



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

**“ANALYSIS OF FACTORS CONTRIBUTING TO TIME OVERRUNS OF
ROAD PROJECTS: THE CASE OF ETHIOPIAN ROADS AUTHORITY”**

BY: WONDWOSEN ESHETU

ADVISOR: Dr. TEMESGEN BELAYNEH (PhD)

**JANUARY, 2019
ADDIS ABABA, ETHIOPIA**

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

**DEPARTEMENT OF PROJECT MANAGEMENT
MBA PROGRAM**

**“ANALYSIS OF FACTORS CONTRIBUTING TO TIME OVERRUNS OF
ROAD PROJECTS: THE CASE OF ETHIOPIAN ROADS AUTHORITY”**

BY: WONDWOSEN ESHETU

**A THESIS PAPER SUBMITTED TO ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF PROJECT
MANAGEMENT [MBA]**

JANUARY, 2019

ADDIS ABABA, ETHIOPIA

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

**DEPARTEMENT OF PROJECT MANAGEMENT
MBA PROGRAM**

**“ANALYSIS OF FACTORS CONTRIBUTING TO TIME OVERRUNS OF
THE ROAD PROJECTS: THE CASE OF ETHIOPIAN ROADS
AUTHORITY”**

BY: WONDWOSEN ESHETU

APPROVED BY THE BOARD OF EXAMINERS

Name	Signature	Date
_____	_____	_____
ADVISOR		
_____	_____	_____
EXAMINER (INTERNAL)		
_____	_____	_____
EXAMINER (EXTERNAL)		
_____	_____	_____
DEAN OF GRADUATE STUDIES		

DECLARATION

I declare that this thesis entitled “**Analysis of Factors contributing time overruns on the road projects: case of Ethiopian Roads Authority**” is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged.

Candidate:

Name: _____

Signature: _____

ENDORSEMENT

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

Advisor

Signature

Table of content

Acknowledgments-----	I
List of Acronyms-----	II
List of Tables-----	III
List of Figures-----	IV
Abstract-----	V
Chapter One: Introduction	
1.1 Background of the Study-----	1
1.2 Statement of the Problem-----	3
1.3 Research questions -----	4
1.4 Research objectives -----	5
1.4.1 General objectives-----	5
1.4.2 Specific objectives-----	5
1.5 Significance of the Study-----	5
1.6 Scope of the Study-----	5
1.7 Limitation of the Study-----	5
1.8 Organization of the Study-----	6
Chapter Two: Review of Related Literature	
2.1 Definition-----	7
2.2 Project time overrun-----	7
2.3 Causes of delay-----	9
2.4 Types of delay-----	14
2.4.1 Critical & non-critical delays-----	14
2.4.2 Excusable delay & non-Excusable delays-----	14
2.4.3 Compensable & non-compensable delays-----	15
2.4.4 Concurrent & non-concurrent delays-----	16
2.5 Effects of Delay-----	17
2.6 Conceptual Framework-----	19
Chapter Three: The Research Methodology	
3.1 Introduction-----	20
3.2 Research approach method-----	20
3.3 Research design-----	20
3.3.1 Questioner design-----	20

3.4 Source of data-----	22
3.5 Population of the study-----	22
3.6 Sampling procedure & techniques-----	22
3.7 Methods of sample size determination-----	23
3.8 Methods of data collection-----	23
3.9 Validity & Reliability of the instrument-----	23
3.10 Methods of data analysis-----	24
3.11 Ethical research consideration-----	24
Chapter Four: Data Presentation, analysis and interpretation	
4.1 Introduction-----	25
4.2. Analysis of Case study Projects-----	25
4.2.1 Jimma-Mizan road upgrading project-----	25
4.2.2 Mega- Moyale rehabilitation project-----	26
4.2.3 Sawla-Laska road project-----	27
4.2.4 Koka-Adulala-Debreziet road project-----	28
4.2.5 Zagora-Gassay road project-----	29
4.3 Analysis the Survey Questionnaires-----	30
4.4 population characteristics-----	31
4.4.1 Experience of respondents-----	31
4.4.2 Questionnaire response rate-----	31
4.5 Analysis of the most Important delay causes-----	32
4.5.1 owner related delay factors-----	32
4.5.2 Labor related delay factors-----	33
4.5.3 Contractor related delay factors-----	34
4.5.4 Financial/Economic related delay factors-----	34
4.5.5 Design/Consultant related delay factors-----	35
4.5.6 External related delay factors-----	36
4.5.7 Equipment/Material related delay factors-----	36
4.5.8 The top 15 delay factors from the respondents' point of view-----	37
4.6 Extent of time overruns-----	42
Chapter Five: Summary, Conclusions and Recommendations	
5.1 Summary of the major findings-----	43

5.2 Conclusions-----	43
5.3 Recommendations-----	45
Reference-----	46
Annex A: Questionnaire-----	49
Annex B: Ranking of all identified variables-----	54
Annex C: Summary of Case Study Projects-----	56

Acknowledgements

I would like to express my gratitude to all those who gave me the possibility to complete this research. I am expressing my deepest appreciation and thanks to Engineer Yossef Hailu for his valuable advice, invaluable suggestions, timely comments, and thorough guidance throughout the work of this paper.

I would like to express my appreciation to all individuals who contributed directly or indirectly to this paper and provided the necessary materials and support for realization of this research. Especial thanks are forwarded to contractors, consultants and owners who sacrificed their time in filling the questionnaires.

I would also like to use this opportunity to convey my gratitude to my friends. Without their support and encouragement, I couldn't have this opportunity to complete my study. I also gratefully acknowledge the contributions of all those individuals who had contributed in one way or the other in the realization of this paper.

Finally, I would like to give my special thanks for my family enabled me to complete this work.

LIST OF ACRONYM

<i>EOT</i>	<i>Extension OF Time</i>
<i>ERA</i>	<i>Ethiopian Road Authority</i>
<i>ETCA</i>	<i>Ethiopian Transport Construction Authority</i>
<i>FPM</i>	<i>Fundamentals of project management</i>
<i>IHA</i>	<i>Imperial Highway Authority</i>
<i>IPM</i>	<i>Industrial project management</i>
<i>PM</i>	<i>Project management</i>
<i>PPM</i>	<i>practical project management</i>
<i>RSDP</i>	<i>Road Sector Development Program</i>
<i>MOWUD</i>	<i>Ministry of Works & Urban Development</i>

List of Tables

Table 3.1: Reliability statistics-----	24
Table 4.1: Questioner distribution & response-----	32
Table 4.2: Ranking of owner related factors-----	32
Table 4.3: Ranking of labor related factors-----	33
Table 4.4: Ranking of contractor related factors-----	34
Table 4.5: Ranking of Financial/Economic related factors-----	35
Table 4.6: Ranking of Design/Consultant related factors-----	35
Table 4.7: Ranking of External related factors-----	36
Table 4.8: Ranking of Equipment/Material related factors-----	37
Table 4.9: Ranking of the top 15 delay factors-----	38
Table 4.10: The extent of time overrun-----	42

