engineers, 20.8 % (10) are management staffs and 8.3 % (4) of the respondents have different field of study such as accounting, information science, construction managements. In addition to company type and field of study respondents are classified with their level of education. It can be seen that most of the respondents involved in the survey were holding bachelor degree in terms of

educational qualification with the highest percentage 83.3 % (40), 4.2 % (2) were diploma holders or Certificate, and master degree holders were 12.5 % (6) .

4.3. Results of desk Study

During desk study the actual completion, cost to complete, planned completion and time to complete of the AADRUP was studied thoroughly using different documents like contract document, annual and monthly progress report prepared by the project office.

Table 4.1 Summary of general information of the AADRU project from desk study

Name of the Project:	Addis Ababa Distribution Rehabilitation and Upgrading Project (AADRUP)
Loan from:	EXIM bank of China
Source of finance for the project	EXIM bank of china: USD 137,843,114.24 Government fund: ETB 461,012,243.33
Total Project estimated cost	USD 162,168,370
Consultant	EEU, Engineering ,Quality and Research and Development
Contractor :	Power Construction Corporation of china, Ltd. (PCCC)
Type of Contract:	EPC (Engineering, Procurement and Construction)
Contract No:	33.20/157/08
Date of Contract signing:	April 27,2016
Time to Complete The project	12 Months

Reviewing the contract document and conducting short discussion with the project manger the scope of the Addis Ababa distribution rehabilitation and upgrading project which was being constructed with financial source of loan agreement with Exim bank of Chinese found to have the following major targets:

- Reduction in power interruption
- Decreasing high line loss and
- Increasing the automation level of the distribution network in Addis Ababa city.

To achieve its aim the project planned to execute the following major activities during its contract period. The major activities were:

- Extension of 46 km double circuit express line
- Reconstruction of damaged 31.7 km double circuit express line feeding mainly the Addis light railway stations
- Extension of 25.86 overhead double circuit express line
- Erection of 72 switching stations
- Extension of 466.69 km outgoing line from newly built switching stations
- Erection of 461 Compact and pole mounted distribution substations
- Extension of 400 km new low voltage and upgrading of old low voltage distribution line
- Replacement of 19461 wooden low voltage and medium voltage poles with reinforced concrete poles
- Automation of system integrating dispatch, control and distribution network in five 132/15 KV substations. i.e Addis center, Bella, Addis east, Weregenu and Nifas silk substations.

The project planned to complete all the aforementioned activities within 12 months from the commencement date of contract signing (from September 2016 to August 2017) and was believed

- To insure the reliability & quality of power supply in Addis Ababa city
- To reduce the Technical loss and interruption frequency and duration of distribution system.
- Enable the system to connect new customers and meet their electrical energy requirements.

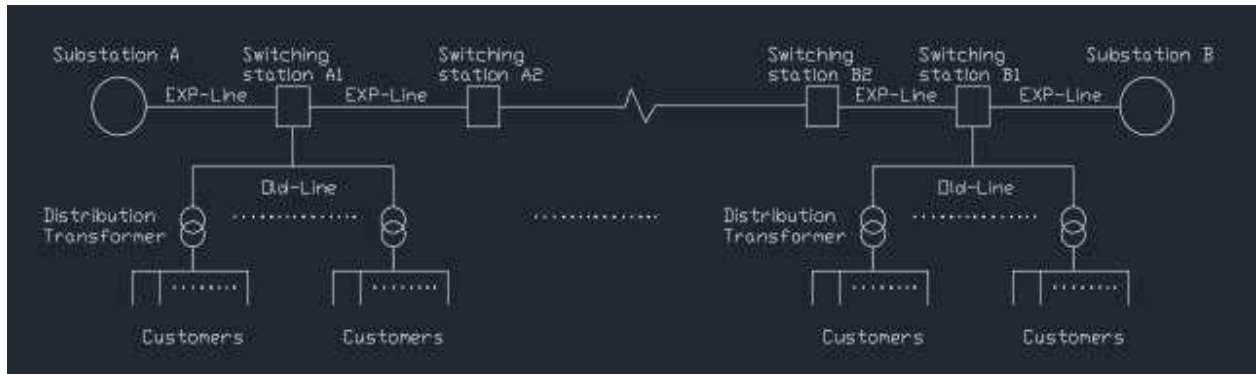
The initial estimated cost of AADRUP excluding operational expenses of project office was USD 162,168,370 and as of today the project consumed USD 166,540,920 and the total cost of the project at completion will be USD 169,297,782. Therefore, the project is experiencing cost overrun of USD 7,129,412 which is 4.39 % of the contract amount. According to the project manager the difference in USD was because of underestimation of nearly 20,000 concrete low voltage poles with accessories which required ETB12000 per head and missed installation of about 4000 energy meters in the customer’s premises during scope definition which also needs more than ETB 6000 per head.. These materials were missed during material estimation process in the planning phase and according to the project manager the difference was covered by the contractor for free after negotiation made between the employer and contractor. Even though the client was not charged due to the generosity of the contractor the project faced a cost overrun from contractual perspective.

