St. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

CAUSES OF DELAYS ON CONSTRUCTION PROJECTS IN ETHIOPIAN ELECTRIC UTILITY ENTERPRISE: THE CASE OF UNIVERSAL ELECTRIC ACCESS PROGRAM

BY

MEAZA ALEMAYEHU

SGS/0154/2007A

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DECLARATION

I, the undersigned declare that this thesis is my original work, prepared under the guidance of Dr. Maru Shete (Associate Prof.). All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

Meaza Alemayehu _____

Name Signature

St. Mary's University, Addis Ababa June, 2017

ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

Maru Shete (PhD and Associate Prof.) _____

Advisor Signature

St. Mary's University, Addis Ababa June, 2017

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Chapter One
Introduction

This chapter introduces the background of the study briefly. It highlights the relevance of factors causing for delay of construction projects and the practice in the ever changing world of electrification construction projects particularly in Ethiopian Electric Utility Enterprise. The chapter also explains the problem statement, objectives of the study, the research questions, significance, scope, and the organization of the study.

1.1 Background of the Study

Delays happen in most construction projects, whether simple or complex. In construction, 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 a project (Assaf and Al-Hejji, 2006). A project consists of a collection of activities delays can occur in any or all of these activities, and these delays can concurrently cause delays in the completion of the project. A project delay is the accumulated effect of the delays in the individual activities. Delay analysis is used to determine the cause(s) of the delay in order to ascertain whether an extension of time should be awarded. An extension of time relieves the contractor from the liability for damages (Lowsley and Linnett, 2006).

The analysis of delays in construction projects is difficult and complicated because of the large number of individual activities that have to be dealt with, even for a relatively simple project. A medium-sized project may consist of hundreds of activities, many of which may take place at different times and with different durations than originally planned (Shi et al., 2001). Some activities may be delayed or accelerated, and such changes may partially or fully, or may not, affect the project completion date. Projects are envisaged and visualized with the foresight of achieving the primary objective of timely completion. Some projects are planned and executed successfully whereas others get delayed due to reasons, some of which are analyzed and evaluated in this dissertation. Delay to projects is considered to be one of the common problems in the construction industry. Delays have a negative effect on the project in terms of performance, time and cost. Thus, it is essential to identify the types of delays that normally occur in a project. The types of delays can be broadly split in two categories of delay by the

client (compensable delays) and the contractor (non-excusable delays). The delays can be identified as critical or noncritical and whether the delay is concurrent or non-concurrent. The identification of the types of delays leads to the reasons of delay.

The reasons for the delays are identified so that the effect on construction projects can be reduced. The reasons for delays are client and contractor related. Unreasonable project scope and inadequate early planning are the prime delays by the client. The client interference and delay in the decision making process also major reasons for delays. The client in some cases delays the design or changes the design leading to various other changes like design related changes to drawings and their approval by the authorities. The contractor had delays related to overambitious estimates and incorrect task assessment which lead to delays and affect the project. In case of lack of task clarity, an inexperienced contractor or subcontractor may unknowingly delay the works (Assaf and Al-Hejji, 2006).

The 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. In fact the lessons leant feedback from projects is a real eye opener and helpful for others to avoid similar issues. 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. The works can then be estimated, allocated and modularized for execution. The issues that can lead to delays need to be escalated, identified and resolved on a priority to ensure that they do not become a reason for delay (Masseb et al 2011)..

In electric energy sector construction projects are done to Generate electricity, for Substation & Transmission line construction & distribution network construction, this study covers the distribution line construction to electrify rural town and villages in the country. Ethiopian Electric Utility Enterprise is established during the split of Ethiopian Electric Power Corporation/EEPCO/ in to two companies Ethiopian Electric Utility Enterprise and Ethiopian Electric Power Enterprise on December 2013 with the purpose to construct and maintain electric distribution networks, to purchase bulk electric power & sell electric energy to customers (Council of Minister Regulation No.303/2013). The case organization in this studies Universal Electricity Access Program/UEAP/ is under Ethiopian Electric Utility Enterprise (Council of Minister Regulation No.382/2016). UEAP is established in 2005 to electrify rural towns

throughout Ethiopia. In GTP I UEAP had a plan to electrify 10,164 rural towns and up to the end of the GTPI 5,542 rural towns are electrified which is 54.6% of the plan (Ethiopian Electric Power 2008).

1.2 Statement of the Problem

In the study of Assaf and Al-Hejji (2006), the problem of delay in construction is a global phenomenon which stated only 30% construction projects were completed within the scheduled completion date and that the average time overrun was between 10% and 30%. The other research indicated that around 80% construction projects in Pakistan faced delays, and only 20% of construction projects were completed within scheduled time duration and estimated cost (Masseb et al 2011). According to Al-Momani (2000) poor design, changes in orders/design, inclement weather, unforeseen site condition, late deliveries are major causes of delay and according to Abubeker Jemal Mustefa (2015) factor that causes delay in the road construction project in Ethiopia was Delay to deliver the site (Right of way problem),Financial problems, Improper planning, Weather condition, unrealistically imposed contract duration.

At the end of GTP I, in August 2015, EEU annual conference was held in Addis Ababa, in which stakeholders including the board of directors and management members participated in the seminar and evaluated the overall performance of the enterprise against the plan. In the assessment conference, the participants identified and forwarded major problems of the enterprises that resulted in high power interruption, project delays, poor customer handling, and unsatisfactory overall performance. The rural electrification project performance report was presented only 54.6% percent achievement which is 45.4% delay of project construction completion (Ethiopian Electric Power 2008). In addition to this the 2007 EC performance report of the Universal Electricity Access Program (UEAP) indicated that there is 64.5% delay of project construction completion for which the causes needed to be studied (Ethiopian Electric Power 2007).

In case of UEAP delays due to contractor's performance, material shortage is raised in different discussion places. However, research was not conducted to assess the cause of delay in Electric Access Program distribution line construction in Ethiopia, the causes needed to be studied, the organization must have identified critically the causes for delay to address the problems properly.

This motivated the researcher to conduct study to identify factors causing delays in Electric access program distribution line construction projects in Ethiopia.

1.3 Research Objective

1.3.1 General Objectives

The general objective of the study is to assess the factors of delay of the projects in the case organization and finally forward suggestions on how to minimize the project delay.

1.3.2 Specific Objectives

The study has the following specific objectives:

1. To assess the extent to which the enterprise is forced to incur additional costs to complete the delayed projects
2. To identify the main reasons of construction delay in UEAP construction project
3. To assess the extent to which managers are flexible to find alternatives to complete the projects on time
4. To identify the methods of minimizing construction delay in UEAP construction projects

1.3.3 Research questions

The major research questions that of this study try to address are;

1. To what extent is the Utility forced to allocated additional resources to complete the delayed projects
2. What are the main reasons for the delay of the electrification construction projects?
3. To what extent the managements of the projects strived to complete the projects within the project schedule?
4. What mechanisms could be recommended to complete projects on time and minimize the delay?

1.4 Scope and Limitation of Study

The scope of this study is limited to assess the factors causing for delay of the electric power distribution line construction projects in Universal Electricity Access Program in Ethiopian Eclectic Utility in GTP I (2011-2015). Because of time and budget constraints, the study focused only universal electric access project offices which has been launched across the country and the researcher assumes to survey all rural town electrification projects regionally throughout the country.

Conceptually, it focused on construction project practices in the company align with project management major activities in project life cycles such initiation, planning, implementation and closing. Finally, the researcher uses critical or non-critical, one of the basic ways to categorize type of delay. 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 (Theodore, 2009). Though it is not natural to state the weakness of a given study at the proposal level, it is being wise to expect some potential risks to the study (Creswell, 2003). During interview, respondents may not tell us their real experience, feeling and behavior. Moreover, qualitative data analysis is the easier said than done and sensitive to subjectivity. Besides, the sample organization is not the only stakeholder in the universal access to electrification program in the nation though it provides a general framework for future studies.

1.5 Significance of the study

The findings of this study have a paramount importance for the following groups. It provides possible recommendations to the program office in effort it would make to minimize project construction delays to ensure project management effectiveness and efficiency. In addition, it is also assumed that it will help the project office knows its strengths and weaknesses to see policy changes needed and review the design and implementation of project management. Moreover, it will serve as a stepping stone for those who are interested to conduct advanced research works in the field under consideration. Obviously, it also helps to enhance the researcher's knowledge in research practices and in the contemporary project management.

1.6. Organization of the Study

The study is organized into five chapters. Chapter one provides a brief background to the study, discusses the research problem, scope and limitation, and significant of the study. Chapter two also deals with the review of related literature of the study. Chapter three presents research methodology to be adopted in the study. The fourth chapter focuses on the presentation, analysis and interpretation of primary and secondary data. Finally, chapter five contains the summary, conclusions and recommendations.

1.7 Operational Definition

For the purpose of this research, 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 a project by more than 10%. The plan to complete UEAP distribution construction projects is eight months and with its 10% incremental it is 0.75 years. When the completion time and cost increases far from the 10%, the delay will be more critical and the community waiting for the power will sever for additional time. The local community is eager to get the power timely and the extended project completion time and additional costs incurred to complete the projects have multiple effects both on the community and government resources. Projects completed delayed from the expected time and with much additional costs have negative effects on next projects on waiting list.

Chapter Two

Review of Related Literature

2.1 Introduction

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 in size, 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 a number of 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 in order to minimize and avoid the delays and increasing cost in any construction project (Ahmed et al., 2000).

2.2 Causes of Delays

Researchers have studied the many causes of delay in the construction industry. Lo et al. (2006) summarized some of the studies that took place from 1971 to 2000 (Table 2.1).

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

Researchers	Country	Major causes of delay
Baldwin et al. (1971)	United States	• inclement weather • shortages of labor supply • subcontracting system
Arditi et al. (1985)	Turkey	• shortages of resources • financial difficulties faced by public agencies and contractors • organizational deficiencies • delays in design work • frequent changes in orders/design • considerable additional work
Okpala and Aniekwu (1988)	Nigeria	• shortages of materials • failure to pay for completed work • poor contract management
Mansfield et al. (1994)	Nigeria	• improper financial and payment arrangements • poor contract management • shortages of materials • inaccurate cost estimates • fluctuations in cost
Semple et al. (1994)	Canada	• increases in the scope of the work • inclement weather • restricted access
Al-Khal and Al-Ghafly (1999)	Saudi Arabia	• cash flow problems/financial • difficulties • difficulties in obtaining permits • “lowest bid wins” system
Al-Momani (2000)	Jordan	• poor design • changes in orders/design • inclement weather • unforeseen site conditions • late deliveries
Lo et al. (2006)	Hong Kong	• 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 Jemal Mustefa (2015)	Ethiopia	• Delay to deliver the site (Right of way problem) • Financial problems • Improper planning • Weather condition • unrealistically imposed contract duration

2.3 Types of Delays

Delays are classified into two different types according to liability: excusable and inexcusable. When the contractor is responsible for the cause of the delay, it is called an inexcusable delay. The contractor cannot obtain a time extension for inexcusable delays. The contractor is also liable for damages incurred by the owner as a result of the inexcusable delay. Theodore (2009) mentioned that there are four basic ways to categorize type of delays:

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

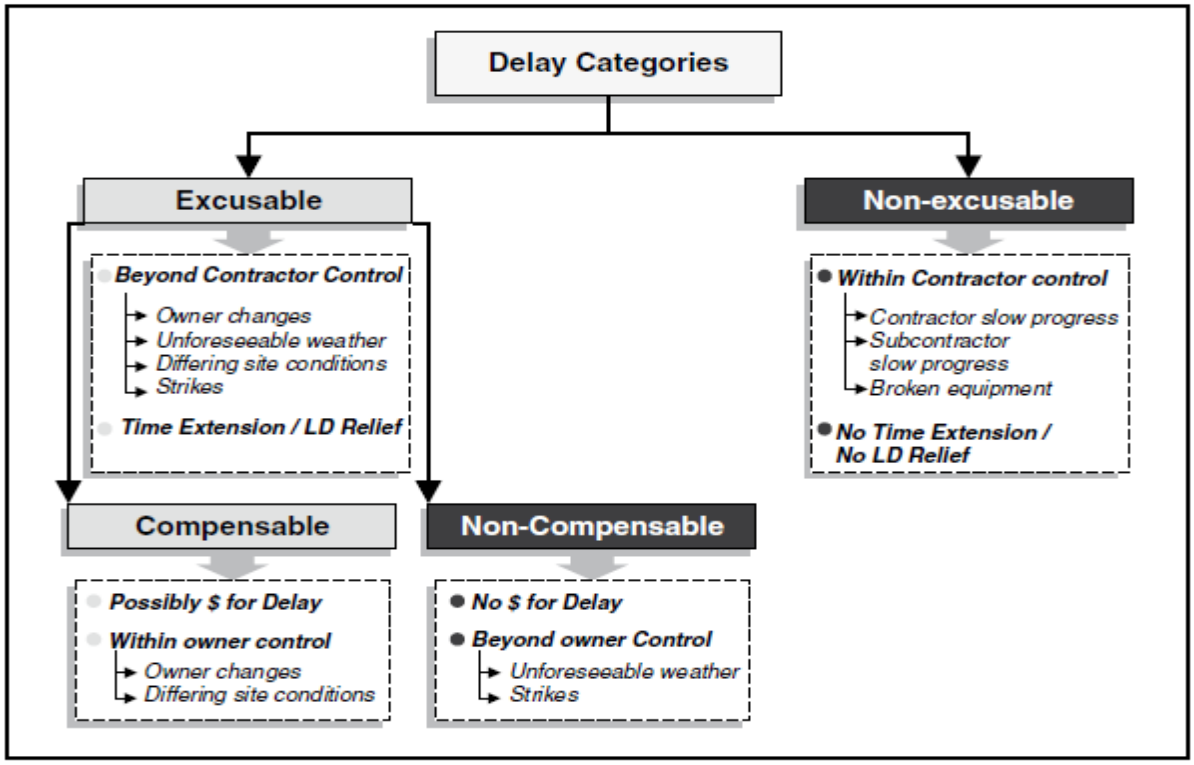

Figure 2.1: Delay Categories (Theodore, 2009:154)