List of Figures

Figure 2.1-----	19
Figure 4.1-----	31

Abstract

In Ethiopia the number of road construction projects is increasing from time to time. However, it becomes difficult to complete projects in the allocated cost and time. Thus, time and cost overrun are some of the major problems in Ethiopian road projects. Therefore, this research was carried out to dig-out information on the most important factors that contribute time overrun on the road construction projects in Ethiopia. The objective of this study was to identify the causes of delays, based on a study of completed road projects and rate the extent of time overruns of the road construction projects in Ethiopia. The research used purposive sampling technique and analyzed data using SPSS & Relative Importance Index(RII) to rank the delay factors. A total of forty-five factors and seven groups that contribute to the causes of delay. From the investigation study found out that: improper planning, unforeseen site condition, delay removal of obstruction & poor site management as important factors causing delay. The questionnaire survey was distributed to the three main parties of the construction industry; employers (Ethiopian Road Authority), contactors and consultants. Based on the survey findings the top fifteen delay factors contributing to road construction project are, failure to remove obstruction & give site, award project to lowest bid price, improper planning, rework due to errors during construction, low productivity of labor, progress payment delay by owners, design modification, poor site management, inaccurate time estimation, sub-contractor delay, inaccurate cost estimation, low skill of manpower, poor resource management, interference of owner & liquidated damage, ranked from the perception of the stakeholders (owner, consultants & contractors).

Key words, road project, delay factors, Road construction project stake holders, time overrun, causes.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Project management is the process of managing, allocating, and timing resources in order to achieve a given objective in an expedient manner. The objective may be stated in terms of time (schedule), performance output (quality), or cost (budget). It is the process of achieving objectives by utilizing the combined capabilities of available resources. Time is often the most critical aspect of managing any project. Time is the physical platform over which project accomplishments are made (*Adedeji Badiru, Abidemi B. & Adetokunboh Badiru, 2008*).

Time is money; delay in a certain construction project affects time and thus money, which is the lifeblood of any economy. The timely completion of highway construction projects is considered one of the most important factors referring to the project success, as well as the quality and the safety. All around the world many construction projects face one of the biggest construction problems which is the delay, delays differ from a country to another, from a construction project to another and from construction type or cost to another due to every project circumstances (*Sullivan and Harris, 1986*).

The construction industry is an important part of any economy. Infrastructures delivered by the construction industry and its key allies affect economic growth. In fast developing countries, the contribution of construction to the economy is believed to be higher than the global average (*Winch, 2002*).

The construction sector particularly road construction is a very important sector for the development and economic growth of any developing country (*M. Haseeb, 2011*).

G. Ofori, (2006), on his part contends that in spite of the extensive efforts that has been made to improve the performance of the construction industries in many developing countries, the industries in these countries continue to face problems including poor cost, time and quality performance; lack of work opportunities and poor level of professionalism.

Construction is an industry that has a great impact on the economy of all countries. Almost, it is very difficult to think of any development activity that does not involve construction. All infrastructure facilities needed for development such as road, telecom, electricity, power projects, and socioeconomic facilities such as school, hospitals, factories etc.; and the very

neighborhood we live in are all products of the construction industry. The role the construction industry plays in developing countries is quite significant. For example, in many developing countries, major construction activities account for about 80% of the total capital asset, 10 % of their GDP and; more than 50 % of the wealth invested in fixed assets (*Jekale, 2004*).

Public construction projects in Ethiopia are parts of the country's development initiative. It shares considerable amount of the country's scarce financial resources. In Ethiopia, the construction industry is the highest recipient of government budget in terms of government development program. Consequently, public construction projects consume an average annual rate of nearly 60% of the government's capital budget (*MOWUD,2006*).

The construction industry performance has a marked effect both on the economy and on social conditions. This is especially true in developing countries, where much of these infrastructures and service giving industries are lacking. For the development and capacity building of the industry, the role of banks is very crucial. With the availability of funds from international financiers and allocation of budget from the government (either Federal or Regional Government), there are different civil engineering projects under construction in Ethiopia and there are a lot of projects under study to be implemented. Presently, Ethiopia has relatively an extensive program of infrastructure development and it is growing faster. The construction of new roads, high rising buildings, hydroelectric power generating plants, water work projects, Airfields etc. are among the major construction activities to be cited. The quality and standards of the design and construction play a significant role in the successful accomplishment of these investments. When the quality and time of completion of construction works considered, the capacity of the construction firms involved come into picture in developing countries (*Abebe Dinku, 2000*).

Ethiopia is under development and the development of road Construction is vital like any other developing country if not more vital. In Ethiopia many road projects constructed, Ethiopian Roads Authority has tendered and awarded the construction & supervision work of these road projects, under construction and planned to be constructed. But, a very common problem which is affecting almost all road construction projects in the country is the failure to meet the stated/planned completion period. The Government of Ethiopia has well recognized that limited road network coverage and poor condition of the existing road network has been an impediment to economic recovery and economic growth. Therefore, to address the problems in the road

sector; the Government has launched the Road Sector Development Program (RSDP) in 1997. Since then, four phases of RSDP were implemented over the period of 1997 - 2015 and the fifth phase; RSDP V has been implemented since July 2015.

- RSDP I - From July 1997 to June 2002 (5 years' plan)
- RSDP II - From July 2002 to June 2007 (5 years' plan)
- RSDP III - From July 2007 to June 2010 (3 years' plan)
- RSDP IV - From July 2010 to June 2015 (5 years' plan)
- RSDP V - From July 2015 to June 2020 (Ongoing)

However, the mid-term review of RSDP shows that despite the improvement seen in performance and productivity within the sector, there still remains problems of delay and cost overrun of all the road projects. From reports examined on completed road projects, the delay encountered ranges from 20%-30% of the original contract time causing claims for additional costs and extension of time, prolongation costs, consultant fees and overhead costs for the client (ERA) and losses of opportunity costs, losses of revenues/benefits attributed solely to the delay, cost of extension of various bonds (performance bonds and bank guarantees), operational and maintenance costs of facilities to the contractor and finally to the public it creates losses of business opportunities (*ERA, RSDP 20 years Performance Assessment, 2017*).

This research focused on the factors contributing time overrun on the road construction projects in Ethiopia.

1.2 Statement of the Problem

This section of the research states about the motivations (deriving force) to study the selected area. The initiation for the study of this research is largely due to personal observation and low performance of road construction projects in Ethiopia in terms of completion time.

Cost, time, and quality are primary measures of a project's success. This is true, especially for public projects in developing countries, because public construction projects in these countries are executed with limited financial resources. However, the history of the construction industry is full of projects that were completed with significant schedule delay (*Nega, 2008*).

Talukhaba (1999), argues that project delay frustrates the process of development, has an immeasurable cost to the society, and also leads to loss of reputation of the parties involved in the concerned projects. Completing projects on time is an indicator of efficiency, but the

construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it is difficult to see a project is completed within the specified time.

Delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination (*Divya R. & S. Ramya, 2015*). This statement again implies how delay in construction projects has many effects.