Based on the data found during the desk study contract and actual completion time and cost, rate of time overrun and cost overrun are described as shown in the table below. Accordingly, table 4.3 shows summary of actual completion time and cost, rate of time overrun and cost overrun in AADRUP.

Table 4.2 Summary of AADRUP project from desk study

S/ No	Name of the Project	Contract Completion Time	Time Since Contract signed	Contract Completion Cost in millions USD	Cost of project as of today in Millions USD	Rate of Time overrun (%)	Rate of Cost overrun (%)
1	AADRUP	12 Months	48 Months	162,168,370	169,297,782	400%	4.39 %

Figure 4.5 The New Distribution Network Structure



While reviewing different monthly and quarterly performance reports, amendments, contracts and minutes of the project it also was found that activities missed during feasibility study were proposed by the consultant to be annexed with variation and contract amendment. Some of these activities included were customer service drop, replacement of damaged existing switching stations, installation of measuring instruments on the new distribution transformers for in and out energy measurement purpose and connecting Shegole and Geferesa substations with express line. Additional costs required was estimated to amount about 6 % of the contractual amount of the total project and were assumed to be covered by the utility itself. And hence it was the main source of cost overrun in AADRUP.

4.4. Cause and responsible parties of cost and time overrun

Factors affecting time and cost overrun are the main questions the researcher raises in the research question. i.e. What are the factors affecting time and cost overrun of AADRUP is the main question? Therefore, to find out answers of the main question data collected from respondents this question has been subdivided into two questions. The first question indicates identification of significant rate of different factors affecting time and cost overrun and the second question is empathy of the significance rate of factors related to responsible parties.

4.4.1. Factors affecting time and cost overrun

This section discusses factors of time and cost overruns that are included in the literature are tested with the questionnaire collected. And hence, calculating the total point each factor achieves by taking its weight and number of respondents who are not satisfied (1), slightly satisfied(2),moderately satisfied (3), very satisfied (4) and extremely satisfied (5) the relative importance index (RII) of each factor is determined. Using the RII rank of each factor is

found out as indicated in the table below. Table 4.4 below indicates RII and rank of the top 20 factors affecting time and cost overrun in AADRUP.

Table 4.3 Relative importance index and rank of top 20 factors affecting time and cost overrun from the questionnaires.

S/No.	Factors of time and cost overrun	RII	Rank
1	Project Size	0.825	3
2	Project Location	0.792	9
3	Project Scope Definition	0.783	12
4	Man Power and Equipment	0.858	1
5	Inadequate Funding of the project	0.775	14
6	Frequent Design Change	0.817	5
7	Increase In Project scope	0.792	9
8	Inadequate Material Selection Skills and Experience	0.817	5
9	Poor Communication and Coordination system	0.758	16
10	Financial problem or cash problem during construction	0.800	7
11	Inadequate Planning and scheduling	0.750	20
12	Poor Performance of subcontractors	0.775	14
13	slowness in giving instruction	0.758	16
14	Under estimation of cost	0.758	16
15	Unrealistic project duration or project time estimation	0.825	3
16	Employee turnover	0.750	20

17	Change in scope of the work	0.842	2
18	Shortage of material estimation	0.750	20
19	Inaccurate material estimation	0.792	9
20	Dependency on imported construction materials	0.783	12
21	Cost Under estimation	0.758	16

Source: own manipulation,2020

4.4.2. Responsible parties for factors affecting time and cost overrun

This section consists of discussions and results of responsible parties for factors which affects time and cost overruns in the project under study. The factors are categorized as Project related factors, client related factors, contractor related factors, consultant related factors, external related factors, labor and equipment related factors, contract management related factors, material related factors and financial related factors.

After calculation of the relative importance index of each factor from questionnaire responses, the results is as indicated in the table below. Accordingly, table 4.5 indicates the relative importance index (RII) and rank of factors affecting time and cost overrun for each party.