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 delay are concurrent. All delays that are identified in the analysis will be either excusable or non-excusable. Delay 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 which activities truly control the project completion date depends on the following:

a) The project itself

b) The contractor's plan and schedule (particularly the critical path)

c) The requirement of the contract for sequence and phasing

d) The physical constraint of the project, i.e. 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 is a delay that is due to an unforeseeable event beyond the contractor's or the subcontractor's control. These are some examples or non-excusable delays:

- Late performance of sub-contractors
- Untimely performance by suppliers
- Faulty workmanship by the contractor or sub-contractors
- A project-specific labor strike caused by either the contractor's unwillingness to meet with labor representative 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 or not 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.

2.4 Classification of Factor of Delays in Construction Projects

2.4.1 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 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.

Yaw et al (2003) note that planning and scheduling deficiencies, deficiencies in cost estimates prepared, waiting for information, mistakes during construction contribute to causes of delays. Abdallaet al (2002) identify the subcontractor, site management, construction method, improper planning and inadequate contractor experience contributes to causes of delays. Sweis et al (2007) identify the lack of contractor administrative personnel, shortage of technical professionals in the contractor organization, insufficient coordination among the parties by the contractor, delay in mobilization, safety rules and regulations are not followed within the contractor's organization, incompetent technical staff assigned to the project, improper technical study by the contractor during the bidding stage, poor planning and scheduling of the project by the contractor, improper handling of the project progress by the contractor, ineffective quality control by the contractor, use of unacceptable construction techniques by the contractor, financial difficulties faced by the contractor, delay in contractor payments to subcontractors contribute to causes of delay.

There are a lot of factor that were get from previous study about the factor cause the delay in construction project. Most of the researchers agree that are the factor that always happen relate to the contractor:

i. Inadequate contractor experience problems with subcontractors.

ii. Ineffective planning and scheduling of project progress by contractor.

iii. Mistakes during construction.

iv. Delay in mobilization.

v. Incompetent technical staff assigned to the project.

vi. Poor site management and supervision by contractor.

2.4.2 Client related Delays

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

identified the change or variation orders, delay caused by owner, oral change orders by owner contribute to causes of delays. Sadiet 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.

Abdalla et al (2002) note the owner interference, slow decision making by owner, unrealistic impose contract duration contribute to causes of delays. Sweis et al (2007) identified the delays in site preparation, delay in contractor's claims settlements, work suspension by the owner, too many change orders from owner, slow decision making from owner, inference by the owner in the construction operations, delay in progress payments by the owner. There are a lot of factor that were get from previous study about the factor cause the delay in construction project. Most of the researchers agree that are the factor that always happen relate to the client:

i. Inference by the owner in the construction operations change orders by owner during construction owner.

ii. Poor communication and coordination by owner and other parties.

iii. Slow decision making from owner.

2.4.3 Material Supply Related Delays

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

Abdalla et al (2002) identify the poor quality of material and shortage having high influence to causes of delays. Murali et al (2007) identify the shortage in material and quality of material that contributes to causes of delays. Sadietal (2005) 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. Sweis et al (2007) identify the shortage of materials, delay in materials delivery, modifications in materials specifications that contribute to causes of delays. There are a lot of factor that were get from previous study about the factor cause the delay in construction project. Most of the researchers agree that are the factor that always happen relate to the material:

i. Shortage of construction materials in market.

ii. Unpunctually material delivery.

iii. Poor quality of material in construction.

2.4.4 Labor related Delays

Group of labor related delays, one of the groups of causes identified earlier, was commonly cited in the literature that caused of delays. Several factors that related to labor can be distinguished and categorized under the principle cause. The methodology of establishing the factors of this group of causes was similar to that of the material related delays.

Several studies identified the factors of labor related delays. According to Muraliet al (2006) identify the labor supply and labor productivity that contribute to causes of delays. Abdalla et al (2002) identify the labor supply and labor productivity that contributes to causes of delays. Yaw et al (2003) identify 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) identifies the shortage of manpower (skilled, semi-skilled, unskilled labor) and presence of unskilled labor that contribute to causes of delays. There are a lot of factor that were get from previous study about the factor cause the delay in construction project.

Chapter Three

Research Methodology

Research methodology is the step by step procedure used to determine a solution to a particular problem. The methodology adopted in this research provides the procedures that are necessary for obtaining the information needed to structure the research questionnaire, collect data, analyses the collected data, and interpret and present the results.

The research design, population and sampling size, data sources and their collection tools, sampling techniques, data collection procedures and methods of data analysis are presented in this chapter.

3.1 Research Approaches

There are two basic approaches to research: quantitative and qualitative (Leedy *et al*. 2005). The former involves the generation of data in quantitative form which could be subjected to accurate quantitative analysis in a proper and rigorous manner and in the form of a data base from which to realize characteristics or relationships. In quantitative research, samples of a population are studied (observed or questioned) to establish its characteristics, in short, a quantitative approach attempts to produce "real answers" from "hard data", whereas a qualitative approach is concerned with subjective evaluation of opinions, behavior and attitudes. Research in such a situation is a purpose of the researcher's insights and impressions, and the techniques involved are projective techniques, focus group interviews and depth interviews. Qualitative methods are not good at giving direct answers, but are good at developing more questions, because of consistent use of "soft data" (Higgins, 2009). Therefore, in this research both quantitative and qualitative approach is used.

3.2 Research Approach and Design

Research design refers to the plan or organization of scientific investigation, designing of a research study involves the development of a plan or strategy that will guide the collection and analyses of data (Poilt and Hungler, 1985).

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 ended 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. Thus, in order to substantiate their limitations and capture the strength of the two approaches the researcher used both of them together. Moreover, because of descriptive type of research design helps to depict accurately the characteristics of a particular individual, situation and a group (Zikmund, 2003); the research design adopted for this study is descriptive.

3.3 Data Sources and data collection Methods

The researcher used both primary and secondary data sources. The primary data were collected through structured questionnaire and interview. The secondary data were collected from relevant documents, newspapers and magazines of the enterprise that were related to the study. The organization project management manuals and policy documents, newsletters, website and annual reports were used to obtain reliable information that help for the study. For this research, structured questionnaire was designed, distributed and filled by the sampled respondents to collect primary data. Because, the questionnaire survey method is usually cheap, easy to administer to a large number of respondents, and normally gets more consistent and reliable results. The structured questionnaire was employed with five ranking scale. Interviews were conducted with concerned management bodies of the employer and contractors in order to gather the relevant primary data.

The following 3 types of data collection technique were used and a triangulation research method was applied thereby reliable research finding can be produced.

Interview method: Using semi structured interview guide, interviews were conducted with 5 purposely selected interviewees (5 technical employees) to collect in-depth information about their view with regard to the efforts in addressing the factors of delays in constructing distribution projects.

Survey method: Self-administered questionnaires were distributed to 324 sample representative of the total population in order to assess their view as to why the projects of the UEAP are delayed from the contractual period.

Document review method: Different and relevant contracts, amendments, performance reports, contractor's compliant letters, minutes, manuals, etc. will be reviewed to supplement information to be gathered through questionnaire and interview.

Data Collection Procedures

The procedures mentioned below were implemented

- Request the organizations permission to communicate the respective offices.
- The researcher discussed with the organizations respective higher officials by briefing the purpose and benefit of the study.
- Distributing the questionnaire to the selected employees and conducting interview with the respective managers at their work place.
- The researcher has given a week period of time to the respondents in order to have adequate time to fill the questionnaires and collect the questionnaires from each employee.
- Finally, pre-pilot and pilot test will be conducted to determine the reliability and validity of the instruments and for the sake of accuracy

3.4 Population and Sampling

Target population is defined as the entire group a researcher is interested in. According to Zikmund (2003) the definition of population was identifiable total set of elements of interest being investigated 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 is professional staffs who are working in Head Office and regional branch offices of UEAP and the contractors' staff. The sample from the population based on the scope of work is stratifies as follows:

Table 3.1 Respondent Stratification

Sampled Employees			
Name of work place	Scope of work/share of projects (%)	Sample size	**Contractors Sample size**
Head Office		25	0
Oromia, Diredawa and Harari	36	73	34
Amhara	23	47	22
SNNPR	17	35	17
Tigray	9	17	8
Ethio Somali	6	12	6
Afar	4	9	4
Benishangul Gumuz	3	6	3
Gambella	2	4	2
Total		**228**	**96**

Among all work units and project offices of the Ethiopian Electric Utility (EEU), UEAP was selected purposely because the distribution projects are constructed by this program office. The total population size of the research is 530 internal staff and 126 contractors. The researcher used the following formula to calculate sample size with 95% confidence level and 0.05 sampling error are assumed for the equation (Yamane, 1967).

$n= N/1+N (e)^2$

Where N=Population size

n=sample size

e=acceptable magnitude of error.

Based on the equation the total sample size is 324. Among this, 228 are employees and from UEAP head office and regional offices, and 96 are contractors. And for the qualitative information, technical managers of the UEAP head office were selected purposely.

Sampling is the process of selecting a suitable sample for the purpose of determining parameters or characteristics of the whole population. To carry out a study, one might bear in mind what size the sample should be, and whether the size is statistically justified and lastly, what method of sampling is to be used (Leedy, 1997). The researcher used proportional stratified random sampling techniques for the target population to collect primary data through structured questionnaires and interview. Finally, to collect additional information pertaining to reasons of construction project delays, the researcher conducted interviews with project managers in both the owner and the contractors' side.

3.5 Data analysis

First the qualitative data were analyzed using content analysis technique. Content analysis is the process of extracting desired information from a text by systematically and objectively identifying specified characteristic of the text (Smith, 2000 in Hoyle et al. 2002). Finally, analytical generalization was made on the selected theories (their applicability in the Ethiopian context will be commented). More specifically, analysis of qualitative data followed the following procedures recommended by Cress well (2003),

1. The data were read a number of times to identify points that are significant for the study
2. Thematic contents were formulated based on the major research questions
3. Emerging theme titles were listed out on a separate sheet in to find connection between them.
4. A master list of themes was produced and ordered coherently
5. Sub-themes, which go with each master theme, were identified
6. The relevant information was organized under each theme and analyzed.

Then quantitative data were analyzed using Statistic Package for Social Science (SPSS) by use of Relative Importance Index (RII). The contributions of each of the factor to overall delays were 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 was computed using the following equation.

$$RII = \frac{\sum W}{A*N} \qquad (0 \leq RII \leq 1)$$

W – Is the weight given to each factor by the respondents and ranges from 1 to 5, (where "1" is "Not Important/Significant at all" and "5" is "Extremely Important/Significant")?

A –Is the highest weight (i.e. 5 in this case) and;

N–Is the total number of respondents. The results were represented using tables and descriptive statistics such as the bar charts, pie charts.

3.6 Ethical issues

In doing any research, there is an ethical responsibility to do the work honestly and with integrity. The basic principle of ethical research is to preserve and protect the human dignity and rights of all subjects involved in a research project (Leedy and Ormrod, 2013). In this regard, the researcher assured that the respondents' information is confidential and used only for the study purpose. The researcher also committed to report the research findings in a complete and honest manner, without confusing others about the nature of the results. As a general rule, therefore, the study did not raise any ethical anxiety. Moreover, the researcher was dreadfully careful about professional theft (plagiarism).

Chapter Four

Data Analysis

4.1. Introduction

This chapter presents a series of statistical tests and analysis carried out for the factors of each of the sections. These include the causes of delay, effects of delay, the risks of delay as well as ways of mitigating delays. It also presents the results of the questionnaires which were carried out using the Statistic Package for Social Science (SPSS) and Relative Importance Index (RII).