The majority of road construction projects in Ethiopia do not get completed within the initial set targets of time. Among the projects undertaken in recent years, most of them are delayed well beyond the expected time for completion and also were required additional budget more than the ones envisaged during the commencement of respective projects. As it is obviously known, Ethiopian Roads Authority representing the Government of Ethiopia manages the substantial portion of the road construction projects in the country. However, most of the projects severely suffering from over extended delays, excessive cost overruns and quality problems (*Fetene Nega, 2008*). Construction delay remains the main problem and there are various factors which affect the accomplishment of projects as planned in this case in terms of time requirement.

Generally, this study tried to analyze and ranking the delay variables in their order of importance and also investigate the delay causes on recently completed sampled road projects administered by ERA.

1.3 Research Questions

The study addresses the following research question

1. What are the factors that causes delay in the road construction projects in Ethiopia?
2. What are the most important factors that causes delay in the road construction projects in Ethiopia?
3. What needs to be done to expedite road project completion?

1.4 Research Objectives

1.4.1 General Objective

Identify the most important delay causes that contributing time overrun on the road construction projects & extent of time overrun in the case of Ethiopian Roads Authority (ERA).

1.4.2 Specific Objectives

- Identify the most important delay factors from the stakeholders (owners, contractors & consultants) view point.
- Investigate the factors causing delay on sample road construction projects in Ethiopia previously completed.

1.5 Significance of the Study

This research is significant in various dimensions; like:

- ❖ Helps to understand the most delay factors in the road construction projects in Ethiopia.
- ❖ Helps to know the extent of time overruns in the road construction projects in Ethiopia.
- ❖ Helps the management of the ERA & responsible parties to take corrective actions to foster project management success in terms of time requirement.

1.6 Scope of the Study

This study is focused on to analyze the delay causes & rate the extent of time overrun on the road construction projects in Ethiopia. The research identified and rank the delay variables in their order of importance and also investigate the delay causes on recently completed road construction projects administered by Ethiopian Roads Authority (ERA). Once the most important delay causing factors are identified, the parties to the projects shall then be able to channel their energies and resources to the specific factors thereby reducing delays to the projects.

1.7 Limitation of the Study

The major limitations of this study are:

- Lack of timely response of some of the respondents for the distributed questionnaires.
- Difficulty to access full documents of delay causes for case study.

1.8 Organization of the Study

This study consists of five distinct chapters. Chapter one deals with the back ground, statement of the problem, research objective, significance of the study and scope and limitation of the research. Chapter two focuses on relevant literature review with the topic, differences and similarities as well as arguments of different writers regarding time overruns, their likely causes, types of delay & the effect of time overruns would be dealt under this chapter. Third chapter presents methodologies used in conducting the study and description of the study area, research design, data sources, target populations, data collection instruments, data collection procedures, methods of data analysis and validity & reliability of the instrument. Chapter four includes the result and discussion of the case study & the study the data collected and analyzed using the data analysis tools. Finally, the last chapter shows the summary, conclusion and recommendation.

CHAPTER TWO

REVIEW OF RELATED LITRATURE

2.1 Definition

A project is a group of tasks, performed in a definable time period, in order to meet a specific set of objectives. The definable time period of projects indicates a definite beginning and end. the end is reached when the projects objectives have been achieved or when the project is terminated because its objective will not or cannot be met, or when the need for the project is no longer exists (*Harvey A. Levine ,2002*).

Project management is the planning, scheduling, and controlling of project activities to meet project objectives. The major objectives that must be met include performance, cost, and time goals, while at the same time you control or maintain the scope of the project at the correct level. The planning process compromises issues like project scope, work brake-down structure, and estimation method for time & cost as main topics. As it is prevailed above project requirements are commonly assumed to be time, quality and cost of a project. Success and failure of any project will be measured by these three requirements. The execution of a project is said to be successful when it is completed within the scheduled time, without exceeding the allotted budget, and according to the specified quality and standards. Therefore, a proper practices of project managerial functions; proper planning of every element of a project, proper execution/implementations including controlling and proper close-up of the project fosters/ enhances project success in terms of the above three principal requirements which is what we call golden triangles of project success. Any deviation in terms of the planned time, quality and cost will lead to argue that the project is not successful or failed to meet its requirement (*James P. Lewis, 1995*).

2.2 Project time overrun

In construction, the word “delay” refers to something happening at a later time than planned, expected, specified in a contract or beyond the date that the parties agreed upon for the delivery of a project(*Pickavance,2005*).

Trauner et al. (2009), describe delay as “to make something happen later than expected or to not act timely”. It is usual for delays to occur on construction projects. According to *Abbas (2006)*, let completion of works as compared to the planned schedule or contract schedule is what is known as delay. Delay occurs when the progress of a contract falls behind its scheduled program. It may be caused by any party to the contract and may be a direct result of one or more circumstances. A contract delay has adverse effects on both the owner and contractor (either in the form of lost revenues or extra expense) and it often raises the contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts.

Time overruns in road construction projects happen because of various causes or reasons. These causes lead to the delay in construction completion, and these delay leads to some negative effects on the construction projects. There are many causes for late completion or delay in road construction projects and several studies have pointed out various factors based on the underlying conditions that the specific study is concerned; that is, for a particular project type, specific location or to a particular project size (*Apolot, et al, 2009*).

According to (*Robert Palles, 1998*), delays occur in every road construction projects though the magnitude varies considerably from project to project. Some projects are only a few days behind the schedule; some are delayed over a year. The complexity of projects, complicated schedules and hair-splitting coordination all contribute to the necessity for this attention to time. Delay and additional cost in a construction projects are an inevitable consequence of the risk and uncertainty associated with the execution of any construction project, which is likely to be unique and prototypical in nature.

Inability to complete a project either by the original planned time or budget, or both, ultimately results in project delay. The social and economic costs of delay can be amazingly high and to a certain extent cannot be absorbed by the industry. When a delay can no longer be absorbed by the owner, it will result in the project being abandoned. Thus, it is important to predict and identify problems in the early stages of construction and diagnose the main causes and implement the most appropriate and economical solutions to prevent further negative impacts of delay (*Pickavance, 2005*).

Lo. Fung and Tung (2006), define delay as the slowing down of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project

In Ethiopia, it is very rare case that road construction projects are completed on the time specified or agreed upon. There are many ERA road construction projects which suffered delay or in some cases suffered suspension or even abandonment (*Adiam Atfraw, 2016*).

2.3 Causes of Delay

A numbers of studies have been conducted to identify important causes of delay in road construction which is common globally. And most of the literatures' discussed here under are conducted on different countries and situations to ascertain the fact that delay factors could be different in different countries and situations.

The top five delay factors in Libya were identified as: payment delay by client, slow decision making and bureaucracy in the client's organization, inadequate planning, project scheduling, and delays caused by rain (*Abubaker.Y. Y,2017*).