Table 4.4: Relative Importance Index and rank of factors causing time and cost overrun from questionnaire survey

S/No.	Factors Affecting Time and Cost Overrun	RII	Rank
I	Project Related Factors		
1	Project Size	0.825	2
2	Project Location	0.792	3
3	Project Scope Definition	0.783	4
4	Man Power and Equipment	0.858	1

II Owners Related Factors			
5	Inadequate Funding of the project	0.775	4
6	Frequent Design Change	0.817	1
7	Increase In Project scope	0.792	3
8	Selection Of Incompetent Subcontractors	0.675	9
9	Delay In Delivery of Material	0.667	10
10	Inadequate Material Selection Skills and Experience	0.817	1
11	Slowness Of Decision Making Process	0.708	7
12	Delay in Payment for completed works	0.667	10
13	Delays in contractors claim settlement	0.700	8
14	Poor Communication and Coordination system	0.758	5
15	Owner Interference	0.742	6
III Contractors Related factors			
16	Financial problem or cash problem during construction	0.800	1
17	Interest Rate Instability	0.658	10
18	Poor site Management	0.717	4
19	Inadequate Planning and scheduling	0.750	3
20	Poor Performance of subcontractors	0.775	2
21	Delay in work progress and poor labor productivity	0.683	7
22	Shortage and low skilled labor	0.658	10

23	Mistake during construction or rework	0.717	4
24	Inadequate controls experience	0.700	6
25	Poor Communication and misunderstanding	0.675	8
26	Unethical Behaviors	0.675	8
IV Consultant related Factors			
27	Incomplete drawings and documents	0.717	4
28	slowness in giving instruction	0.758	2
29	Under estimation of cost	0.758	2
30	Unrealistic project duration or project time estimation	0.825	1
31	Inadequate quality control procedures	0.717	4
32	Poor contract management	0.683	7
33	Lack of communication or miss communication	0.642	9
34	Delay payment preparation	0.717	4
35	Delay in Material Approval	0.667	8
V External related Factors			
36	Unavailability or insufficient of water and electricity	0.667	1
37	Unpredictable weather condition	0.567	5
38	Government regulation and control	0.667	1
39	Bad site Condition	0.575	4
40	Labor strike	0.608	3

VI Labor and Equipment Related factors			
41	High Transportation cost	0.658	3
42	Frequent break down of machine	0.650	4
43	Maintenance Cost of Machinery	0.667	2
44	High Cost of Machinery	0.650	4
45	Employee turnover	0.750	1
VII Contract Management Related Factors			
46	Change in scope of the work	0.842	1
47	Suspension of works	0.700	4
48	Lack experience of project managers	0.800	2
49	Lack experienced consultants	0.675	5
50	Different consultants for design and supervision	0.733	3
VIII Material related Factors			
51	Change in material specification	0.717	5
52	Escalation of Material Price	0.742	4
53	Shortage of material estimation	0.750	3
54	Inaccurate material estimation	0.792	1
55	Dependency on imported construction materials	0.783	2
VX Financial related Factors			
56	Cost Under estimation	0.758	1

57	Fluctuation in money Exchange rate	0.708	2
58	Lack of financial management planning	0.700	3

After calculation of the mean score RII of responsible parties, the contribution of each of the factors to over all delay were examined and ranking of factors in terms of their criticality as perceived by the respondents was then made by use of mean score of their RII. Taking the mean score of the relative importance index of each factor, it was found as indicated in the table below. Accordingly, table 4.6 indicates the mean score and rank of RII importance of responsible parties which cause time and cost overrun in AADRUP.

Table 4.5: Mean score and rank of factors causing time and cost overrun from questionnaire survey

S/No	Factors Affecting Time and Cost Overrun	Mean Score	Rank
1	Project related Factors	0.81	1
2	Owner related Factors	0.74	4
3	Contractor Related Factors	0.71	7
4	Consultant Related Factors	0.72	6
5	External Related factors	0.62	9
6	Labor and Equipment Related factors	0.68	8
7	Contract Management Related Factors	0.75	3
8	Material related factors	0.76	2
9	Financial related factors	0.72	5

Source: own calculation, 2020

1) Project Related factors

The results of analysis on the causes of project related delay factors revealed that man power and equipment followed by project size with relative importance index of $RII = 0.858$ and $RII = 0.825$ are the most influencing factors for delay of AADRUP according to respondents view. This project is an USD 162,168,370 which they believe needed experienced project managers, coordinators, consultants and contractors who know how to track project progress and mitigate when it needs to be. Even though respondents did not give due attention ($RII = 0.783$) to project scope definition as a cause contributing to the project implementation delay and cost overrun, a discussion with project manager and contract administration staffs showed that AADRUP has problem of scope definition from the begging which forced redundant interruption of the project till agreements were achieved between owner and contractor. They mentioned that negotiation was made between these parties to settle the issue of customer service drop, low voltage poles installation and abandoning of the automation system and incorporating more than 200 KM medium voltage line extension instead. The project was conducted in Addis Ababa city where horizontal communication with other stakeholders like AACRA, AAWSA and city municipality to avoid right of way issues which hinders progress of project and delayed project implementation. And hence project location with $RII = 0.792$ also contributed much for time and cost overrun.