4.2 Questionnaire Distribution and Response Statistics

A total of 324 questionnaires were distributed among the respondents of managers, regional staff and their woreda level staff members and contractors working on UEAP distribution construction projects. The distribution mainly focused to the people working in project owners, contractors and employees. Out of 324 questionnaires distributed, 239 (74%) were returned. There were 71(74%) questionnaires from contractors/TVET and 168(73.7%) were from UEAP employees at all level. Out of the total 168 employees' respondents 36(21.4%), 86(51.2%), and 36(21.4%) are from head office, regional offices and woreda coordination offices respectively and 10(6%) respondents were not stated their work place.

4.3 Vulnerability to delay of UEAP distribution line constructions

During the desk study forty-one distribution line construction projects are selected, relevant contracts, amendments, performance reports, minutes are reviewed and evaluated their planned completion time and actual completion time. The schedule variance shows there is an average 2.39 years' delay on each contract and the rate of time overrun ranges from a minimum of 56% to the maximum of 767% of the contract time. This shows the project is susceptible to delay.

As per the data gathered through questionnaire 232 (97.1%) of the respondents revealed that the distribution projects of UEAP were subject to delay. The vulnerability to delay might result in for cost and time over runs. Most of the projects were expected to service the rural community but the projects could fail to give service timely to the community and the government was also

forced to incur additional cost. Whatever the causes might be, the respondents agreed that the power distribution construction projects of UEAP are vulnerable to delay and from this one can inferred that at large the community expecting the electricity supply is suffering from the delay.

Table 4.1 Vulnerability of projects to delay

		Frequency	Percent
Valid	Yes	232	97.1
	No	5	2.1
	I do not know	2	.8
	Total	239	100.0

Source: Own Survey (2016)

4.4 Delay factors of UEAP distribution line construction projects

As shown in Table 4.2, the factors to the vulnerability to the delay of UEAP distribution projects are as presented in the following order of significance: (1) Material/Logistics shortage(RII=0.7711); (2) Contractors/TVET Capacity problem(RII= 0.6278); (3) Project management in the employer(RII= 0.4990); (4) Feasibility Study (RII= 0.4177), (5) Design Problem(RII= 0.4138),(6) Lack of awareness/Understanding (RII= 0.3341) and (7) Supervision Problem (RII= 0.3253).The following quotation from the respondents reinforce the observations:

> There is no clear feasibility study, design problem which come to the office for approval and causes cost overrun. Awareness on all sides the employer as well as the contractor is needed. But from both side (UEAP and contractors), what is needed? When? At what level? Why? is not clearly put before starting the assignment. The project management of the employer is poor. The ethics of the employees who are participating on the assignment are going out of their assignment. Every contractor is complaining about the ethics of the supervisors. (Interviewee code no. 01on Dec 22, 2016 at Bahirdar)

Material/Logistics shortage (RII=0.7711)

Shortage of materials/logistics received the highest rank than other for the vulnerability of the distribution line construction projects. Material shortage is the most preferred causes as perceived by the respondents that need to be considered in the delay of distribution projects which creates cost and time over runs for the projects. The following quotation from the respondents reinforce the observations: "The major delay is due to material/logistics shortage the project can't be finalized if all required materials are not fulfilled. The required materials are not reached on time and the company took longer time to take action on the delayed contractors, because the company does no fulfill the requirements."(Interviewee code no. 04 on March 22, 2017 at Addis Ababa). A second interviewee code no. 02 on March 9, 2017 at Addis Ababa also explained the following: "Materials/logistics shortage takes the lion share. This is because taking time during procurement and supply UEAP should improve its planning and procurement process."

Contractors/TVET Capacity problem (RII= 0.6278)

The respondents agreed that the capacity problem of the contractors/TVET takes higher rank next to the shortage of materials. The experience, skill and structural arrangement of the contractors have limitations which make then vulnerable to the delay of the UEAP distribution construction projects. The following quotation from the respondents reinforce the observations: "Capacity problem of contractors/TVET is the most cause of delay because most of the rural towns & kebeles that were started many years ago are not energized yet due to their limited capacity."

Project management in the employer (RII= 0.4990)

The respondents also revealed that the project management of the employer with related factor (RII=0.4990) cause to delay because there is no sufficient follow up from feasibility study up to the completion of the according to the set procedure and schedules. The employer lacks proper supervision, timely decision for shortage of materials & contractors request/claims, timely inspection & commissioning of completed projects and dealing & solving of issues related to

local governments. The respondents indicated that UEAP had staffing plan to its projects but no enough engineers are assigned at head office, regions and their woreda coordination offices and therefore the project management at all level is weak.

Feasibility Study (RII= 0.4177)

The respondents also revealed that the feasibility study of the projects is not done properly and it became sources to the delay of the projects. Many towns, villages and kebeles were constructed with the interest of the government and residents by ignoring whether the projects are feasible or not. One the construction is begun, it took years and the community never got power because the projects faced problems due to the feasibility study problems.

Table 4.2 Projects delay factors

Delay Factors	Low(1)	Medium(2)	High (3)	RII	Rank
Material/Logistics shortage	24	57	155	0.7711	1
Contractors/TVET Capacity problem	19	99	122	0.6278	2
Project management in the employer	50	97	81	0.4990	3
Feasibility	38	119	66	0.4177	4
Design Problem	50	111	64	0.4138	5
Lack of awareness/Understanding	73	101	46	0.3341	6
Supervision Problem	74	103	45	0.3253	7

Source: Own Survey (2016)

As it is indicated in the table below, the contractors were also agreed that the material/logistics shortage took the lion share for the delay of the distribution line project constructions. The contractors differed in that they put lack of awareness at the forth step in contrary to the internal staff. The contractors gave slightly less waited to the first and second ranked delay factors that the internal staff.

4.3 Contractor Related Delay Factors

Delay Factors	Low (1)	Medium (2)	High (3)	RII	Rank
Material/Logistics shortage	8	18	45	0.7542	1
Contractors/TVET Capacity problem	5	28	35	0.6325	2
Project management in the employer	18	30	21	0.4468	3
Lack of awareness/Understanding	20	33	18	0.3857	4
Design Problem	13	42	16	0.3310	5
Feasibility	18	41	12	0.2647	6
Supervision Problem	36	28	4	0.1154	7

Source: Own Survey (2016)

As it can be shown in table 4.4 below, the internal staff of UEAP ranked the first three delay factors similar with the contractors. Shortage of materials and capacity problems of contractors stood first and second followed by project management. Even if both the contractors and employees put the first three delay factors similarly, the employees gave more wait to each delay factors than the contractors.

Both the contractors and employees agreed that the delay factors ranked similar with the total respondents.

Table 4.4 Owners Related Delay Factors

Delay Factors	Low (1)	Medium (2)	High (3)	RII	Rank
Material/Logistics shortage	16	39	110	0.7783019	1
Contractors/TVET Capacity problem	14	71	87	0.6258993	2
Project management in the employer	32	67	60	0.5202312	3
Feasibility	20	78	54	0.4792899	4
Design Problem	37	69	48	0.4514107	5
Supervision Problem	38	75	41	0.3954984	6
Lack of awareness/Understanding	53	68	28	0.3076923	7

Source: Own Survey (2016)

As show on figure 4.2 below, out of the total number of respondents 155 (65.7%) indicated that shortage of materials/logistics is inferred as high factor for the delay followed by low capacity of contractors/TVETs. The respondents agreed that the capacity of contractors for the delay of the projects is high

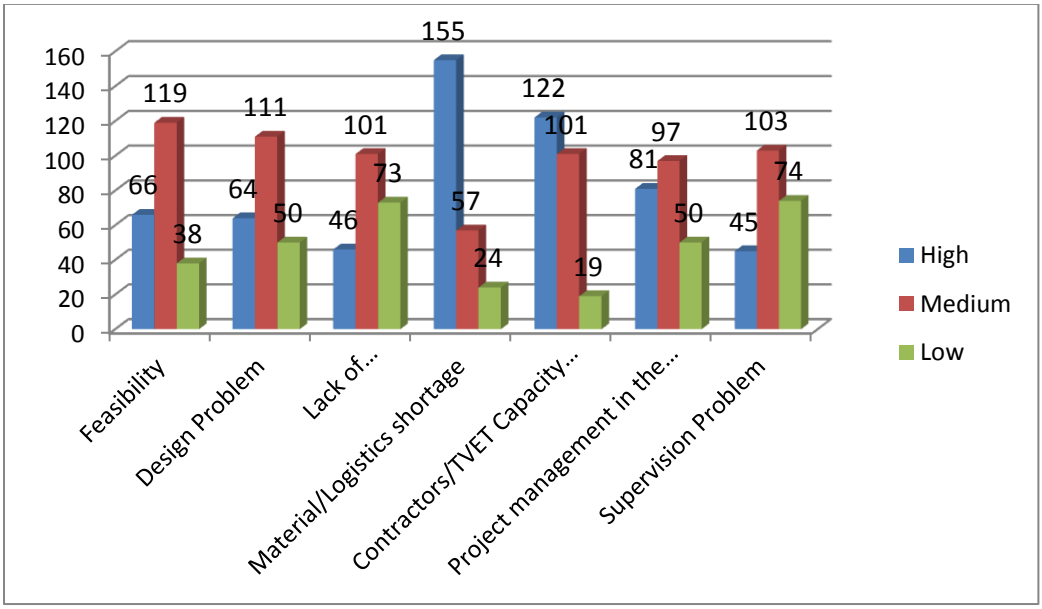

Figure 4.1 Summary for intensity of delay cause

Source: Own analysis from survey data (2016)

4.5 Average delay time of UEAP distribution Construction Projects

As indicated in the figure 4.2 below, 189 (79%) of the respondents agreed that the UEAP distribution construction projects delayed for more than one year. It is known that the community is highly eager to get electric power but 35.5% of the projects were delayed for more than four years. The respondents said that the weather conditions where the projects constructed, the road access of the localities, the incomplete handover of the projects, and the less commitment of local governments are some of the factors for the delay of the projects.

The delay in progress payments, the capacity problems of contractors, the engineering problems, and the material supply problems described as factors to the delay of the projects by the respondents.

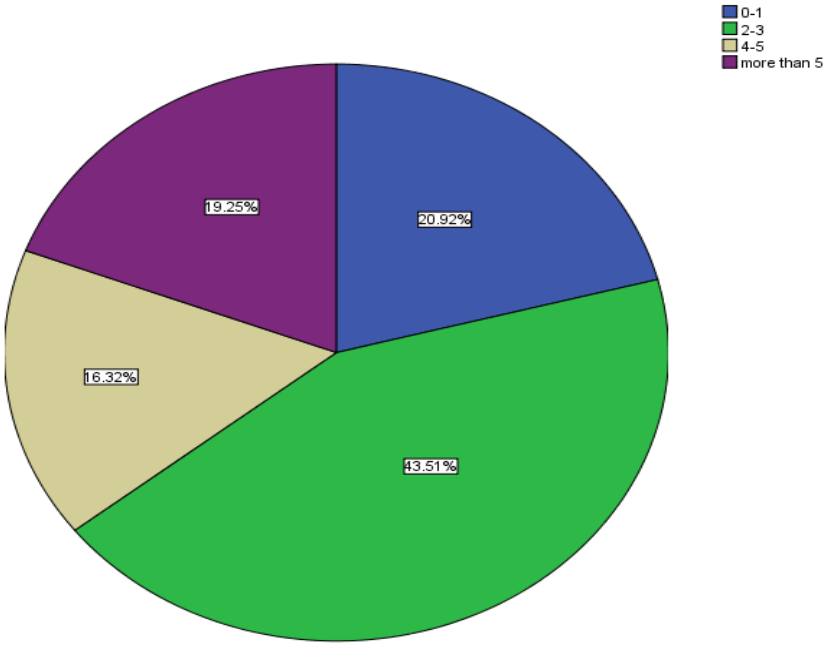

Figure 4.2 Average of delayed time from the planned completion time Source: Own analysis from survey data (2016)

4.6 Stake holders responsible for project delay

The table below shows the key players for the project delay. The most responsible for the delay of the projects is the owner of the projects (EEU/UEAP). 148 (64.1%) respondents revealed that UEAP is the key player for the delay and the contractors also contribute 22.9% for the delay. The community which was expected to be beneficiaries from the projects contributed very minimal for the delay but the most affected party due to the delay. The local governments have their own contribution but comparing to the employers and the contractors, its share is 10%. To construct the distribution projects within the planned time, the problems related to EEU/UEAP and contractors must be resolved.