Al-Momani (2000), investigated causes of delay in road construction projects constructed in Jordan during the period of 1990-1997. He concluded that the main causes of delay are related to designer or user changes, weather, site conditions, late deliveries, economic conditions and increases in quantities. *Sambasivan and Soon (2007)*, concluded that the ten most important causes of delays the construction industry in Malaysia were: contractor's improper planning, contractor's poor site management, inadequate contractor experience, inadequate client's finance and payments for completed work, problems with subcontractors, shortage in material, labor shortages, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage. According to *Ibrahim Mahamid (2017)*, the top five frequent factors in schedule delay in Saudi Arabia are: rework improper planning, changes in material types and specifications during construction, poor contract management, and poor resource management. *Mahamid I. (2013)*, investigated 7 delay factors in the road construction projects in Palestine. These factors are: **Financial status of the contractors**: one of the most common problems in construction contracting in Palestine is the policy of awarding the bid to the lowest bidder rather than to the most accurate. The owners award the contracts to lowest bidders, but sometimes the lowest bidder is a less well qualified contractor with low capabilities and resources which leads to poor performance and causes delays in completion of the work. To overcome this problem, the owner may check for the resources and capabilities of the bidders before accepting a bid or awarding the contract, or contracts could be awarded to the bid closest

to the client's estimate of the cost and not necessarily to the lowest bidder. **Payment delays by the owner:** construction works involve high daily expenses that can't be met by the contractors when progress payments by the owners are delayed. This affects the completion of works on time since many of the contracting firms in the West Bank are small with very limited cash reserves. **The political situation and Segmentations of the West Bank:** the political situation in the West Bank is described as unstable because of the conflict between Israel and Palestine. As a result, the West Bank is segmented into many areas that restrict the movement of people, goods and services between these areas. High costs of material, lack of resources, limitations on material import, high level of taxes imposed by Israel, delays and monopolies are some other results of the political situation in the West Bank. All of these factors lead to time overruns in construction projects. **Poor communication between construction parties:** this leads to estrangement between the parties and misunderstandings regarding the contract requirements. Thus, this result illustrates the importance of rising awareness among the contracting parties to ensure a culture of team work and to achieve their desires of a less adversarial working climate. **High competition in bids:** due to the intense competition between contractors and few projects in relation to the number of contractors in the West Bank, some contractors burn the rates to win bids. In this regard, an accurate estimate of prices may be established by the owner to evaluate properly the tender price before awarding the tender. This may help to avoid awarding contracts to companies offering rates that might affect their ability to execute the project properly and safely. This result was not pointed out by any of the investigated studies. **Lack of equipment efficiency:** many of the contracting firms in the West Bank are small with inadequate cash flow. Usually, they rent their equipment when required. When there are many construction projects, the equipment is in short supply and are poorly maintained. This leads to failure of the equipment causing projects to be delayed. This result was not pointed out by any of the investigated studies.

Robel Assefa (2015), in his research studied and concluded that construction delay in Ethiopia is mostly caused due to financial problem, managerial problem or local contractor's limited capacity and ability. Robel further stated delay causes as;

- Delay in delivering material on site, poor site management and untimely provision of documents by the contractor.

- Slow supervision and decision by the consultant.
- Delay in site handover, right of clearance, late in approving payments and lack of proper liaison work of the employer with local authorities.

Germa Worku, Tessema Chala & Yifredew Abreham (2006), identify delay causes & their impacts in road construction projects. Generally, they classify events that cause delays in to two:

- I. Pre-construction events causing delays during construction stage (this includes events that occur during project conception, project design and project contracting), and
- II. Construction stage events causing delays (these are delay in site hand over, highly bureaucratic organization, financial difficulties, improper inspection approach harvest time, Different attitude between the consultant and inexperienced personnel contractor).

Siraw Yenesew (2014), listed delay factors into the views of the three groups (owners, contractors & consultants). These are:

- **Slow site clearance:** which indicates the high importance of clearing the project site early to commence and finish the road projects on time. The suspension of clearing the project site will certainly disturb the overall plans of the project and will result with delay in commencement and delivering road projects as per the agreement.
- **contractors' financial problems:**
- **Inflation:** inflation is as important as financial problems of contractors to contribute for delay in road construction projects.
- **Exchange rate fluctuation:** If currency fluctuation affects financial power of construction parties which is indispensable, the road construction projects are certainly to be delayed beyond the agreed time requirement to deliver.
- **Supply of materials:** 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.

- **Inadequate contractors' experience:** most of local contractors in Ethiopia are inexperienced and it can be taken as an important factor contributing a delay in the road construction projects in the country.
- **Low productivity of labor:** In Ethiopia the labor group is regarded as unproductive due to many reasons like the inadequacy of higher education in the country, civilization of the people and many other reasons. 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 delivery of the road construction projects.
- **Inaccurate cost estimation:** If the estimated cost is below the actual cost necessary to complete the road projects, it will be a difficult mountain to climb for contractors and certainly there will be a disagreement with other construction parties which will result with delay in the delivery of the project.
- **Poor resource management and improper planning:** in construction industries generally and road construction projects particularly, managing the scarce resources which is necessary to complete the projects is inimitable. And everything must be planned properly before starting the actual work. Unless all the activities and the necessary resources are not planned properly, it will be impossible to forecast anything which will happen to affect the success of the project.
- **Progress payment delay by owner:** if owners can't pay the required money as per the agreement when the project progresses, it will be to add a fuel on the financial problems of contractors. If contractors don't have the required financial adequacy, it will be a very difficult job to make payments for the necessary construction materials, salaries and for anything which will be critically necessary.
- **Slow equipment movement:** The problem of slow equipment movement could be related with the inefficient transportation systems of the country and the type of technologies that is used in the construction process to move equipment's.
- **Unforeseen site conditions:** it is difficult to think like everything will remain exactly as planned and as calculated. Uncalculated or unforeseen conditions could happen once the project is undergoing and the most common which could happen is site conditions which

are different from the site condition that was assumed and believed to be when the agreement was signed.

- **Quality of material:** Quality of materials is critically important for the success of a project in general and road construction projects in particular. Because, the less the quality of materials the more frequently rework will happen which will result with delay and time overrun of projects or road construction projects.

According to *Sadi.A, and et al. (2006)*, the causes can be grouped in to nine classes. Ranking of these groups associated with frequency of occurrence, degree of severity and importance by owners, contractors and consultants are presented below. Owners and consultants specify that labor, contractor and project related causes as source of delay. From owners' point of view, the most frequent causes of delay are related to both contractors and labor. As owners are realizing that awarding of projects to the lowest bidders is one of the highest frequent factors of delay. The idea here is the lowest bidders are unqualified contractors with shortage in resources and low capabilities, which leads to low performance and which causes delay in completion of the work. While contractors indicate that source of delay in construction projects are owners and consultants. The combined results presented on his study prevails that delay in road projects is mostly originated by the owner, followed by contractors. Design, labor and consultant related factors are less important. *Chan et al. (1997)*, indicated that the five principal causes of delays in Hong Kong construction projects are: poor site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client-initiated variations and necessary variations of works. Study by *Zinabu Tebeje (2016)*, the top five factors identified to result in delay of construction projects are cash flow problem during construction, mismanagement by the contractors, improper planning, slow decision making and late delivery of material and equipment.

According to *Msafiri Atibu Saboru (2015)*, the overall top five causes of delay identified by both consultants and contractors were: Payment by client, Slow decision-making and bureaucracy in client organization, Claims, Inadequate planning / scheduling and Rain.