2) Owner related Factors

The results of analysis on the causes of owner related delays factors revealed that frequent design change ($RII = 0.7175$) and increase in scope are the factors that always happens in AADRUP project. Sadi Assaf et al. (2006) identified seventy three causes of schedule delay exist in Saudi construction projects. They found that the most important causes of schedule delay as seen by contractors were: delay in progress payments by owner, late approving design documents by owner, change orders by owner during construction. Poor communication and coordination by the owner to act on the issues raised by the contractors timely leads delay in project performance which in turn exposed to cost overrun by raising administration costs, increase in inflation in currency exchange rate. Scarcity of finance to complete a project, and/or delays in effecting progressive payments for services rendered by contractors lead to delays in the projects. Delays on progressive payments sometimes provoke the contractor to claim for interest rates. As many of the power distribution contractors in Ethiopia are young and inexperienced TVET graduates, they face difficulties to bear the daily construction costs if the progress payments are approved/released late. The respondents agreed that slow decision is the common phenomena of AADRUP management.

Most of the cost and time overrun seen on the projects are the results of sluggish decision making by the management. Abdalla et al. (2002) noted that slow decision making by owner contribute to causes of delays in project implementation.

3) Contractor Related Factors

More than 162 subcontractors were participating in the project when the project was started. However, most of them were newly established and had experienced financial problem with RII= 0.8 and drop out through time and as of now only 15 selected subcontractors are left. Therefore, financial or cash shortage of contractors played significant role in implementation delay and cost overrun. This finding is in coinciding with the findings other research works such as Mahamid (2011) mentioned that the financial status of a contractor is one of risk factors to time overrun which need to be controlled and reduced. Alaghbari et al. (2007) also found financial problems by contractor as the most significant factor in causing time overrun and second rank in top ten ranking which show that this is very important factor that should be given a serious attention. Poor performance and inadequate scheduling and planning of subcontractors with RII= 0.775 and RII= 0.750 contributed the most to time delay and cost overrun according to respondents. Therefore, contractor's ineffective planning, lack of proven experience, low capital and less understanding of the project schedules are factors that bring delays in project implementation.

4) Consultant Related Factors

Unrealistic project duration or time estimation with relative importance index value of RII= 0.825 and slowness in giving instruction with relative importance index value of RII = 0.758 are the most contributing factors that causes delay and cost overrun consultants did in AADRUP. According, to respondents there is no employed consultants who had experience in consulting such a huge project contracted by foreign contractor. The consultant lacks experience and they are simply approving report submitted by the contractor than evaluating contractor's performance as per plan and approved drawings.

5) External Related factors

Government regulation with relative importance index value of RII=0.667 and unfavorable weather conditions with relative importance index rate of RII=0.567 are among the most important factors causing delays of power distribution construction projects.

6) Labor and Equipment Related factors

Employee turnover specially in the management level with the relative importance index value of $RII=0.750$ and Maintenance cost of machinery and high transportation costs with relative importance index value of $RII=0.667$ and $RII = 0.658$ contributed a lot for the delay of the projects.

7) Contract Management Related Factors

The project scope is changing time to time randomly. The project office is not properly following and analyzing change and change requests, why changes are needed due to lack of experience. During planning stage automation and integration of five substations were among the core activities the project defined in its scope. However, through time the automation and integration of distribution system is abandoned and replaced by extension of nearly 200 km medium voltage line. For these reason, respondents agreed that Change in scope of the work with relative importance index with $RII= 0.842$ is one of mentioned cause of delay for project implementation and cost overrun.

8) Material related factors

Inaccurate material estimation relative importance index factor of $RII=0.792$ followed by dependence of imported material with relative importance index factor of $RII=0.783$ are the factors that bring delays in the implementation of AADRUP.

9) Financial related factors

From the analysis it showed that causes which contributed to delay related to financial factors are cost under estimation with relative importance index value of $RII= 0.758$ followed by fluctuation in money exchange rate with relative importance index value of $RII = 0.708$ perceived by respondents as the most decisive factors that contributed to the delay project implementation and as a result cost overrun of the project.

According to the respondents' ranking, 11.3% originated by the owner, 10.9% originated by contractors, 11.6% originated by material, 9.5% originated by external factors, 11.1% originated by consultants, 10.4 % originated by labor and equipment related factors, 12.5 % originated by Project Related factors, 11.5 % originated by Contract Management Related Factors, 11.1 % originated by Financial related factors. The respondents showed that 33.7% of the delay causes were owner related factors, contractor/TVETs related factors and Contract Management Related Factors. To decrease the delay time and reduce cost over runs of the distribution construction projects, the most important player of the delay (owner and contractor related including contractual issues) need to be addressed. Ramabathan et al.