Table 4.5 Major contributors to the delay

	Frequency	Valid Percent
Contractor/TVET	53	22.9
Village/Society	3	1.3
Regional Government/Woredas	23	10.0
EEU/UEAP(Owners)	148	64.1
Others	4	1.7
Total	231	

Source: Own analysis from survey data (2016)

4.7 The importance and ranking of delay causes by respondents

The distribution construction delay in Universal Electricity Access Program was subject to delays. Delays in distribution construction projects happen because of various factors and causes. These causes are classified in the following groups: (1) Employer related factors, (2) Contractors/TVET related factors, (3) Engineering/Design Related Factors, (4) Material/logistics related factors, (5) External Factors and (6) Labor related factors. In this respect the respondents were asked to rank the importance of delay factors using a five points scale (Extremely Important/Significant, Important/Significant, Moderately Important/Significant, Slightly Important/Significant, and Not Important/Significant at all). Participants were also asked to add in the space provided general comments at the end of the questionnaire. The importance and ranking of delay causes resulted by the research methodology of questionnaire survey and evaluated by statistical formula for each factor group are shown below.

4.8 Delay Factors

4.8.1 Employer Related Factors

Table 4.6 Employer Related factors

Factors	Frequency of Respondents					RII	Rank
	1	2	3	4	5		
Delay in progress payments (Funding problems)	12	35	58	70	65	0.7175	1
Contract Amendment/design modifications (replacement and addition of new work to the project and change in specifications)	8	62	54	64	51	0.6736	2
Slowness in decision making	21	52	54	46	67	0.6717	3
Unrealistic contract period	20	43	64	65	48	0.6650	4
Selecting inappropriate contractors/TVET	16	55	60	61	48	0.6583	5
Improper project feasibility study	18	57	62	50	52	0.6510	6
Lack of incentives for contractor to finish ahead of schedule	23	41	71	65	37	0.6358	7
Poor communication and coordination with contractor/TVET	22	59	56	57	43	0.6338	8
Inadequate planning	18	64	73	41	43	0.6226	9
Inappropriate contractual procedure	18	64	80	52	24	0.6000	10
Delay in approving design documents	33	53	80	48	26	0.5842	11
Unrealistic Contract price	32	61	78	38	29	0.5805	12
Delay in site handover for the contractor	36	68	61	47	30	0.5775	13
Change orders	25	66	84	39	20	0.5684	14
Lack of capable Supervisors	37	67	57	47	30	0.5667	15
Delay in performing final inspection and commissioning	24	59	59	53	25	0.5490	16

Source: Own survey data (2016)

Table 4.6 above represents the results of analysis on the causes of client/employer related delays. Delay in progress payments (Funding problems) (RII=0.7175) is the factor that always happens

in UEAP projects. The overall lack of finance to complete a project, or delays in the progress payments for services by the project owners to contractors can lead to significant financial problems. If the progress payments are delayed, the project costs might be increased significantly beyond the original estimate, and then work on the project may have to be stopped or be delayed until additional funds can be found. Delays on payment may sometimes provoke the contractor to claim for interest rates. As many of the power distribution contractors/TVETs in Ethiopia are young and inexperienced, they got difficult to bear the daily construction costs if the progress payments are late. The delayed progress payment may result in weak cash flow capacity of the contractors/TVETs to cover construction costs because they are not financially sound.

The second common factor ranked by the respondents is "Contract Amendment/design modifications (replacement and addition of new work to the project and change in specifications) with relative factor (RII=0.6736)." is suggested as one of the key important factor causing the delay on power distribution construction projects at EEU/UEAP. The third factor ranked by the respondents is "Slowness in decision making" with relative factor (RII=0.6717). During project construction, issues which need the attention of the management and if timely decision is not given they could result in delay of the project. The contractors might stop work until they get decision from the management and if not they may claim for additional costs and/or time. The respondents agreed that slow decision is the common phenomena of EEU/UEAP management. Most of the cost and time overrun seen on the power distribution projects are the result of slow decision of the management. The lack of timely decision making of the employer results to most of the additional costs and/or time observed.

The slow speed of decision making affects all project teams. The information flow among all project teams was neither timely nor well organized and the decision makers were not clearly identified. Employers were accused of being slow decision making and in many instances contractors waste time in waiting decisions from the employer. Most decision are make in committee and in their nature decisions made by committee are late than individual decisions. The accountability in decision making by committee is less and individuals who are responsible get chance to shift the accountability to committee. Respondents revealed that it is common trend in EEU/UEAP to refer to others and even it is highly difficult to trace where the decision is pended.

The fourth contributing factor for the delay of power distribution projects under UEAP is "Unrealistic contract period" with relative factor (RII=0.6950). There are instances that UEAP management makes construction periods shorter to divert the attention of government and the beneficiary communities. Unreasonably short contract period although the contractor understands that the completion on contract time is impossible, the contractors sign the contracts and later on submits claims. In this situation, the contractors only want to secure a contract and thus agree with an unrealistic contract period imposed by a project owner because they don't want to lose the project. The following narrative show the management is not transparent to customers: "The Company was expected to support TVET and Contractors by effecting their payment timely and providing technical support during the construction time. Instead UEAP is claiming them as they are the major contributor for the delay." (Interviewee code no. 03 on March16, 2017 at Hawassa).

Another Interviewee code no. 05 on March27, 2017 at Addis Ababa said that:

> The management of UEAP is well aware of the project delays. Due to the shortage of finance the management can't purchase materials as per its plan, some of the materials are not produced in the country and procurement from abroad takes long time. The government of Ethiopia should release sufficient budget to solve the shortage of supply, to make construction payment timely and to control the delay. The UEAP management should train regional and woreda coordination office experts to improve the contract management capacity.

Therefore, as we can understand from the above table, employer related delay is a major problem which is commonly happening in the EEU/UEAP distribution projects. According to the respondents, there are different factors to contribute for delay and the factors are different in terms of their importance and frequency to happen. As it is indicated above, the researcher tried to identify, rank and select the sixteen most important and frequently happening delay factors based on the views of owner related factors which is assumed to represent the views of respondents of the power distribution construction projects of UEAP.

4.8.2 Contractors/TVETs Related Factors

Table 4.7 Contractor/TVET Related Delay Factor

Factors	Number of Respondents						Rank
	1	2	3	4	5	RII	
Submit claims with mistakes	18	45	91	60	86	0.876	1
Shortage of Capital	8	24	44	75	89	0.778	2
Inadequate contractor/TVET experience	17	31	64	61	67	0.708	3
Incompetent construction team.	16	29	62	89	43	0.6950	4
Ineffective project planning and scheduling	11	40	67	74	43	0.683	5
Poor communication and coordination between owner and contractor	19	45	61	54	55	0.669	6
Inefficient quality control system	15	46	75	64	34	0.648	7
Poor skill and experience of labor	14	50	85	65	23	0.628	8
Poor site management	30	45	61	63	35	0.624	9
Construction mistakes and defective works	20	45	87	65	23	0.622	10
Inadequate site investigation during site survey	21	53	79	52	30	0.614	11
Rework due to errors	29	64	83	43	15	0.556	12

Source: Source: Own survey data (2016)

The most key factor within the contractor/TVET related factor that cause delay for the distribution construction projects of UEAP was found to be Submitting claims by the contractors with mistakes (RII=0.876). (Table 8) This finding implies that the contractors failed to analyze the projects properly before signing an agreement and this unfortunately leads to errors, carelessness and recklessness during project execution where all these errors manifest and which leads to time and cost overruns when attempt is made to rectify them at a later stage. Besides, the reasons contributing to the delay that couldn't support the claim was Contractor's ineffective planning, lack of proven experience, low capital and less understanding of the project schedules.

As the researcher indicated above, most contractors in this industry are young and lack experience. They sign contracts not lose the task and they request for time and/or cost claims. They tried to shift the reason for the delay to the owners claiming that they didn't start the project on time due to late handing over the site. The second major contractors related factor for the delay of power distribution projects in Ethiopia is "Shortage of Capital of contractors" with relative index factor (RII=0.778). Most of the contractors are TVET which were established with government support and some of them were established targeting these projects. They started the projects with the capital they got from the employer as advance payment. As indicated above there is delay in progress payments to contractors and this scenario made the capital shortage of most contractors.

The third common and frequent factor ranked by respondents is "Inadequate contractor/TVET experience' with the relative importance index value of (RII=0.708). This might traced to the low experience distribution construction contractors/TVET in our country. As most of these contractors/TVETs are inexperienced in the power distribution construction industry, it is normal to think that they may not be strong financially to complete projects on time with the agreed standard. This is a strong indication that financial power of contractors in construction distribution construction projects is so far so important to deliver projects with the required and agreed requirement because the projects are expected to contribute to the lifestyle improvement of the rural communities.

According to the views of respondents, "Incompetent construction team" is ranked as the fourth most important and frequently happen factor to contribute for the delay of power distribution construction projects under UEAP with the relative importance index value of (RII=0.695). As I have indicated above under "Inadequate contractor/TVET experience", power distribution construction contractors in Ethiopia are young, weak structural arrangement and imminent. Ethiopians as a society are leaning through trial and error in different aspects as many things are being started very lately. The Ineffective project planning and scheduling with Relative index rate (RII=0.683) contractors related factor ranked fifth delay factor for the UEAP distribution construction projects. The contractors start construction without proper planning and scheduling. The contractors tried to plan and check the schedules once they faced real problems.

The other factors stood from 6th to 12th also have their own contribution for the delay of the distribution projects and both the employers and the contractors need to give due attention.

4.8.3 Engineering/Design Related Factors

Table 4.8 Engineering/Design Related Factors

Factors	Number of Respondents						Rank
	1	2	3	4	5	RII	
Design errors and omissions made by designers	18	68	64	47	44	0.647	1
Design changes by employer or his representative during construction	18	65	62	44	44	0.627	2
Poor use of advanced engineering design software	27	56	61	50	38	0.614	3
Lack of design team experience in distribution construction projects	34	48	63	51	37	0.608	4
Mistakes and delays in producing design documents	19	60	85	46	24	0.599	5
Unclear and inadequate details in drawings	26	64	64	50	29	0.593	6
Incomplete project design	33	56	65	44	34	0.591	7

Source: Own data (2016)

The results of the questionnaire survey showed that, the most important and highly ranked Engineering/Design Related Factors related delay causes in the construction of power distribution UEAP projects, are Design changes by employer or his representative during construction (RII=0.647), Design errors and omissions made by designers (RII=0.627), Lack of design team experience in distribution construction projects (RII=0.608), Mistakes and delays in producing design (RII=0.599), Unclear and inadequate details in drawings (RII=0.593), and Incomplete project design(RII=0.591).

4.8.4 External Related Factors

Table 4.9 External Factors related Factors

Factors	Number of Respondents						Rank
	1	2	3	4	5	RII	
Inadequate production of raw material in the country	15	35	48	55	82	0.731	1
Poor site conditions (location, ground, road status etc.)	14	56	74	52	39	0.639	2
Price fluctuations	18	62	67	53	34	0.620	3
Unfavorable weather conditions	17	67	77	56	18	0.592	4
Project delay due to unplanned/Emergency works	21	79	58	47	29	0.589	5
Delay in obtaining permits from municipality/regional government	27	88	57	41	22	0.551	6
Unexpected geological condition	30	73	72	47	13	0.549	7
Changes in government regulations and laws	67	66	53	28	21	0.489	8

Source: Own data (2016)

As indicated on the table above, Inadequate production of raw material in the country (RII=0.731) under the external related factor is the most important and influential delay causing factor. Concrete pole is the key material required for the projects and this is expected to be produced by local producers. The capacity of these producers is weak and the failed to fulfill the quantity of pole required for the projects. The respondents revealed that Poor site conditions (location, ground, road status etc.) with relative importance index of (RII=0.639) is the second most important factor for the delay of power construction projects under UEAP. Price fluctuations with relative importance index rate of (RII=0.620) followed by Unfavorable weather conditions with relative importance index rate of (RII=0.592) are the 3rd and 4th most important delay factors causing the delays of power distribution construction projects under UEAP.

4.8.5 Labor Related Factors

Table 4.10 Labor related Factors

Factors	Number of Respondents						Rank
	1	2	3	4	5	RII	
Low motivation and morale of labor	21	46	69	41	58	0.659	1
Low productivity of labor	30	47	72	49	37	0.614	2
Slow mobilization of labor	36	78	78	30	12	0.518	3
Absenteeism	52	72	64	32	15	0.503	4
Shortage of labor	56	66	71	33	9	0.492	5

Source: Own data (2016)

The most important and frequently happening delay factor for power distribution construction projects under EEU/UEAP is "Low motivation and morale of labor" with the relative importance index value of (RII=0.659) and the second important labor related delay factor is "Low productivity of labor" with relative importance index value of (RII=0.614). The respondents revealed that the motivation and moral of EEU/UEAP employees is low which contributed a lot for the delay of the projects. From feasibility study to energizing stage of the projects, the roles of the employees is very critical and if the employees failed to support the construction, the projects may be subject to cost & time overruns.