Factors of delay on road projects in Kenya are payment delays by the owners, poor performance of the road contracts is due to poor management of funds and poor delivery of services to the road user. In addition, performance measurement systems are not effective or efficient to overcome this problem. So it is essential to define the actual causes of delays in order to

minimize and avoid delays in road construction projects. Assessing the actual causes of delay, the extent to which delay may occur and the impacts of delay can provide insights for early planning to control projects delay and improve project performance (*James Gachern Kimemia, 2015*).

2.4 Types of Delays

The classification of delays is dependent upon the type and magnitude of the effect that an activity will have on the project and who is responsible for the delay among the stake holders. Delays categorized into four groups as follows; Critical or noncritical, Excusable or non-excusable, Compensable or non-compensable and Concurrent or non-concurrent, which will elaborately discuss in the subsequent sessions (*Twana A.Muhammed, 2015*).

2.4.1 Critical Delays and Non Critical Delays:

According to *Twana A. Muhammed (2015)*, critical delays are delays which prevent the contractor from finishing the work on the scheduled completion date as agreed upon in the contract. This concept has roots entrenched in the Critical Path Method (CPM) schedule which helps identify the critical activities in a construction project. All projects have critical activities embedded in their execution irrespective of the kind of schedule being run. These critical activities are sometimes referred to as the controlling item of work. CPM seeks to accomplish three main objectives:

- To calculate the project's completion date
- To identify the extent to which each activity in the schedule could slip without delaying the project.
- To identify which activities in the schedule would have the highest risk of affecting the project completion date if they slipped.

Non critical delays can be seen as those delays that do not impact the completion date of the project but in a way, affect the progress of the work.

2.4.2 Excusable Delays & Non Excusable Delays:

Theodore T. (2009), stated that excusable delays are a delay that is due to an unforeseeable event beyond the contractors or the subcontractor's control. Normally, based on common general

provisions in public agency specifications, delay resulting from; General labor strikes, Fires, Floods, Acts of God, Owner- directed changes, Errors & omissions in the plans and specifications, differing site conditions or concealed conditions, usually severe weathers, Intervention by outside agencies & Lack of action by government bodies. Before the analyst concludes that a delay is excusable based solely on the preceding definition, he or she must refer to the construction contract documents. Decision concerning delays must be made within the context of the specific contract. The contract should clearly define the factors that are considered valid delays to the project that justify time extensions to the contract completion date, for example some contracts may not allow for any time extension caused by weather conditions, regardless of how unusual, unexpected, or severe.

Twana A. Muhammed (2015), non-excusable delays are events that are within the contractor's control or that are foreseeable. Some examples of non-excusable delays are: Late performance of subcontractors, Untimely performance by suppliers, Faulty workmanship by the contractor and subcontractors & a project specific labor strike caused by either the contractor's unwillingness to meet with labor representatives or by unfair labor practices.

Non-excusable delays might be the result of inadequate scheduling, mismanagement, construction mistakes, equipment break down problem, staffing problem etc. such types of delays are inherently the contractor's responsibility in which he is subjected to contractually imposed liquidated & ascertained damages (*Abd. Majid, M.Z. and McCaffer, R.,1998*).

2.4.3 Compensable or Non Compensable Delay:

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. An example of this type of delay would be the late release of drawings from the owner's architect. An excusable, compensable delay usually leads to a schedule extension and exposes the owner to financial damages claimed by the contractor (*Soon, 2010*).

Fugar and Agyakwah Baah, (2010), stated that non-compensable delays are caused by third parties or incidents beyond the control of either the owner or the contractor and are not attributable to any of the parties. Non-compensable delay means 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 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.

2.4. 4 Concurrent or Non Concurrent Delays:

B.P. Sunjka and U. Jacob (2013), stated that concurrent delays are those caused by both the owner and the contractor. Concurrent delay mostly refers to the situation where two or more delay activities occur at different times but the impact is felt (in whole or in part) at the same time. It occurs when both parties to the construction contract (owner and contractor) delay the project during an excusable but non compensable delay (such as severe weather conditions). Such delays do not necessarily have to occur simultaneously but can be on two parallel critical path chains. Concurrent delays may also be an excusable delay with compensation which may grant some reliefs to the contractor in the form of extension of time, remission of liquidated damages and sometimes potential delay of damages subject to the given circumstance and the contractual agreement. In the same vein, a concurrent delay may also be inexcusable where the delay of the contractor, though concurrent with that of the owner, had a more severe impact on the finishing date. For instance, the owner's delay occurred from the 5th to the 8th month of the project period while the contractor's delay was from 4th to the 10th of the project period. Though these two delays happened around the same time, the contractor's delay would impact the completion date rather than the owner's.

Concurrent delay is said to be caused when there is a situation of two or more delay occurrence at the same time or overlap to some degree. In such circumstances the combinations of the aforementioned scenarios should be considered in order to determine the possible entitlement to the contractor whether it is only extension of time or extension of time with financial compensation. Concurrent delays could be caused by the delaying effects of events that were either excusable (i.e. the events for which the employer takes the risk of time and for which extensions of time should be granted to the contractor) or culpable (i.e. events for which the

contractor takes the risk of time). However, the effects of two delaying events by both parties to the contract, which impacted upon progress of the contract at mutually exclusive time frames, could not be said to be concurrent (*N. Braimah, 2014*).

2.5 Effects of Delay

According to *Aboubaker. Y. Y (2018)*, the effects of delays are a result of factors which are not identified and resolved. Numerous factors can result in cost and time overruns in various types of projects, and client satisfaction will decrease if the cost of a project or schedule exceeds the planned budget. The outcomes of construction project schedule overruns have been identified as follows:

- **Time overrun:** A project experiences schedule overrun if the stipulated completion time is exceeded. Schedule overrun implies late delivery or completion based on the specified time that has been agreed by all the parties involved in the construction project.
- **Cost overrun:** Critical factors in road construction projects in Jordan are delay and cost overrun.
- **Dispute and claims:** The losses incurred due to schedule overruns result in disputes and claims.
- **Arbitration:** Project delays can lead to arbitration between contractual parties. Some of the parties might not accept the mediator's decision and will appeal in an arbitration process. The decision to address the issue will also be made by the arbitrator. Projects will incur extra costs and time following the engagement of professional arbitrators.

Sambasivan and Soon (2007), conducted a study in Malaysia found that the six main effects of delay are: schedule delay, cost overrun, disputes, arbitration, litigation, and total abandonment. Public construction projects in Ethiopia are parts of the country's development initiative. It shares considerable amount of the country's scarce financial resources; the construction industry is the highest recipient of government budget in terms of government development program. Consequently, public construction projects consume an average annual rate of nearly 60% of the government's capital budget (*Werku Koshe, 2016*).

Therefore, the delay factors could be various in numbers and types in different situations, countries and circumstances. Various studies have been conducted to identify the most critical,

common and frequent factors as a cause of time overrun in different countries and situations. Delays in road construction projects affect everything negatively. Especially in developing countries, it might be worse than that as road and other infrastructures are needed badly to enhance the economic development of the country. And again, developing countries didn't afford any compensation (additional cost) for a late completion of road construction project.