(2011) stated that mismanagement of the project by contractor, consultant and owner will lead to time overrun. Bad weather conditions; fluctuation in raw material prices and fossil fuels; delay in dealing with land and property acquisition causing delay to construction work; the distance between each project site posed challenges in logistic planning to distribute the resources; and reworks due to poor quality work standards.

4.5. Performance and cost efficiency of AADRUP

Performance and cost efficiency of AADRUP project was analyzed from desk study by using Schedule Performance Index (SPI) and Cost Performance Index (CPI) from current financial report of the project is presented as follows.

4.5.1. Schedule Performance Index (SPI)

SPI is accepted by most projects when more work was completed than was planned. If SPI is greater than 1.00 expected performances is better. However, as indicated in Table 4.5 SPI for AADRUP Project indicates 0.983 as of today. This implies that AADRUP had a rate of poor performance and only progress at 0.983 of the rate planned work after four years of the project started.. This indicates that less work was completed than was planned. A discussion with the project manager, project engineer and other staffs also showed because of time overrun, client incurred high cost of payment for office rent ,work follow-up and increase in money exchange rate. Contractors incurred overhead costs, cost of extension of performance due to delay of construction.

4.5.2. Cost Performance Index (CPI)

Projects are said to be in good performance financially when CPI is greater than 1.00. It indicates better performance than expected. However, as depicted in Table 4.5 CPI of AADRUP was found to be 0.954 as of today. This result implies that AADRUP had a rate of poor performance and utilized above the budget and has a negative cost variance. As a result investing additional one USD has a loss of USD 0.954. According to the discussions with project manager, the project losses the above mentioned USD because of poor scope definition, weak of cost planning, lack of proper monitoring and control of resources and additional works. However, according to the project manager as the cost of the project was fixed loan signed between Exim bank of China and ministry of finance and development of Ethiopia the contractor agreed to cover all the deficit of budget required to complete the project. Therefore, the contractor bears all the additional costs without claiming to the client.

Table 4.7 Schedule and cost performance index of AADRUP

S/No	Planned Value (PV) in USD	Work Performed %	Earned Value (EV) in Birr	Actual cost (AC) in Birr	SPI= EV/PV	CPI= EV/AC
1	162168370	98.3	159,411,507.7	167,176,213.6	0.983	0.954

Source: own analysis from surveyed data,2020

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

This chapter includes the summary of major findings, conclusions and recommendations that would help in timely delivery of the future power distribution projects which brings the wishes of EEU into reality. Furthermore, it suggests lessons to be learned for future similar projects. Besides, it provides actionable recommendations for parties which are involved in construction of condominiums. These include the client, contractors and consultants about causes and effects of project delay.

5.1. Summary

The main objective of this study was to identify factors affecting time and cost overrun of the Addis Ababa Distribution Rehabilitation and Upgrading Project (AADRUP). This project was selected because this project showed a huge delay in its implementation time when compared to its baseline plan. This project was planned to be completed in 12 months, but 4 years or 48 months have elapsed with 98.3 % performance. This delay is four times more than schedule baseline. Quantitative method research approach was used to capture quantitative data for the study. Questionnaire and cell phone discussion with project manager and other selected staffs were used to identify the major causes of delay and cost overrun in construction of this project. For the data analysis, descriptive statistics and relative importance index ranking methods were used.

Performance efficiency of AADRUP was analyzed by using schedule performance index, which indicates a rate of poor performance. Performance of this project with its current accomplishment was found to be 98.3 %. This implies that less work was completed than was planned. Cost efficiency of AADRUP was analyzed by using cost performance index. The ratio result depicts that as of today it is 0.954 only. This indicates that AADRUP has a rate of poor performance, utilized above the budget and has a negative cost variance. As per the finding, currently the project is losing USD 0.954 for every USD invested on this project due to wrong or weak cost planning, lack of proper monitoring and control of resources and additional works.

Project related factors, contractors related factors, consultant related factors, owner related factors, labor and equipment related factors, material related factors, external related factors, financial related factors and contract management related factors were identified as a major time overrun and cost overrun factors for the project. From the discussion with the project

manager lack of project management experience of staffs and employee turnover in the client side and freshness of consultant are found to be the main reasons for the scope deviation and under estimation observed in the project. If the contractor did not agree to bear all the additional costs due to scope change and increase, the project might face difficulties in going forward as the cost fixed and cannot be revised.

5.2. Conclusion

From the results of the analysis of desk study and respondents' responses of the questionnaire conclusions are drawn as follow.