The majority share of work force in Ethiopia is to be taken by young with productive age group of the population. But still, the labor group of the country is regarded as unproductive due to many reasons like the inadequacy of higher education in the country, civilization of commitment in the industry, incentives and low internal development system. Therefore, labor in Ethiopia is good in terms of number but not good in terms of quality. Due to this and other reasons "low productivity of labor" can be taken as an important and frequently happening factor to affect the timely and quality project construction under EEU/UEAP. Slow mobilization of labor (RII=0.518), Absenteeism (RII=0.503), and Lack of design team experience in distribution construction projects (RII=0.608), Shortage of labor (RII=0.492) are labor related delay factors of UEAP distribution construction projects ranked from 3rd to fifth.

4.8.6 Material/Logistics Related Factors

Table 4.11Materials/Logistics Related Factors

Factors	Number of Respondents						Rank
	1	2	3	4	5	RII	
Late delivery of materials	5	36	42	71	79	0.757	1
Shortage of construction materials	9	39	41	55	89	0.751	2
Delay in procurement process	9	34	57	65	64	0.720	3
Weak material requirement plan	14	42	65	52	61	0.689	4
Inefficient utilization of vehicles	13	48	61	72	36	0.661	5
Poor quality of construction materials	15	53	65	60	41	0.650	6
Unqualified/inadequate experienced labor	27	49	70	46	40	0.620	7
Unreliable suppliers	31	57	55	37	47	0.611	8
Changes in material types and specifications during construction	18	61	77	51	26	0.605	9

Source: Own data (2016)

The first material/logistics related delay factor of power distribution projects is “Late delivery of materials” with relative importance index factor of (RII=0.757) followed by “Shortage of construction materials” with relative importance index factor of (RII=0.751).

As we know Ethiopia is a land locked country and that most construction materials are to be imported from abroad and the procurement system of EEU/UEAP is not efficient. To mean Ethiopia is a land locked country, the movement of commodities from inside to outside and from outside to inside of the country should not be smooth and fast. When road construction parties are importing construction materials from abroad, the materials are expected to be waiting at the border to fulfill the necessary importing requirements. Besides to that, when a country is a land locked country, the price of importing materials is relatively high to cover costs for seaports. Like any other project or organization, road construction projects under Addis Ababa city administration must be affected negatively due to these unfavorable scenarios if not more. One more thing which makes supply of materials for road construction projects is inefficient and to be taken as an important factor to contribute for time overrun in asphalt road construction

projects of Addis Ababa city administration is the transportation technology and system of the country. In terms of transportation technology, Ethiopia is believed to be the least due to different measurements like; the country is using cars to transport commodities to make international trades than using modern transportation technologies and it makes the delivery of construction materials for projects in efficient. As shown on Table 4.10 below, from the overall results obtained from the questionnaire response, delay causes that contribute lion shares to the delay of power distribution construction projects are presented in the level severity.

As indicated on the table above, 25 most important factors causing delay in UEAP power distribution construction projects are summarized and presented as per the rank set by respondents. The respondents revealed that Submit claims with mistakes with relative importance index factor (RII=0.876) and Shortage of Capital with relative importance index factor of (RII=0.778) by contractors/TVETs are suggested as the most important delay causing factors on power distribution construction projects under UEAP. This is closely followed by late delivery of materials with relative importance index factor (RII=0.757) and Shortage of construction materials with Relative index factor of (RII=0.751) by employer. Inadequate production of raw material in the country (RII=0.731) by external related factor is set by the respondents as the 5^{th} important delay factor for the distribution construction projects. The respondents ranked Delay in procurement process (RII=0.720) and Weak material requirement plan (RII=0.689) 6^{th} and 10^{th} respectively by material related delay factors as important UEAP power distribution construction projects delay factors.

Delay in progress payments (Funding problems) (RII=0.7175) by employer related factors, Inadequate contractor/TVET experience (RII=0.708) and Incompetent construction team (RII=0.695) by contractor related factors were ranked from 7^{th} to 9^{th} important delay factors of UEAP distribution delay causes. The delay importance rate difference from 11^{th} to 25^{th} is minimal and this shows that even the 25^{th} has major roles for the delay of distribution construction projects.

Table 4.12 Relative Importance factor for most delay factors from overall results

Rank	Delay Causes	RII	Factor
1	Submit claims with mistakes	0.876	Contractor
2	Shortage of Capital	0.778	Contractor
3	Late delivery of materials	0.757	Material
4	Shortage of construction materials	0.751	Material
5	Inadequate production of raw material in the country	0.731	External
6	Delay in procurement process	0.720	Material
7	Delay in progress payments (Funding problems)	0.718	Employer
8	Inadequate contractor/TVET experience	0.708	Contractor
9	Incompetent construction team.	0.695	Contractor
10	Weak material requirement plan	0.689	Material
11	Ineffective project planning and scheduling	0.683	Contractor
12	Contract Amendment/design modifications (replacement and addition of new work to the project and change in specifications)	0.6736	Employer
13	Slowness in decision making	0.6717	Employer
14	Poor communication and coordination between owner and contractor	0.669	Contractor
16	Unrealistic contract period	0.6650	Employer
19	Inefficient utilization of vehicles	0.661	Material
20	Low motivation and morale of labor	0.659	Labor
22	Selecting inappropriate contractors/TVET	0.6583	Employer
23	Improper project feasibility study	0.6510	Employer
24	Poor quality of construction materials	0.650	Material
25	Inefficient quality control system	0.648	Contractor

Source: Own data (2016)

As indicated on the figure below, delay factors based on the overall RII is summarized below. According to the respondents' ranking, 28% originated by the employer, 23% originated by contractors, 17% originated by material, 13% originated by external factors, 12% originated by engineering/design, and 8% originated by labor related factors. The respondents showed that 51% of the delay causes were employer and contractor/TVETs related factors. To decrease the

delay time and reduce cost over runs of the distribution construction projects, the most important player of the delay (employer and contractor related) need to be addressed.

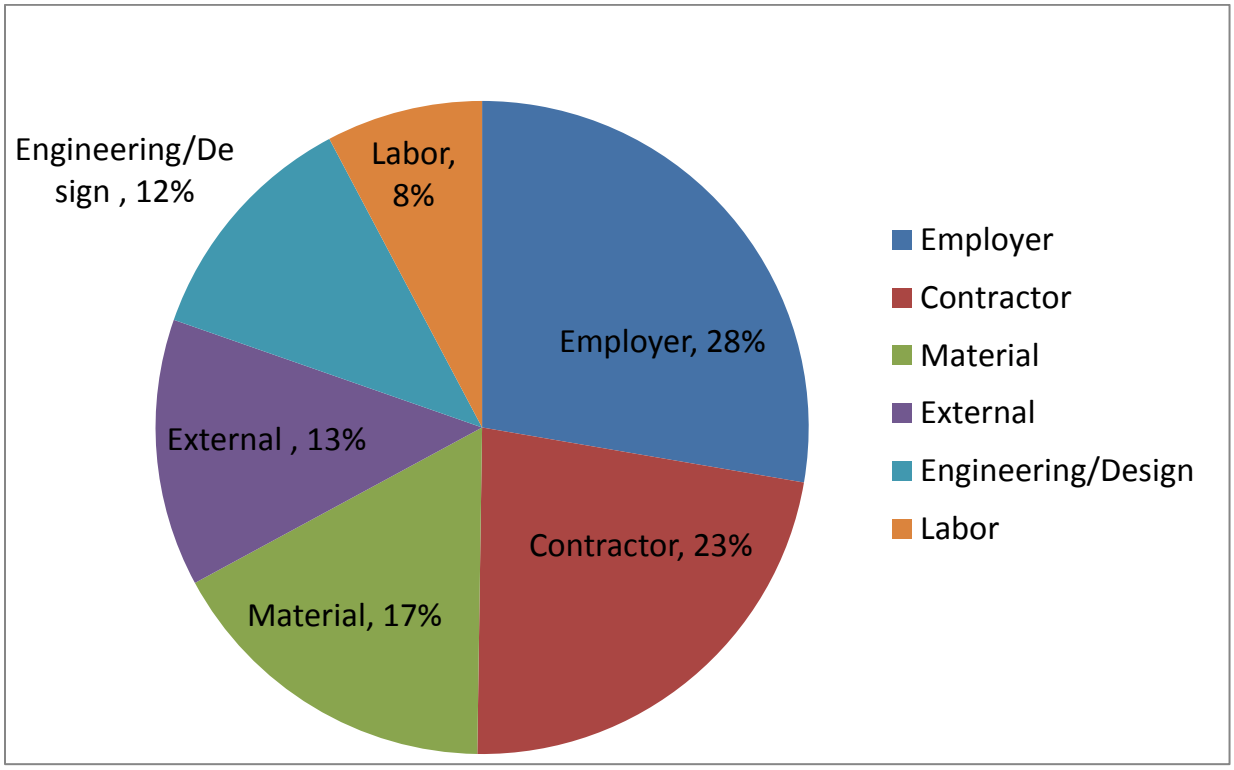

Figure 4.3 Summary Percentage of delay causes by origin factors

Source: Own analysis from survey data (2016)

4.9 Cost overrun and Time Delay of UEAP power distribution line construction Projects

Electric Power construction projects Cost overruns and time overrun (delays) have been critical problems of many projects in Ethiopian Electric Utility (EEU) in general and in Universal Electrification Access Program (UEAP) in particular. One of the objectives of this research is to assess the extent to which the utility is forced to incur additional costs to complete the delayed projects. Like elsewhere in the Ethiopia, construction time delays and cost overruns are common occurrences in UEAP distribution construction projects. Cost overruns and time delays have substantial implications from an economic, social and political point of view. Due to delays in

project implementation, the local communities as well as the economy need to wait longer than is necessary for the provisions of electricity services. Thus, time delays and cost overruns restrict the growth potential of the rural community and affect the strategy to balance the regional development of the country.

Cost overrun is the difference between the final and originally estimated cost of the projects. The estimated costs are defined as budgeted or forecast costs which are made at the beginning of the project to construct a project. Even if the project planning and scheduling process varies with project type, time and country, it is possible to locate for a particular project a specific point in the procedure that could be identified as the time where the formal decision is made to construct the project. Actual cost is real, accounted cost determined at the time of completing a project. UEAP power distribution construction projects are subject to cost overruns and the company is forced to pay additional resource from its limited budget. During desk study forty-one Power distribution construction projects are selected and evaluated their estimated completion time and actual completion date then calculated the rate of time overrun if any. The data was collected via reviewing project documents (contract agreements, and amendments).

4.9.1 Time Overrun

From Table 4.13, it can be seen that the time delay of UEAP projects per project and per region. UEAP projects were delayed from the scheduled time up 3.25 years' projects in Amhara region, 4.42 in Oromia region, 4.62 year is south region and 3.5 years in Tigray. Out of the projects completed beyond their schedule, 38 projects were in the above regions and their average regional schedule variance in Amhara, Oromia, South and Tigray was -1.86, -2.38, -2.71, and -2.53 respectively. The rate of time overrun ranges from a minimum of 56% to the maximum of 767% of the contract time.

The scheduled contract period is 8 months, however as the researcher stated in the operational definition delay is considered if the project is completed beyond 110% of the planned completion period which is approximately 9 months (0.75 year).

In table 4.13 below if the schedule variance is greater than nine months it showed that there is delay and if the schedule performance index (SPI) is greater than one it also revealed that the

project is delayed. The scheduled performance index (SPI) of all studied projects is greater that and this indicated that the projects were delayed significantly.