Accordingly, from the referred literatures a total of forty-five variables which are related to most delay causes in Ethiopian case regarding on the main party accountable for the causes of delay have been identified which is to be dealt with on chapter four; moreover, before conclusion is made that causes of late completion of projects in Ethiopia are the same and depends only on the categorized variables, further study is done on completed sample road projects in Ethiopia by taking case study of five road construction projects and also the listed factors are incorporated in the questionnaire.

2.6 Conceptual Framework

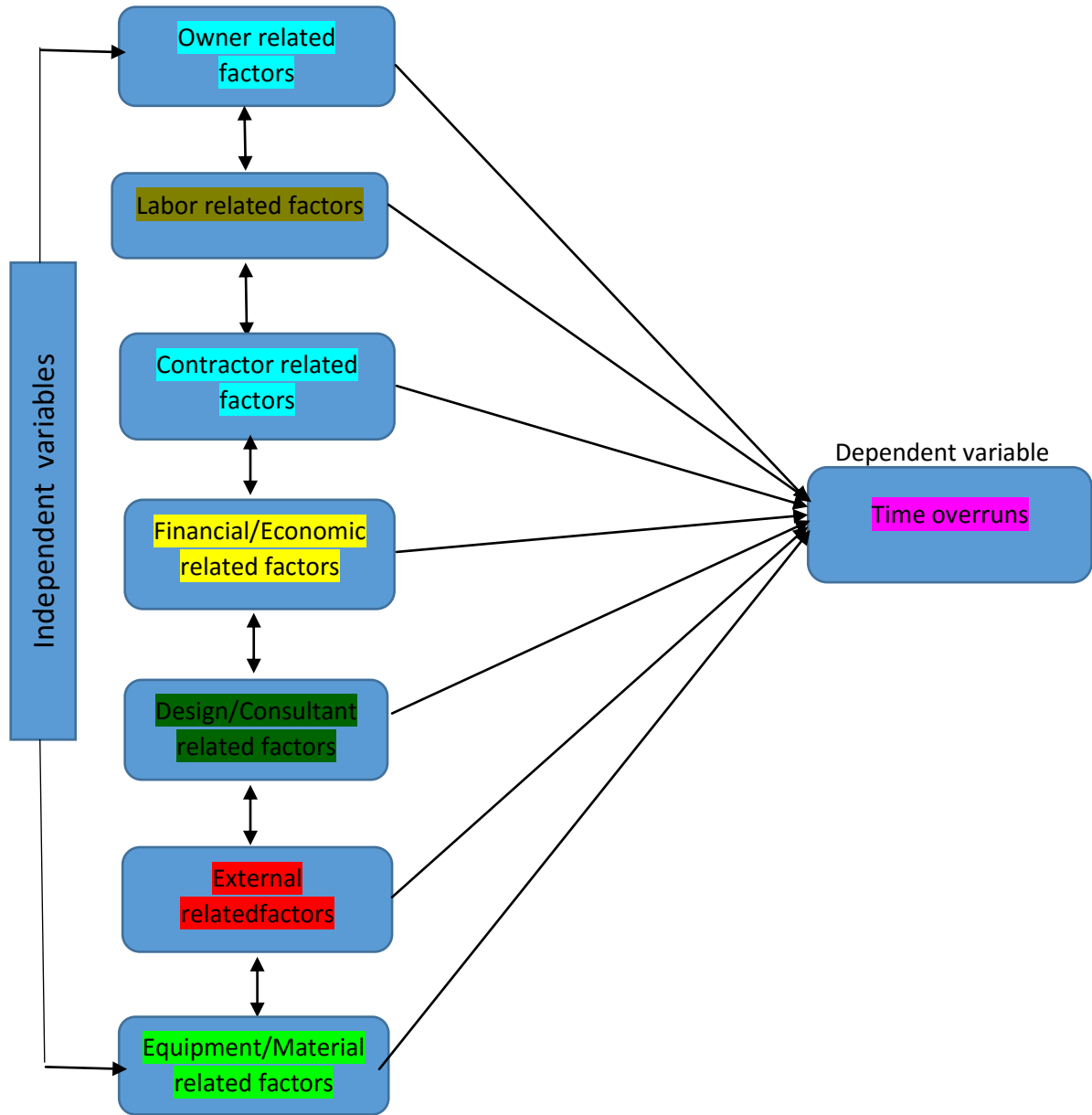


Fig.2.1 conceptual framework

CHAPTER THREE

RESEARCH DESIGN & METHDODOLOGY

3.1 Introduction

Research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis (*Clifford Woody, 1924*).

According to *Kothari (2004)*, defined research methodology as a way of systematically solving a research problem. This involves various steps that were followed by the researcher during the study.

This chapter provides the research design, the study area, and the target population, sampling procedure, methods of data collection and data collection instruments.

3.2 Research Approach Method

This research has a deductive approach. The research adopted both quantitative and qualitative methods. The quantitative method administered by the use of questionnaire while the qualitative method used document review by taking sample projects as a case study.

3.3 Research Design

A mixed method of case study and questionnaire survey was adopted in the research. The research design for this study is a descriptive and interpretive case study that is analyzed through qualitative & quantitative component. The quantitative method administered by the use of questionnaire while the qualitative method used document review by taking sample projects as a case study.

3.3.1 Questionnaire Design

In order to carry out this research with desired quality, there was a need to design a questionnaire survey to identify the most important delay factors. The questionnaire was designed based on factors that were identified as the causes of delay. A questionnaire survey was developed to assess the perception of owner(ERA), contractor and consultant of the relative importance of causes & rate the extent of delay on the road construction projects in Ethiopia. The questionnaire

was developed from literature review that was done through books, magazines and other sources. And it has three sections: section A; section B; and section C.

Section A: General organizational information

This section is to obtain the information about the respondents. The questionnaire includes the following:

- Name of the organization
- Sex of the respondent
- Relevant work experience &
- Respondents designation (i.e., owner, contractor, consultants)

Section B: Delay variables that contributing time overrun in the road construction project.

This section is to obtain information the most important delay factors that contribute time overruns on road construction projects. There are seven categories with a fifty-five (45) factors that contribute to causes of delay which are structured in table form in the questionnaire. The questionnaire based on Likert scale of five ordinal measure from one (1) to five (5) according to level of significance. Each scale represents the following rating;

- Five (5) = Very High
- Four (4) = High
- Three (3) = Moderate
- Two (2) = Low
- One (1) =Very Low

Section c: The extent of time overrun on the road construction projects in Ethiopia.

This section is to rate the extent of time overruns on the road construction projects in Ethiopia.

The questionnaire based on Likert scale of five ordinal measure from one (1) to five (5) according to the extent of time overrun. Each scale represents the following rating;

- Five (5) = Very High
- Four (4) = High
- Three (3) = Moderate
- Two (2) = Low
- One (1) =Very Low

3.4 Source of Data

Both primary and secondary data were used in relation to the topic under discussion. The study has used the data sources to produce the following basic documents: primary documents and secondary documents. The primary documents were collected using questionnaire from owners, contractors and consultants. Secondary documents assessed some cases of sample road projects in Ethiopia that are completed within the last five years and have prolonged completion dates.