- The Addis Ababa Distribution Rehabilitation and Upgrading project suffered with time and cost overruns in its execution and completion. For this power distribution construction project, the actual time overruns is more than 400% of the contract completion time and the cost overrun will be more than 4.39% of the contract completion cost at completion and is 1.03% as of today.
- The first question of the statement problem which needs to be answered in this research was to know level of understanding of project management practice in Ethiopian Electric Utility. After analysis made, frequent Design Change (RII: 0.817) , increase in scope of the project (RII: 0.792) , Poor communication and coordination system (RII: 0.758) has been identified as major causes of time and cost overrun which showed owner or client's poor practice of project management.
- Mean score analysis and result of the relative importance index of categorized major causes indicated that financial problem or cash problem during construction (RII:0.8), poor performance of subcontractors (RII: 0.775), Inadequate planning and scheduling (RII: 0.75), poor site management (RII: 0.717) has been ranked in the first, second, third and fourth position as contractors responsibility; and in the same manner unrealistic project duration or project time estimation (RII: 0.825), ,slowness in giving instruction (RII:0.7758),inadequate quality control procedures (RII: 0. 717) and incomplete drawings and documents(RII: 0.717) are consultants' responsibility that causes time and cost overrun. Similarly change in scope of the work (RII: 0.842),lack experience of project managers (RII:0.80) and lack experienced consultants (RII:0.675) are contact management related factors which are responsibilities of both clients and contractors

- As a limitation to be mentioned is this research focused only on a single project, AADRUP, in Ethiopian Electric utility, through data collected from only this project and main parties (client, consultant and contractors) to conclude the project management practice of the organization.
- Almost all grouped factors causing time delay and cost overrun in AADRUP are positively correlated even though the correlation of some of the factors are not significant.

5.3. Recommendation

Based on the research findings and conclusions drawn the following recommendations were forwarded to stakeholders involved in the project:

5.3.1. Recommendation to owner/clients

- The client needs to avoid slow decision making as much as possible to decrease cost and time overruns resulted from contractors claim (contractual extension, insurance claims, and inflation rate fluctuation). Accordingly, good governance and sound financial management procedure should be properly implemented.
- Reason for employee turnover has to be thoroughly investigated by the client and needs to apply motivational strategies so that the project team have to own the project to maximize sense of ownership that would improve and facilitate construction in timely delivery of the projects to satisfy stakeholders and end users.
- Client has to improve the communication and coordination between the stakeholders. The client has to avoid frequent design change and scope increase to accomplish the project within budget and planned time.
- While selecting the contractors, clients have to make sure that the contractors are not selected based only on the lowest bid. The selected contractor must have sufficient experience, technical capability, financial capability, and sufficient manpower to execute the project.

5.3.2. Recommendation to Consultants

- Incomplete drawings and documents by the consultant is one of main problem in this project. Therefore, the consultant has to improve its capability of preparing workable documents timely.

- Realistic project duration and cost estimation by the consultant will avoid exaggerated time and cost deviation of what is planned and what is actually achieved.
- Quality control , delay in payment preparation and delay in material approval by the consultant has played a significant role in delaying the overall performance of the project and hence due attention to all be given by the consultant.

5.3.3. Recommendation to Contractors

- It is advisable for contractors to improve their planning and scheduling skills using the appropriate scheduling tool and techniques, train their employees to increase their labor productivity and improve mistake during construction so that reworks could be avoided.
- Contractors should not take up the job in which they do not have sufficient expertise.
- Contractors must do their work Properly as per specification to avoid rework due to error.
- Contractors have to provide safe work environment to create conducive work environment to improve sense of ownership, prepare standards for work and pay attention on monitoring and evaluation as well as follow up. To properly utilize advance payments and to manage miss utilization of resources, contractors have to prepare accurate budget schedule management.

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APPENDICES

APPENDIX I

Analysis of data collected from respondents was made using five Likert scales and relative importance index ,RII, to identify causes of time and cost overrun in AADRUP. 1 stands for NS- Not significant, 2 stands for SS- Slightly significant, 3 stands for MS- Moderately significant, 4 stands for VS- Very significant and 5 stands for ES- Extremely significant

S/ N o	Time and Cost Overrun factors	NS (1)	SS (2)	MS (3)	VS (4)	ES (5)	Total	RII	Ran k
1	Project Size			10	22	16	198	0.825	3
2	Project Location			12	26	10	190	0.792	9
3	Project Scope Definition			18	16	14	188	0.783	12
4	Man Power and Equipment		4	6	10	28	206	0.858	1
5	Inadequate Funding of the project	2		20	6	20	186	0.775	14
6	Frequent Design Change			14	16	18	196	0.817	5
7	Increase In Project scope		4	8	22	14	190	0.792	9
8	Selection Of Incompetent Subcontractors	2	8	12	22	4	162	0.675	40
9	Delay In Delivery of Material	2	10	14	14	8	160	0.667	44
10	Inadequate Material Selection Skills and Experience		2	2	34	10	196	0.817	5
11	Slowness Of Decision Making Process		2	20	24	2	170	0.708	32