Table 4.13 Time delay of UEAP projects

ser. No	Contractor Name	Working area/region	Contract Date	Actual completion period	contract period	completion period with acceptable delay time/years	Actual completion time/years	Schedule variance /years	Schedule performance index /SPI
1	HidassieTvet	Amhara	20-Sep-11	15-Oct	8 month	0.75	4	-3.25	5.33
2	BridgetechPlc	Amhara	8-May-09	13-Feb	8 month	0.75	3.75	-3	5
3	Marenta Electro Mechanical(2)	Amhara	16-Oct-12	16-Jul	8 month	0.75	3.75	-3	5
4	Satelight Power Distribution	Amhara	29-Mar-08	12-Jan	8 month	0.75	3.75	-3	5
5	Circuit Business Plc	Amhara	21-Jul-11	14-May	8 month	0.75	2.8	-2.05	3.73
6	Liyu Cooperatives(2)	Amhara	23-Dec-10	13-Sep	8 month	0.75	2.3	-1.55	3.07
7	Arganon Engineering	Amhara	31-Oct-11	13-Nov	8 month	0.75	2	-1.25	2.67
8	BirhanLehulum Electrician	Amhara	3-Jul-09	11-Jun	8 month	0.75	2	-1.25	2.67
9	Edison Electro Mechanical Plc	Amhara	21-Jun-11	13-Aug	8 month	0.75	2	-1.25	2.67
10	Shambel& His Friends Tvet	Amhara	31-Dec-12	14-Dec	8 month	0.75	2	-1.25	2.67
11	WondwesenTadesse Construction	Amhara	19-Sep-11	13-Jul	8 month	0.75	1.75	-1	2.33
12	Ethiopia Tvet	Amhara	1-Apr-13	14-Jul	8 month	0.75	1.17	-0.42	1.56
Average regional time delay						**0.75**	**2.61**	**-1.86**	**3.47**
13	MILESTONE ENGINEERING	B.Gumuz/ Assosa	25-Dec-11	15-Jun	8 month	0.75	3.4	-2.65	4.53
14	AMS ELECTRICAL SOLUTION	Ethio-Somale	8-May-09	13-Aug	8 month	0.75	4	-3.25	5.33
15	Hightec Engineering	Gambela	8-May-09	15-Dec	8 month	0.75	6.5	-5.75	8.67
16	HENOK TILAHUN ELECTROMECHANICAL	Oromia	14-Sep-11	16-Dec	8 month	0.75	5.17	-4.42	6.89
17	SABA ENGINEERING (3)	Oromia	8-May-09	13-Jun	8 month	0.75	4	-3.25	5.33
18	DODI ENGINEERING(2)	Oromia	7-Jul-09	13-Jun	8 month	0.75	3.8	-3.05	5.07
19	ABEL SEYOUM ENGINEERING	Oromia	19-Sep-11	15-Jun	8 month	0.75	3.67	-2.92	4.89
20	BIRUK BELAY ELECTROMECHANICAL (3)	Oromia	5-Sep-11	15-Jun	8 month	0.75	3.58	-2.83	4.77

21	SHIMELES & FAMILY DRILLING & CONSTN WORK	Oromia	12-Jan	15-Jul	8 month	0.75	3.4	-2.65	4.53
22	YEDABERE ENGINEERING	Oromia	31-Mar-11	14-Sep	8 month	0.75	3.4	-2.65	4.53
23	Infineth Solution(2)	Oromia	8-Feb-08	11-Jun	8 month	0.75	3.25	-2.5	4.33
24	Asalta Engineering System Plc	Oromia	6-Jul-09	12-Jul	8 month	0.75	3	-2.25	4
25	Inception Construction & Trading	Oromia	19-Sep-11	14-Aug	8 month	0.75	2.8	-2.05	3.73
26	Solar General Electrical Work Plc	Oromia	29-May-08	11-Apr	8 month	0.75	2.8	-2.05	3.73
27	Lydtco	Oromia	7-Jul-09	12-May	8 month	0.75	2.75	-2	3.67
28	Tower Electromechanical Access Program	Oromia	8-Sep-11	14-Jun	8 month	0.75	2.67	-1.92	3.56
29	Afro Drim	Oromia	13-Feb	15-Nov	8 month	0.75	2.58	-1.83	3.44
30	Boku Electrical & Communication Engineering Plc	Oromia	8-Mar-13	15-Apr	8 month	0.75	2	-1.25	2.67
31	Continental Electromechanical Engineering(2)	Oromia	6-Jul-09	10-Oct	8 month	0.75	1.17	-0.42	1.56
Average regional time delay						**0.75**	**3.13**	**-2.38**	**4.17**
32	Ad-Mire Energy Balance Plc	SNNP	8-May-09	14-Nov	8 month	0.75	5.4	-4.65	7.2
33	Wale Electro Mechanical Works	SNNP	7-May-09	13-Jul	8 month	0.75	4.17	-3.42	5.56
34	Kebde G/Michael Electromechanical	SNNP	30-Dec-10	14-Apr	8 month	0.75	3.25	-2.5	4.33
35	Clue International Trading &EnginPlc(2)	SNNP	24-Dec-10	13-Jul	8 month	0.75	2.5	-1.75	3.33
36	MesayNigussie 7 Friends Electro Mecha	SNNP	11-Apr-11	13-Jun	8 month	0.75	2	-1.25	2.67
Average Regional Time Delay						**0.75**	**3.464**	**-2.71**	**4.62**
37	Semic Engineering & Trading Plc.(2)	Tigray	20-May-10	14-Oct	8 month	0.75	4.25	-3.5	5.67
38	Fersina International Business	Tigray	23-Dec-10	14-Jul	8 month	0.75	3.5	-2.75	4.67
39	YihalemMebrat General Contractor	Tigray	27-Jul-11	15-Jan	8 month	0.75	3.4	-2.65	4.53
40	Haile Gebru Electromechanical	Tigray	19-Jul-11	14-Dec	8 month	0.75	3.25	-2.5	4.33
41	Hadu Electro Mechanical Engineering	Tigray	28-Jan-13	15-Mar	8 month	0.75	2	-1.25	2.67
Average regional time delay						**0.75**	**3.28**	**-2.53**	**4.37**
Average Country level time delay						**0.75**	**3.14**	**-2.39**	4.19

Source: Own data (2016)

4.9.2 Cost Overrun

Table 4.14 below shows UEAP distribution projects with cost overruns. From the desk study a variety of power distribution construction projects of UEAP were surveyed. During the desk study all the documents of each project such as correspondence letters, project report, payment certificate, the contract amount and actual cost were thoroughly investigated. These help to understand the reasons behind each project for cost overrun, and to investigate how the actual cost at completion deviates from the contract amount.

From the table it can be seen that the rate of cost overrun has significant variations for the UEAP distribution construction projects. From the desk study it was found that UEAP projects have the lowest rate of cost overrun with 8% of the contract amount and the highest rate of cost overrun was 389%%. This indicated that UEAP distribution construction projects require additional cost of 8% to 389% to accomplish the project. The average contract cost of the projects with cost overrun is around ten million and fifteen additional projects could be constructed from the additional cost paid to accomplish the surveyed 33 projects. The average cost overrun per region was 35% in Amhara, 53% in Oromia, 34% in Tigray, and 51% in SNNPR and the overall cost overrun was 46%. UEAP paid additional cost of ETB 145.7 million to accomplish 33 projects and this is very huge amount of resources. There are many rural towns, villages and kebeles which are on waiting lists due to the limited resources but in contrary to the demand of the community, the company paid additional costs.

Table 4.14 UEAP Projects Cost Overrun

ser. no	Contractor Name	Working area/region	Contract Amount	Increment due to price change in ETB	Increment due to price change in %
1	Kale Electromechanical Tvet	Afar	7,087,407.72	2,208,330.01	31%
2	Birhan No.2 Tvet(2)	Amhara	8,043,762.89	660,300.50	8%
3	Ethiopia Tvet	Amhara	7,721,044.71	2,087,822.73	27%
4	Edison Electromechanical Plc	Amhara	12,934,775.40	3,537,897.56	27%
5	Shambel& His Friends Tvet	Amhara	3,806,714.83	1,080,216.97	28%
6	Birhan Be Ethiopia	Amhara	5,764,036.09	2,224,349.21	39%
7	YetebaberutTvet(2)	Amhara	18,070,478.12	7,531,431.91	42%
8	Edget	Amhara	1,852,474.95	3,386,576.92	183%

Regional Average Cost overrun			**58,193,286.99**	**20,508,595.80**	**35%**
9	Ams Electrical Solution	Ethio-Somale	16,613,653.20	4,002,526.04	24%
10	Abel Seyoum Engineering	Oromia	20,407,096.27	5,943,158.74	29%
11	TeferaKumsaBelete& Friends	Oromia	9,694,200.28	3,520,716.63	36%
12	Nataniem	Oromia	9,682,036.89	3,539,603.18	37%
13	Biruk Belay Electromechanical(3)	Oromia	26,175,119.75	9,730,750.82	37%
14	Tokuma	Oromia	1,879,335.72	878,158.57	47%
15	Yewodes Engineering	Oromia	13,610,552.30	7,722,870.01	57%
16	Dagne&Mitsilal Electromechanical(2)	Oromia	14,052,170.66	8,738,074.39	62%
17	Mahi-Seid Engineering 8 Trading Plc(2)	Oromia	8,021,162.16	6,402,590.30	80%
18	Dodi Engineering Plc(2)	Oromia	5,124,170.00	6,071,337.33	118%
19	Abdena&Gelgela	Oromia	7,543,770.60	9,236,328.75	122%
Regional Average Cost overrun			**116,189,614.63**	**61,783,588.72**	**53%**
20	Open Tech Intrantional	SNNP	17,860,289.39	1,388,496.46	8%
21	Asteguma International Electromechanical Business Plc	SNNP	9,735,007.09	1,780,877.18	18%
22	Clue International Trading &Engin(2)	SNNP	9,129,280.32	2,181,109.35	24%
23	Raey Rural Electric Lines S.C /Tvet/	SNNP	9,035,571.85	4,597,199.75	51%
24	Katkse Engineering & Trading Plc	SNNP	4,459,395.46	2,380,426.21	53%
25	Platium Engineering	SNNP	11,958,576.90	7,792,372.31	65%
26	MesayNigussie 7 Friends Electro Mecha	SNNP	9,937,912.34	12,274,858.85	124%
27	HibretTvet	SNNP	1,233,678.72	4,794,965.79	389%
Regional Average Cost overrun			**73,349,712.07**	**37,190,305.90**	**51%**
28	YihalemMebrat General Contractor	Tigray	20,394,312.74	2,631,833.78	13%
29	Challenge Electric Power	Tigray	9,917,219.16	1,423,800.21	14%
30	Semic Engineering & Trading Plc(2)	Tigray	9,572,966.03	2,358,585.60	25%
31	Gofer Business Plc	Tigray	6,732,859.58	3,236,347.98	48%
32	Viva Engineering Plc	Tigray	3,996,397.65	2,795,316.20	70%
33	Fersina International Business	Tigray	8,879,704.64	7,537,760.95	85%
Regional Average Cost overrun			**59,493,459.80**	**19,983,644.72**	**34%**
Overall Average Cost Overrun			**330,927,134.41**	**145,676,991.19**	**44%**

Source: Own data (2016)

The researcher further carried out a performance difference analysis between planned and actual performance using the paired t-test analysis for the two project performance indicators such as time and cost. The analysis result presented below shows that, on average the planned project contract period were 8 months (0.67 years), and the actual completion period was 3.14 years. The mean completion time difference between planned and actual was found to be 2.5 years, which is statistically significant at P<0.01. This means that the projects, on average, completed after 2.5 years (delay) of the planned completion period. Similarly, it was found out that the mean planned budget for the projects was ETB 10, 028,095, while the budget at completion was ETB 14,442,549. The mean budget difference between planned and actual used budget was ETB 4,414,454.28, which is again statistically significant at P<0.01. Therefore, the projects, on average, consumed ETB 4,414,454.28 more budget (cost overrun) compared to their planned budget (see table below).

Table 4.15 Paired t-test Analysis Result between Planned and Actual Performance

Performance Indicators	Mean Planned	Mean Actual Performance	Mean Performance Difference	95% Confidence Interval for Mean Performance Difference		t value, 2-tailed (St. Error)
				Lower	Upper	
Time (Years)	0.666years (8 months)	3.145	2.48 (Delay)	-2.82535	-2.13058	-14.42*** (0.17)
Cost (ETB)	10,028,095	14,442,549	4,414,454.28 (Cost overrun)	-5472578	3356330.55	8.49*** (5.19)

*** Significant at P<0.01

Source: Own analysis from survey data (2016)

4.10 Effect of Project Delay on the Society

The objective of the UEAP power distribution construction projects to complete within the budget and time limit specified on the project plan and give electricity service to the community. The projects are expected to play roles in the economic development of rural society and accelerate investments. Commissioning the projects with high quality under the budget and time

schedule is the goals of all projects stakeholders including the owners, contractors and the community. Project construction delay usually results in losses to both contactors and employers. At large the rural village, towns and kebele society is the most stakeholder that affected by the delay of the projects. The effects of delay identified by the respondents were:

The community had the right to get electricity as per the schedule set by the company/government because the government promised to do so but because of the governance problems the community is facing problems due to lack of electricity. The project delay had economic, social and political problems in the country. The projects were expected to be completed as per the time and budget plan and then after generate income so as to contribute to the profitability of the company and support the next distribution projects construction. Ethiopian Electric Utility has social responsibility in addition to its profitability and the organization is losing both its profitability and social responsibility by supplying electricity to the community. The organization has different internal problems which were contributing to the delay of the projects.

The respondents indicated the problems are the employer prepare knowingly over stretched plan to avoid the repeated electricity request of the regional governments & community and therefore some of the projects were known to be delayed from the planning stage, lack of timely response or decision to contractors/TVETs complaints and requests, absence of some power distribution project construction tools and shortage of materials, very long and bureaucratic procurement system, Existence of corruptive employees by considering the material shortage as an opportunity.