3.5 Population of the Study

According to *Amin (2005)*, a target population is the population to which the researcher ultimately wants to generalize the results.

The targeted population, which directly related to the purpose of this study, was 60 engineers who are working under the construct management departments. The population of the study comprises stakeholders of road construction projects such as owners (Ethiopian Roads Authority), contractors and consultants who were involved in the road construction projects in Ethiopia taken for the study.

3.6 Sampling Procedure & Techniques

The research used Purposive sampling technique to select the respondents under owners, consultants and contractors.

Purposive sampling is a popular method used by researchers due to the fact that it is extremely time and cost effective when compared to other sampling methods. Researchers use purposive sampling when they want to access a particular subset of people, as all participants of a study are selected because they fit a particular profile (*Saunders M., Lewis P. & Thornhill A., 2012*).

In this research the population are, members of road construction stakeholders (owner, contractor & consultants) participate in the road construction projects in Ethiopia. The questionnaire was designed to determine the perceptions of the parties involved on the road projects in Ethiopia and the questionnaire was distributed by hand directly to the respondents.

3.7 Method of Sample Size Determination

There are many approaches to determine the sample size (*Glenn, 1992*). This research used a sample size of similar study approach to determine the sample size. And to assure the quality of data only professionals which have engineering knowledge were included. Therefore, the questionnaire was distributed for a total of 60 respondents, who know the area or subject matter very well (*Alade, K. TI, A, Causes & effects of delays in construction projects in Akure, Ondo state, Nigeria, 2016*).

3.8 Methods of Data Collection

According to *Mugenda and Mugenda (2003)*, define data as facts of known or available information. Data collection is the process of gathering such information from all the available sources with the main purpose of using such data in a research or a study.

The main instrument for this research to collect the data was a structured questioner and also sample road projects completion reports were assessed & analyzed to disclose the fact that whether the road construction projects are completed as per the agreement/plan or not.

3.9 Validity & Reliability of the Instrument

Cronbach's alpha value ranged from 0 to 1 according to the correlation between the item, value 0.7 are considered acceptable in most social science research situations (*Keith Tabler, 2017*).

The research used the reliability test depicted the consistency degree of the data collected. The Cronbach's alpha used to measure the internal & external consistency that was, how closely related a set of items were as a group. The research questionnaire tried to address all aspects of the study. Validity refers to the extent to which an instrument measures what is supposed to measure, data need not only to be reliable but also true and accurate. To establish the validity of the data collection instruments, the research instruments will be given to contractors, owners & consultants. The research questionnaire adequately addresses all aspects of the issues being studied.

The research test the reliability of the five-point scale utilized in the survey was carried out using Cronbach's alpha coefficient. Assessment of the consistency and reliability in this study within the ranges assigned in Table below using the Cronbach's alpha test.

		N	%
Cases	Valid	51	100.0
	Excluded ^a	0	0.0
	Total	51	100.0

Cronbach's Alpha	N of Items
.739	7

Table 3.1 reliability statistics

3.10 Methods of Data Analysis

The research adopted both descriptive statistics were employed in the data analysis method. The analysis depends on the primary & secondary data. The data is analyzed by using SPSS (statistical product & service solution),¹⁶ & RII (relative importance index) to calculating the relative important index model to rank the most significant delay factors based on their impact which is derived from the views of the respondents of the three groups.

The RII method is used to determine the relative importance of the various causes of delays for construction projects. The same method is adopted in this study. RIIs for each factor is calculated as shown below:

$$RII = \sum W \div (A \times N)$$

Where: RII = relative importance index

W = weighting given to each factor by respondents (ranging from 1 to 5)

A = highest weight (i.e., 5 in this case); and

N = total number of respondents.

The RII values have a range of 0 to 1 (0 not inclusive); the higher the RII, the more important the cause of delay is. The RIIs is ranked, and the results are shown by using tables.

3.11 Ethical Research consideration

Research was respected & protected the rights & dignity of participants. Therefore, the research subject to the following ethical considerations.

- The research work was started after getting the willingness of the organizations.
- Respondents were clearly communicated about the objective of the research before they are asked to give their answer.
- There was no any physical or psychological damage to them because of the research.
- Respondents were not asked about their name, race, religion, etc.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

The purpose of this chapter in general is to illustrate the issues related to the questionnaire distribution, collection of the responses and subsequent analysis of the responses from the professionals working in three stake holders' owners, consultant and contractor involved on the road construction projects in Ethiopia. The principal purpose is to rank the already identified variables which are causes for late completion of road project and then to find out the critical factors that are required to be given due attention in order to propose remedial measure to substantially minimize the problems which results in late completion of road construction projects in Ethiopia.

And to assesses some cases of sample road projects in Ethiopia that are completed within the last five years and have prolonged completion dates.

4.2 Analysis of Case Study Projects

In Ethiopian road construction project cases it is a common feature to have extended delay and mostly require additional budget for different reasons. This case study is done only on sample projects which are selected from the list of projects found within Ethiopian Roads Authority which have been recently completed and have extended completion period. The description of the cases of each project listed below mainly focus on the delay causes & extent of delays between the originally set duration with the time required to finish the respective projects. The under listed projects are taken from different regions of the country.

4.2.1 Jimma-Mizan Road Upgrading Project, Contract-2: Bonga-Mizan Junction Project

The Bonga- Mizan 120.2KM asphalt concrete road, Part of Jimma-Mizan road upgrading project, Contract-2: Bonga-Mizan Junction is the second section of the main Jimma- Mizan road. It lies in western part of Ethiopia, in Kafa Zone, SNNP region and constitutes a part of Addis-Jimma-Tepi main road one of the components of high priority road sector, formulated by the Government of Ethiopia, for up-gradation, under country's road network development program 2007-2010. This project was awarded to a foreign contractor M/S Keangnam Enterprises Ltd. a

south Korean Company and started on 23rd May 2008 with a planned completion date to be on 22nd December 2011 and a contract period of 976 calendar days. The original contract amount was ETB 742,938,243.78.

However, the actual completion date of the project was on 28th February, 2016. The contractor claimed extension of time (EOT) for 7 times (EOT N₀-1_EOT N₀-7) a total of 1316 calendar days with 167 days of total granted extension of time. Consequently, the project was completed with an amount of 1,052,507,574.98 revised cost.

Analysis of Claimed EOT Vs Granted Time Extensions

- Average extension of time (EOT) claimed as a percentage of the contract period

$$(1316 \div 976) * 100 = 134.83 \%$$

- Average extension of time (EOT) granted as a percentage of total contract period

$$(167 \div 976) * 100 = 17.11 \%$$

From the result the amount of extension of time claimed by the contractor (134.83 % of contract period) is relatively higher than the amount granted by the employer (17.11% of contract period).

❖ The main causes of schedule delay on the Jimma-Mizan road upgrading project.