12	Delay in Payment for completed works		4	26	16	2	160	0.667	44
13	Delays in contractors claim settlement		6	14	26	2	168	0.700	34
14	Poor Communication and Coordination system		4	14	18	12	182	0.758	16
15	Owner Interference		4	18	14	12	178	0.742	23
16	Financial problem or cash problem during construction			16	16	16	192	0.800	7
17	Interest Rate Instability		10	16	20	2	158	0.658	50
18	Poor site Management		8	10	24	6	172	0.717	26
19	Inadequate Planning and scheduling		2	20	14	12	180	0.750	20
20	Poor Performance of subcontractors	2	4	4	26	12	186	0.775	14
21	Delay in work progress and poor labor productivity	2	10	10	18	8	164	0.683	38
22	Shortage and low skilled labor	4	10	10	16	8	158	0.658	50
23	Mistake during construction or rework	2	2	16	22	6	172	0.717	26
24	Inadequate controls experience	2	4	16	20	6	168	0.700	34
25	Poor Communication and misunderstanding	2	14	6	16	10	162	0.675	40
26	Unethical Behavior	4	8	12	14	10	162	0.675	40
27	Incomplete drawings and documents	2	4	16	16	10	172	0.717	26
28	slowness in giving instruction		6	8	24	10	182	0.758	16

29	Under estimation of cost	2		14	22	10	182	0.758	16
30	Unrealistic project duration or project time estimation		6	8	8	26	198	0.825	3
31	Inadequate quality control procedures		16	2	16	14	172	0.717	26
32	poor contract management		14	10	14	10	164	0.683	38
33	Lack of communication or miss communication	10	6	8	12	12	154	0.642	55
34	Delay payment preparation	2	2	20	14	10	172	0.717	26
35	Delay in Material Approval	4	12	8	12	12	160	0.667	44
36	Unavailability or insufficient of water and electricity	4	4	18	16	6	160	0.667	44
37	Unpredictable weather condition	6	12	14	16		136	0.567	58
38	Government regulation and control	2	4	28	4	10	160	0.667	44
39	Bad site Condition	4	4	34	6		138	0.575	57
40	Labor strike	4	12	12	18	2	146	0.608	56
41	High Transportation cost	2	6	22	12	6	158	0.658	50
42	Frequent break down of machine	10		14	16	8	156	0.650	53
43	Maintenance Cost of Machinery	2	6	18	18	4	160	0.667	44
44	High Cost of Machinery	4	4	20	16	4	156	0.650	53
45	Employee turnover	4	4	8	16	16	180	0.750	20
46	Change in scope of the work		4	4	18	22	202	0.842	2

47	Suspension of works	2	2	18	22	4	168	0.700	34
48	Lack experience of project managers			14	20	14	192	0.800	7
49	Lack experienced consultants	2		22	16	6	162	0.675	40
50	Different consultants for design and supervision	2		16	14	14	176	0.733	25
51	Change in material specification	2	10	8	14	14	172	0.717	26
52	Escalation of Material Price	2	2	20	8	16	178	0.742	23
53	Shortage of material estimation	2	4	6	28	8	180	0.750	20
54	Inaccurate material estimation	2		10	22	14	190	0.792	9
55	Dependency on imported construction materials	2		10	24	12	188	0.783	12
56	Cost Under estimation	2	2	16	12	16	182	0.758	16
57	Fluctuation in money Exchange rate	4	4	8	26	6	170	0.708	32
58	Lack of financial management planning	2	12	8	12	14	168	0.700	34

APPENDIX II

Descriptive Statistics from SPSS

	Mean	Std. Deviation	N
Project_Related_Factors	16.29	2.212	48
Owner_related_factors	40.58	6.703	48
Contractor_related_Factors	39.04	8.627	48
Consultant_related_factors	35.81	9.069	48
External_related_factors	15.42	4.094	48
Labor_and_Equipment_Related_Factors	16.88	4.796	48
Contract_Management_Related_factors	19.21	3.513	48
Material_Related_factors	18.92	4.443	48
Financial_Related_Factors	10.83	3.013	48

Appendix III

ST. MARRY UNIVERSITY

SCHOOL OF GRADUATE STUDIES

FUCULTY OF PROJECT MANAGEMENT

Questionnaire Survey

Dear Respondents

The purpose of this study is to obtain information from key informants regarding factors that cause project time and cost overruns at Addis Ababa Distribution Rehabilitation and Upgrading project and develop possible recommendations as a requirement for the completion of master's degree in project management at Saint Marry University. Knowing that you have adequate information and knowledge about the research's topic, I have selected you as one of the respondents of this survey questionnaire. Your voluntary contribution by providing an accurate and reliable information is vital for the success of this study therefore, you are kindly requested to provide a genuine response freely without mentioning your name. The information provided is to be used only for the sake of this study and will be kept strictly confidential.