One of the factors is structural/decentralization address the command of chain and poor controlling of resources. The project delay mainly started from 2012 where UEAP structure is decentralized. The decentralization was done without proper preparation and conducive structural arrangement. Although decentralization concept is good implementation requires strong management of resources and continued staff development. There is inefficient utilization of logistics such as vehicles, the commitment and efficiency of UEAP staff specially the supervisors is very poor, The staffing structure of the organization is not filled with proper manpower, Repeated change of reporting structure of UEAP (to EEP and EEU) and even now there is no clear demarcation between the two companies.

The projects objective is to minimize the economic activities difference among the villages and town in the country. The projects were expected to contribute to environmental conservation and initiate the economic developments of the communities. Due to the delay of the projects under construction, expectation of other societies on waiting list to get electricity will be delayed and decreases the societies trust on the government, It raises political issues and governance problems, slows economic activities of the societies and aggravates deforestation, create social unrest at the community level, social services had built at community level taking in to consideration the plan of electricity but health facilities, schools and other community level facilities could not give full service due to the delay of power distribution projects and the projects were Increase public complain, the delay challenges the development of the country and the profitability of the company & contractors.

The UEAP office responsibility is to support the contractors/TVETs during the construction of the project and capacitating them so as to complete the projects within the time schedules and allocated budget. Contractors/TVETs were established to construct power distribution projects and get profits. The respondents agreed that due to the delay of the projects has negative effect on the profitability of contractors/TVET. Due to the delay contractors discouraged to continue in the industry, contractors exposed to unexpected cost, most of the contractors/TVETs are almost dependent on the projects and their sustainability is under question, the price is flat rate price adjustment by employer based on inflation is poor, but cost of construction materials and labor is very high from year to year.

The respondents gave opinion which support to alleviate the distribution projects delay in the future; During selection of projects the regional and federal governments should put into consideration of the road access, availability of government institution, the number of households and population the project area, The delay of the projects became top up to some professional because they got chances to corruption and therefore a strong internal controlling system should be established, UEAP has to do in house capacity building in the area of project management, Material and construction quality have to be closely followed up to avoid reconstruction work that can delay the project, Inappropriate utilization of vehicles and delay of material transportation needs due attention by UEAP, Engineering manuals need amendments it should include new scenarios in the work program and best practice of other countries in

distribution network facilities, Master plan of kebeles, towns and villages should be clearly completed to avoid reworks and interruption of projects under construction, the program office should give more attention to the project selection and feasibility study because many projects were initiated depending on the regional state and kebele's interest, the government should give attention for the project by availing sufficient budget for construction and for the supply of materials and logistics, flat rate/fixed price should be omitted which is against the procurement law fixed price affects quality and the interest of potential contractors, so it should be changed to competitive pricing at any cost, poor procurement plan are the common problems which need close follow up and attention by the UEAP management and government, feasibility study has less attention in UEAP project. Enough research and development study will be done in the future in order to have a clear picture of UEAP construction projects. Monitoring and evaluation is also ignored in UEAP. Monitoring and evaluation which give us an output, outcome, lesson learnt, impact of a project which will give us major factor that affect project delay, regional governments change needs such as replacing previously planned work with a new project this results in dissatisfaction of the community and high cost of resource mobilization.

The delay in Universal Electric Access Program Distribution construction is critical and concurrent type of delay the project completion time is highly affected, based on the desk data the project is delayed for an average 2.39 years while the plan is 8 months and both the employer and the contractors has their share for the delay, due to this the employer didn't take action for all delayed contractors. Instead the employer allows price adjustment for those delayed contracts.

Chapter Five

Summary, Conclusion and Recommendation

5.1 Summary of Findings

The research has been undertaken by reviewing literature, which was used to identify the possible variables causing delays in power distribution construction projects. It basically aims to acquire data degree of impact and frequency of occurrence of the identified factors; and effects from their personal comments. After distributing the questionnaire for contractors, managers, and employees who have experience in power distribution construction projects in UEAP, sufficient responses are collected 239 with a response rate of more than 73%, which is well and above the minimum required for conducting the analysis.

Based on the respective importance indices, the factors are ranked separately for delays and the rankings is checked using relative importance index, which result in high values of the coefficient confirming strong agreement among the rankings. With regard to delay factors, the most important causes identified, ranked and compared. The reply from respondents and the desk assessment shows the sector is severely suffering from over extended project delays, affecting the implementation of the country's electricity access development programs and the country's economy by losing investments of the rural areas.

This chapter includes the conclusions and recommendations that would help in solving the occurrence of delay and its effects at the power distribution construction projects of Universal Electrification Program. The general objective of this study was to rank the factors of delay of the projects in UEAP and forward suggestions on how to minimize the project delay. The specific objective was to identify the main factors of delay and cost over runs in Ethiopian Electric Utility (EEU)/Universal Electrification Access program (UEAP) projects. To identify the methods of minimizing construction delay on the construction of power distribution construction projects in EEU/UEAP was the other specific objective.

5.2 Conclusions

Fast economic development for developing countries like Ethiopia is mandatory, hence project construction delay related issues in the power distribution construction industry are sensitive and has multiple effects in the development of the country. Therefore, carrying out a research in this area will have a paramount importance. The main objective of this research is, therefore, to identify and investigate the critical causes and effects of delay in distribution construction projects in UEAP. Questionnaire was used to identify the causes and effects of delays. Managers, employees and contractors were asked to identify the variables of delay factors in UEAP distribution construction projects. Relative importance index and the analysis of the results from the open-ended part of the questionnaire were carried out using descriptive analysis.

The overall result shows that most important of the causes of delay in the power distribution construction projects area originates from weakness observed on the owners. In order to minimize these causes, owners should have an available fund for project and avail necessary construction materials and the capacity of contractors especially TVETs should be improved. Besides, the contractors should be financially sound.

The cost and time needed to construct the projects with quality and schedule of individual project needs to be accurately estimated and any potential project risks that can lead to delay should be adequately identified and managed accordingly. Moreover, the regional governments and UEAP should capacitate the TVET contractors so as to improve the delay of distribution construction projects.

Finally, recommendations are made to substantially minimize the impacts of these critical factors causing delays. Blaming each other on who causes delay is not very helpful and a lot of work is expected to be done by each of the parties (especially the employer and contractor) in order to minimize the problems of distribution construction projects delays in UEAP.

Based on the literature reviews, the results of questionnaire responses and case studies the following conclusions are drawn.

1. Mistakes and discrepancies in design documents, frequent design change and variation order during construction, unclear and inadequate details in drawings, slow response and supervision, poor contract management, inaccurate site investigation and change in material type during construction as owners' responsibility;
2. Delayed progress payment, slow management decision, unrealistic project construction time, change and variation of project costs and prolonged procurement system are also owner's responsibility
3. low capacity, submitting repeated claims, signing contracts without proper investigation of projects, less financial capacity, and poor structural arrangement as contractors'/TVETs responsibility
4. change of town/villages to be electrified, slow handover of projects/towns, poor communication with the project management and less support to capacitate the TVET contractors as government/external responsibility
5. Shortage of budget, shortage of construction materials, wastage & damage of materials, slow mobilization of materials, low productivity of labor, limited production capacity of local manufacturers and availability corruptive employees are also among the key delay factors.

5.3. Recommendations

The problems related to delay are badly affecting the power distribution construction projects in UEAP. All stakeholders (employer, contractors, federal government and regional governments) should work together to achieve successful projects within the stipulated time and budget, and exceed the anticipated quality standard. Especially capacitated contractors/TVETs, construction supervisor' and management should pay close attention from feasibility study to commissioning to keep the construction project on budget and schedule, and play an important role in preventing projects from delay. The regional government and the local community should give due attention to project selection and think strategically to avoid changing of villages or town prioritized to get electricity access.

Therefore, assuring the supply of required material with efficient procurement system, capacitating contractors, availing sufficient fund, improving decision making system and

improving supervision through skilled, competent and trustworthy employer staff and contractors is vital, following are the recommendations which should be given due attention by key players of the power distribution projects to minimize delays.

5.3.1 Recommendations to Contractors

- Contractors should prepare proper plan and achievable schedule using the appropriate scheduling techniques and revise as appropriate before signing the agreement.
- Contractors should apply effective site management system for different activities of the project so as to avoid rework of activities and low labor productivity that will result delays of the projects.
- Contractors should capacitate themselves and move out from short-term planning system. They have to consider each project as a learning institution and improve their capacity through time.
- Contractors should give due attention for time value of money.
- Contractors should carefully estimate the costs during pricing and proper working methodology to be adopted.

5.3.2 Recommendations to EEU/UEAP

Project owners are one of the most important parties who invest their money for realization of the project, and they are the key role players starting from feasibility study through construction up to energizing of the project. The following recommendations are expected from project owner.

- EEU/UEAP should revise the lengthy procurement system, material quality inspection techniques and shortage of finance to avail required materials for the projects under construction. Material requirement plan should also be prepared ahead of time so as to start the projects as soon as the contracts are signed.
- Top management and experts of EEU/UEAP should efficiently and effectively manage the feasibility study and design process to give the best information possible to the smooth implementation of the project;

- Continuous coordination and direct communication with regional governments and contractors/TVET, which will eliminate design and feasibility discrepancies and errors as well as omissions in design.
- Adopt efficient information distribution systems with government and community to create sense of ownership by avoiding communication gaps; make timely decision to contractors/TVET to requests for clarification and claims to avoid associated delays and confusions.
- Owners should allow sufficient time for proper feasibility studies, planning, design, information documentation and selection of contractors. This helps to avoid errors and omissions that consequentially help in avoiding or minimizing delays.
- Fulfill contractual obligations, especially as regards to payment of contractor's works duly executed. Owners should ensure that adequate funds are available before projects are started, so that contractors can be paid in accordance with the contract agreement.
- Select suitable contractors not only on the basis of price and time offerings, but also on experience, financial standing, capacity and expertise.

5.3.3 Recommendations to the Federal and/ Regional Governments

The power distribution construction projects are mainly financed by the government; hence, the government is one of the key role players in the construction of the projects. The following recommendations are expected from regional and federal governments.

- The government should select the town or villages by discussing with local community and the access roads to the project sites must be constructed before the projects begin construction.
- The government must avail sufficient budget to UEAP for the construction of the projects and strive to maintain local community ownership.
- The government should release the approved budget to UEAP as per the annual power distribution construction projects plan and if there is any budget shortage timely information should be disseminating to UEAP so as to revise plans.
- Carry on continuous capacity building programs for contractors especially TVETs. . There must be programs for institutional strengthening and man power development of

the TVET contractors in the areas of power distribution construction because they were established with the support of government.

- Work with financiers to co-finance the power distribution construction projects to overcome problems related with finance.

This finding could help the practitioners in power distribution construction projects to gain better understanding about the problems of delay of projects during construction stage. By taking care of these potential causes in their present and future projects, construction participants can reduce and control the extent of delays. All stakeholders such as the regional & federal governments, community leaders, and TVETs can have chances to discuss the trends of the projects to take care of next constructions.

Further studies are recommended to be undertaken in other areas of power construction projects in order to come up with a nationwide and the industry as a whole mechanism to minimize delays in the general electric power construction industry.