**Part I: DEMOGRAPHIC CHARACTERISTICS AND
ORGANIZATIONAL INFORMATION**

Instruction: Please circle the letter in the choice to indicate your response.

1. State respondents organizational / company type

A) Client B). Contractor C). Consultant 2.

Respondent's sex

A).Mail B).Female

3. Respondent's designation

- A).Project manager B).Project coordinator C).Project engineer D).Site engineer E) Technician F). Administrative staff G). Other

Please specify if other is chosen.....

4. Respondents educational Level

- A) High school not completed B) High school completed C) TVT D) Diploma
E) First degree F) Second degree G) PHD

5. Respondents field of study

- A) Electrical Engineering B) Civil Engineering C) Human resource D) Management
E) Other

Please specify if other is chosen.....

6. Respondents work experience

- A) 1-4 B) 5-8 C) 9-12 D) 13-16 E) >16

7. Do you use any software package for project planning and time control

- A) Yes B) No

If yes please mention the names of software that you are using.....

8. Do you use any software package for project cost

- control A)Yes B) No

If yes please mention the names of software that you are using.....

PART II: FACTORS AFFECTING TIME AND COST OVERRUN

Indicate the level of significance in affecting time and cost overrun of the AARDUP with respect to the following statements using the Likert scale ranging from 1 to 5 which indicate the level of importance. :- “ 5” denotes that it is extremely Significant, “ 4”denotes that it is Very Significant, “ 3”,denotes that it is Moderately Significant ,“ 2”denotes that it is Slightly Significant, “ 1”denotes that it is Not Significant.

Instruction : Please read all the items thoroughly and put a tick () mark in the space provided under the scale of your choice.

No	Time Over Run Factors	5	4	3	2	1
	Project Related Factors					
1	Project Size					
2	Project Location					
3	Project scope definition					
4	Manpower and equipment shortage					
	Owner's Related Factors					
5	Inadequate funding of project or financial constraints					
6	Frequent design change					

7	Increase in project scope					
8	Selection of incompetent Subcontractors					
9	Delay in delivery of materials					
10	Inadequate managerial selection skills and experiences					
11	Slowness of decision making process					
12	Delays in payment for completed works					
13	Delays in contractors claim settlements					
14	poor communication and coordination systems					
15	owner Interference					
Contractors Related Factors						
16	Financial or Cash Problems during construction					
17	Unstable Interest rate and inflationary increase in material prices					
18	Poor site management					
19	Inadequate Planning and scheduling					
20	Poor performance of Subcontractors					
21	Delay in work Progress and poor labor productivity					
22	shortage and low skilled labor					
23	Mistake during construction / reworks					
24	Inadequate contractors Experiences					
25	Poor communication and Misunderstanding					
26	Unethical Behavior					
Consultant Related Factors						
27	Incomplete drawings and documents					
28	slowness in giving instructions					
29	Depends on the fresher's to be bear the whole responsibility					
30	Under-estimation of costs					
31	unrealistic contract duration or project time estimation					
32	Inadequate quality control procedures					
33	Poor Contract management					
34	Lack of communication and miss communication					
35	Delays Payment Preparation					
36	Delays In material approval					
External Related Factors						
37	Unavailability or Insufficient of water and electricity					
38	Unpredictable weather condition					
39	Government Regulation and Control					
40	Bad site Condition (Location, Soil, etc)					
41	Labor Strikes					
Labor and Equipment Related Factors						

42	High transportation costs						
43	Frequent break down of machines						
44	High Maintenance cost of machinery						
45	High cost of machinery						
46	Employee turnover						
Contract Management Related Factors							
47	Change in scope of work on site						
48	Suspension of works						
49	Lack of experiences of project managers						
50	Lack of experienced consultants or unavailability of competent staff						
51	Different consultants for design,supervision and contract administration						
Material Related Factors							
52	Change in material Specification						
53	Escalation of material price						
54	Shortage of materials						
55	Inaccurate Material estimation						
56	Dependency on imported construction materials						
Financial Related Factors							
57	Cost Underestimation						
58	Fluctuation in money exchange rate						
59	Lack of Financial Management and planning						

If you have any additional issue you want to raise on the causes of time and cost overrun of the Addis Ababa Distribution Rehabilitation and Upgrading project please explain here.....

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