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Appendices-A

Contractor's List

Ser.no	Contractor Name	Working area/region
1	JACON ENGINEERING & CONSTRUCTION PLC	Afar
2	SAFECON ELECTROMECHANICAL WORKS PLC(2)	Afar
3	ABAY ELECTRIC TVET	Amhara
4	AGERSIFTU IFA TVET	Amhara
5	AKIMA TRANSFORMATION	Amhara
6	ALPS GENERAL CONTRACTOR	Amhara
7	ANS ENGINEERING PLC	Amhara
8	ARGANON ENGINEERING	Amhara
9	BIKAT TVET(2)	Amhara
10	BIRHAN BE ETHIOPIA	Amhara
11	BIRHAN LEHULUM ELECTRICIAN	Amhara
12	BIRHAN NO.1	Amhara
13	BIRHAN NO.2 TVET(2)	Amhara
14	BIRHAN NO.3 TVET(2)	Amhara
15	BRIDGETECH PLC	Amhara
16	CIRCUIT BUSINESS PLC	Amhara
17	EDGET	Amhara
18	EDISON ELECTROMECHANICAL PLC	Amhara
19	ETHIOPIA TVET	Amhara
20	FINOT ELECTRICAL WORK VOCATIONAL(2)	Amhara
21	GAMMA ELECTRIC SERVICE PLC	Amhara
22	GOLDEN VISION ELECTRIC CONSTRUCTION ASSOCIATION	Amhara
23	HABESHA ELECTRIC WORK	Amhara
24	HIDASSIE TVET	Amhara
25	KALE ELECTROMECHANICAL TVET	Amhara
26	LAMBADINA ELECTRICAL INSTALLATION TVET	Amhara
27	LIYU COOPERATIVES(2)	Amhara
28	MARENTA ELECTROMECHANICAL(2)	Amhara

29	POWER ELECTRIC VOCATIONAL (2)	Amhara
30	SATELIGHT POWER DISTRIBUTION	Amhara
31	SELAM ELECTRIC TVET(3)	Amhara
32	SENAY ELECTRIC TVET	Amhara
33	SHAMBEL & HIS FRIENDS TVET	Amhara
34	SUNRISE TVET	Amhara
35	TIKIKEL YIMER ELECTROMECHANICAL	Amhara
36	TOSSA ELECTRICAL WORK VOCATION(2)	Amhara
37	WALIYA ELECTRICIAN TVET	Amhara
38	WONDWESEN TADESSE CONSTRUCTION	Amhara
39	YABERHA LEKEWAKIBTE COOPERATIVES	Amhara
40	YETEBABERUT TVET(2)	Amhara
41	YIBELTAL KINE GENERAL CONTRACTOR	Amhara
42	MILESTONE ENGINEERING PLC	B.Gumuz/Assosa
43	HIGHTEC ENGINEERING PLC	gambela
44	JIREN ELECTROMECHANICAL ENGINEERING PLC	Gambela
]45	ABAY ELELCTRIC WORK	Oromia
46	ABAY POWER DISTRIBUTION	Oromia
47	ABDENA & GELGELA	Oromia
48	ABEL DEMISSIE	Oromia
49	ABEL SEYOUM ENGINEERING	Oromia
50	ACCESS ENGINEERING	Oromia
51	ACME ENGINEERING & TRADING CO(2)	Oromia
52	AFRO DRIM	Oromia
53	AGERSIFTU	Oromia
54	ASALTA ENGINEERING SYSTEM PLC	Oromia
55	ASHEBO INTERNATIONAL BUSINESS(2)	Oromia
56	AYNHAKORE BUSINESS PLC	Oromia
57	BIRUK BELAY ELECTROMECHANICAL CONTRACTOR(3)	Oromia
58	BOKU ELECTRICAL & COMMUNICATION ENGINEERING PLC	Oromia
59	CONTINENTAL ELECTROMECHANICAL ENGINEERING(2)	Oromia
60	D.S ELECTROMECHANICAL PLC	Oromia
61	DAGNE & MITSILAL ELECTROMECHANICAL(2)	Oromia

62	DANIEL HIRPA GENERAL CONTRACTOR	Oromia
63	DYNAMIC POWER DISTRIBUTION & CONSTRUCTION GROUP(2)	Oromia
64	ELECTROMECHANICAL ENGINEERING	Oromia
65	ENDALKACHEW KINE EM ENGINEERING	Oromia
66	EQUATORIAL BUSINESS GROUP	Oromia
67	EXTREM ENGINEERING & TRADING(2)	Oromia
68	FAL TRADING G.C	Oromia
69	FORTSCHRITT ELECTROMECHANICAL PLC	Oromia
70	GESEM ELECTRIC & INSTALLATION	Oromia
71	HAWI DEGAGINA ELELCTRIC WORK	Oromia
72	HENOK TILAHUN ELECTROMECHANICAL CONTRACTOR	Oromia
73	IFA UMETA	Oromia
74	IFTI HUNDAF ELECTRIC SERVICE	Oromia
75	INCEPTION CONSTRUCTION & TRADING	Oromia
76	INFINETH SOLUTION(2)	Oromia
77	LYDTCO	Oromia
78	MAHI-SEID ENGINEERING 8 TRADING PLC(2)	Oromia
79	MANDEFROT GETACHEW & ELEC MECHANICAL(2)	Oromia
80	MODCON	Oromia
81	NATANIEM	Oromia
82	PERFECT ELECTRICIAN	Oromia
83	PORTOBELLO BUSINESS ENGINEERING PLC	Oromia
84	RINAH THERMAL COMFORT	Oromia
85	ROOT ELELCTROMECHANICAL ENGINEERING	Oromia
86	SABA ENGINEERING PLC(3)	Oromia
87	SHIMELES & FAMILY DRILLING & CONSTN WORK PLC	Oromia
88	SOLAR GENERAL ELECTRICAL WORK PLC	Oromia
89	TABY ENGINEERING & TEKELEHAIMANOT ASGEDOM TEDLA CONTRACTOR	Oromia
90	TEGA GENERAL TRADING PLC(2)	Oromia
91	TETA ELECTROMECHANICAL ENTERPRISE	Oromia
92	THIGRO POWER CO-OPERATIVE	Oromia
93	TOKUMA	Oromia
94	TOWER ELECTROMECHANICAL ACCESS PROGRAM	Oromia

95	UNITY ELECTRICAL LINE	Oromia
96	VIDA CONSTRUCTION PLC	Oromia
97	WORLDWIDE ENGINEERING	Oromia
98	YEDABERE ENGINEERING	Oromia
99	YEWODES ENGINEERING	Oromia
100	YIHONAL HAIL TVET	Oromia
101	ZEKARIAS TADESSE ELECTROMECHANICAL CONTRACTOR(2)	Oromia
102	AMS ELECTRICAL SOLUTION	Ethio-Somale
103	KERSERAW BENISON G.T	Ethio-Somale
104	AD-MIRE ENERGY BALANCE PLC	SNNP
105	ASTEGUMA INTERNATIONAL ELECTROMECHANICAL BUSINESS PLC	SNNP
106	CLUE INTERNATIONAL TRADING & ENGIN PLC(2)	SNNP
107	DICO TECNOLOGY SOLUTION PLC	SNNP
108	DODI ENGINEERING PLC(2)	SNNP
109	HIBRET TVET	SNNP
110	KATKSE ENGINEERING & TRADING PLC	SNNP
111	KEBDE G/MICHAEL ELECTROMECHANICAL	SNNP
112	MESAY NIGUSSIE 7 FRIENDS ELECTRO MECHA	SNNP
113	OPEN TECH INTRANTIONAL	SNNP
114	PLATIUM ENGINEERING	SNNP
115	RAEY RURAL ELECTRIC LINES S.C /TVET/	SNNP
116	URJILE TVET	SNNP
117	WALE ELECTRO MECHANICAL WORKS	SNNP
118	BETA ELECTRIC POWER COPERATION	Tigray
119	CHALLENGE ELECTRIC POWER	Tigray
120	FERSINA INTERNATIONAL BUSINESS	Tigray
121	GOFER BUSINESS PLC	Tigray
122	HADU ELECTROMECHANICAL ENGINEERING	Tigray
123	HAILE GEBRU ELECTROMECHANICAL & CO. WORK	Tigray
124	SEMIC ENGINEERING & TRADING PLC(2)	Tigray
125	VIVA ENGINEERING PLC	Tigray
126	YIHALEM MEBRAT GENERAL CONTRACTOR	Tigray

Appendices-B

Questionnaire

ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES, MASTER OF BUSINESS ADMINISTRATION

QUESTIONNAIRE TO BE FILLED BY THE EMPLOYER'S AND THE CONTRACTOR'S STAFF

Dear respondent,

I am doing my thesis entitled **"Factors for the delay of Universal Electric Access Program Construction Projects of Ethiopian Electric Utility Enterprise"** in partial fulfillment of the Requirements for the Degree of Master of Business Administration at St. Mary's University.

This survey questionnaire is prepared in an effort to collect data concern on f**actors for the delay of construction projects** in UEAP EEU. In this regard, the researcher seeks your honest and enthusiastic cooperation to fill this questionnaire. The information gathered will remain confidential and be used for the intended purpose only.

Please note that:

1. No need of writing your name.

2. Please indicate your answer by putting "√" mark.

3. Your cooperation to complete and return the questionnaire is highly appreciated.

MeazaAlemayehu

Contact address: Mobile: +251911042492

E-mail: **meazaalef@yahoo.com**

Thank you in advance, for your cooperation!

Part I: Personal Information

1. Respondents work place/Entity

   Head office Region office ☐ Woreda coordination office ☐

2. How many years have you worked for the organization? _____

3. Indicate your area of profession expertise:

Engineering ☐ Accountant/Management ☐ Technical supervisor ☐ Others (please specify) _____

Part II: General Information

4. Do you think UEAP distribution construction is often vulnerable to delay?

   Yes ☐ No ☐ I do not know ☐

5. If your answer is 'Yes', indicate the intensity of the cause for delay.

	High	medium	low rare
Feasibility Problem	☐	☐	☐
Design problems	☐	☐	☐
Lack of awareness/understanding	☐	☐	☐
Material/logistics shortage	☐	☐	☐
Contractor/TVET' capacity problems	☐	☐	☐
Project management in the employer	☐	☐	☐
Supervision problems	☐	☐	☐

6. Among the above which one takes the major share of delay and why?

_____

_____

_____

_____

7. What is the average of delayed time from the planned completion time? _____

8. Who is the most responsible side for construction delays?

   Contractor/TVET ☐ Villagers/Society ☐

   Regional Government/woreda administration ☐ EEU/UEAP ☐

   Other (please specify) _____

Part III: Specific Information

Please indicate the significance of each factor for delays by ticking the appropriate boxes.

5 = extremely significant; 4 = very significant; 3= moderately significant; 2 = slightly significant; and 1= Not significant at all

No		1	2	3	4	5
	Employer (EEU/UAEP) related factors					
9.	Improper project feasibility study					
10.	Contract Amendment/design modifications (replacement and addition of new work to the project and change in specifications)					
11.	Unrealistic contract period					
12.	Unrealistic Contract price					
13.	Change orders					
14.	Delay in approving design documents					
15.	Delay in progress payments (Funding problems)					
16.	Delay in site handover for the contractor.					
17.	Lack of capable Supervisors					
18.	Delay in performing final inspection and commissioning					
19.	Lack of incentives for contractor to finish ahead of schedule					
20.	Poor communication and coordination with contractor/TVET					
21.	Inadequate planning					
22.	Slowness in decision making					
23.	Inappropriate contractual procedure					
24.	Selecting inappropriate contractors/TVET					
	Contractor/TVET related factors					
25.	Shortage of Capital					
26.	Submit claims with mistakes					
27.	Inadequate contractor/TVET experience					
28.	Incompetent construction team.					
29.	Construction mistakes and defective works					
30.	Poor skill and experience of labor					
31.	Ineffective project planning and scheduling					

32.	Poor communication and coordination between owner and contractor					
33.	Poor site management					
34.	Rework due to errors					
35.	Inadequate site investigation during site survey					
36.	Inefficient quality control system					
	Engineering/Design Related Factors					
37.	Design changes by employer or his representative during construction					
38.	Design errors and omissions made by designers					
39.	Lack of design team experience in distribution construction projects					
40.	Mistakes and delays in producing design documents					
41.	Poor use of advanced engineering design software					
42.	Unclear and inadequate details in drawings					
43.	Incomplete project design					
	External related factors					
44.	Changes in government regulations and laws					
45.	Delay in obtaining permits from municipality/regional government					
46.	Project delay due to unplanned/Emergency works					
47.	Poor site conditions (location, ground, road status etc.)					
48.	Price fluctuations					
49.	Unexpected geological condition					
50.	Unfavorable weather conditions					
51.	Inadequate production of raw material in the country					
	Labors related factors					
52.	Low motivation and morale of labor					
53.	Low productivity of labor					
54.	Absenteeism					
55.	Shortage of labor					
56.	Slow mobilization of labor					
57.	Unqualified/inadequate experienced labor					
	Materials & Logistics Related Factors					

58.	Weak material requirement plan					
59.	Delay in procurement process					
60.	Changes in material types and specifications during construction					
61.	Inefficient utilization of vehicles					
62.	Late delivery of materials					
63.	Poor quality of construction materials					
64.	Shortage of construction materials					
65.	Unreliable suppliers					

66. What are the effects of the delays on the project?

_____
_____
_____
_____

67. Do you have any additional point to mention regarding the factors of project construction delays of UEAP?

_____
_____
_____
_____
_____

Thank you very much; your response is highly appreciated.

Key informative interview guideline

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Key informative interview guideline

Using semi structured interview guide interview will be held with five purposely selected managers as key informant to collect in-depth information about the factors of UEAP project construction delays.

1. Among the factors to UEAP project delays, which one(s) you think is the major contributing factor and why?
2. Are manufactures and suppliers repeatedly failing to supply quality materials which are contributing factors to the project delays?
3. Do you think the management of EEU and government gives due attention to UEAP distribution projects to be completed on time?
4. Are the current project delays because of the weak supervision and less responsiveness to decisions by the management of UEAP/EEU?
5. Do you believe that the contactors contribute a lion share to the delays of the projects?
6. Do you believe that there is repeated purchase of poor quality materials and late delivery of materials to project that contributes to the project delays?
7. Do you believe that the management and board of management are well aware about the factors of project delays? If so, why remedial action is not taken for a long period of time?
8. Do you believe that the utility is weak capacitating the contractors to complete projects on time and take remedial action on weak contractors?
9. Do you believe that the regional/Woreda coordination offices are capable to supervise and give technical assistance to contractors? If not, what measures does EEU/UEAP take on those failed to do so?