From the contractors EOT claim and owner & consultant assessment report analysis the delay causes are: -

- Poor cooperation from local administration (**external related causes**)
- Unfavorable weather condition (**external related causes**)
- Poor site management (**contractor related causes**)
- Conflict between labor & management team (**contractor related causes**)
- Delayed removal of obstruction (**owner related causes**)

4.2.2 Mega-Moyale Rehabilitation Road Project

The Contract Agreement was executed between Ethiopian Roads Authority (ERA) and the Contractor: JMC Projects (India) Ltd on 30th November 2012 for the construction of Mombasa-Nairobi-Addis Ababa Road Corridor Phase II Contracts: Lot III: Mega - Moyale 109KM Road Project, for the amount ETB 1,146,905,005.77 This project was awarded to the Company and

started on 2nd September 2013 with a planned completion date to be on 1st September 2016 and a contract period of 1095 calendar days. The original contract amount was ETB 1,146,905,005.77. However, the actual completion date of the project was on 28th March 2018. The contractor claimed extension of time (EOT) for 4 times (EOT N₀-1_EOT N₀-4) a total of 425 calendar days with 365 days of total granted extension of time.

Analysis of Claimed EOT Vs Granted time extensions

- Average extension of time (EOT) claimed as a percentage of the contract period

$$(425 \div 1095) * 100 = 38.81 \%$$

- Average extension of time (EOT) granted as a percentage of total contract period

$$(365 \div 1095) * 100 = 33.33 \%$$

From the result the amount of extension of time claimed by the contractor (38.81 % of contract period) is higher than the amount granted by the employer (33.33% of contract period).

❖ **The major causes of schedule delay on the Mega-Moyale rehabilitation road project**

From the contractors EOT claim and owner & consultant assessment report analysis the delay causes are: -

- Delayed removal of obstruction (**owner related causes**)
- Delayed approval by consultant (**consultant related causes**)
- Late delivery of material (**material related causes**)
- Bad weather condition (**external related causes**)
- Improper planning (**contractor related causes**)

4.2.3 Sawla-Laska Road Project

The Contract1: Sawla- Laska 52.32KM road project, Part of Sawla-Maji road project. It lies in southern part of Ethiopia. This project was awarded to a local contractor SATCON Construction PLC and started on 11th September 2011 with a planned completion date to be on 12th September 2014 and a contract period of 1095 calendar days. The original contract amount was ETB 732,672,547.64.

However, the actual completion date of the project was on 17th January 2018. The contractor claimed extension of time (EOT) for 7 times (EOT N₀-1_EOT N₀-7) a total of 1224 calendar

days with 368 days of total granted extension of time. Consequently, the project was completed with an amount of 1,052,507,574.98 revised cost.

Analysis of Claimed Vs Granted time extensions

- Average extension of time (EOT) claimed as a percentage of the contract period.

$$(1224 \div 1095) * 100 = 111.78 \%$$

- Average extension of time (EOT) granted as a percentage of total contract period.

$$(368 \div 1095) * 100 = 33.61 \%$$

From the result the amount of extension of time claimed by the contractor (111.78 % of contract period) is slightly higher than the amount granted by the employer (33.61% of contract period).

❖ **The major causes of schedule delay on the Sawla-Laska road project**

From the contractors EOT claim and owner & consultant assessment report analysis the delay causes are: -

- Delayed removal of obstruction (**owner related causes**)
- Poor site management (**contractor related causes**)
- Unforeseen site condition (**material related causes**)
- Bad weather condition (**external related causes**)
- Improper planning (**contractor related causes**)

4.2.4 Koka-Adulala- Debrezeit Road Project

The Koka-Adulala- Debrezeit 50.88KM road Project is located in the central part of Ethiopia under the Oromia National Regional State. The project starts from the outskirts of Koka town and traverses to west to connect the Addis – Modjo – Hawasa Trunk Road and Addis – Modjo – Awash Trunk Road at Bishoftu (Debrezeit) town. This project was awarded to the Contractor: Net Engineers and Architects Plc and started on 9th March 2015 and original completion date 8th March 2017 with a contract period of 730 calendar days. The original contract amount was ETB 613,165,000.00.

However, the actual completion date of the project was on 1st February 2018. The contractor claimed extension of time (EOT) for 3 times (EOT N₀-1_EOT N₀-3) a total of 248 calendar

days with 116 days of total granted extension of time. Consequently, the project was completed with an amount of 712,507,247.86 revised cost.

Analysis of Claimed Vs Granted time extensions

- Average extension of time (EOT) claimed as a percentage of the contract period

$$(248 \div 730) * 100 = 33.97 \%$$

- Average extension of time (EOT) granted as a percentage of total contract Period.

$$(116 \div 730) * 100 = 15.89 \%$$

From the result the amount of extension of time claimed by the contractor (38.81 % of contract period) is slightly higher than the amount granted by the employer (33.33% of contract period).

❖ The major causes of schedule delay on the Koka-Adulala-Debrezeit road project

From the contractors EOT claim and owner & consultant assessment report analysis the delay causes are: -

- Delayed removal of obstruction (**owner related causes**)
- Low productivity of labor (**Labor related causes**)
- Unforeseen site condition (**external related causes**)
- Improper planning (**contractor related causes**)

4.2.5 Zagora-Gassay Road Project

The Zagora-Gassay 44.5KM road Project is located in the Amahara regional state connecting east Gojam zone of Ensaewereda to south Gonder zones of eastern and western Easte&Fartawereda crossing the famous Abay River near Fasilbidge. This project was awarded to the Contractor: China Railway Seventh Group Co.ltd and started on 25th June 2014 and original completion date 24th June 2016 with a contract period of 728 calendar days. The original contract amount was ETB 485,177,003.42.

However, the actual completion date of the project was on 29th May 2017. The contractor claimed extension of time (EOT) for 5 times (EOT N₀-1_EOT N₀-5) a total of 557 calendar days with 331 days of total granted extension of time. Consequently, the project was completed with an amount of 492,026,476.27 revised cost.

Analysis of Claimed Vs Granted time extensions

- Average extension of time (EOT) claimed as a percentage of the contract period

$$(557 \div 728) * 100 = 76.51 \%$$

- Average extension of time (EOT) granted as a percentage of total contract Period.

$$(331 \div 728) * 100 = 45.47 \%$$

From the result the amount of extension of time claimed by the contractor (76.51 % of contract period) is higher than the amount granted by the employer (45.47% of contract period).

❖ The major causes of schedule delay on the Zagora-Gassay road project

From the contractors EOT claim and owner & consultant assessment report analysis the delay causes are: -

- Delayed removal of obstruction (**owner related cause**)
- Progress payment delay (**owner related cause**)
- Change the project scope by owner (**owner related cause**)

4.3 Analysis of the Survey Questionnaires

Generally, this chapter illustrate the issues related to the questionnaire distribution, collection of the responses and subsequent analysis of the responses from the professionals working in three stakeholders' owner, consultant and contractor involved in the road construction industry of Ethiopia.

Questionnaires are frequently used in quantitative research. They are a valuable method of collecting a wide range of information from a large number of individuals, often referred to as respondents (C.N Trueman, 2015).

The principal purpose is to rank the already identified variables which are causes for late completion of road projects and then to find out the critical factors that are required to be given due attention in order to propose remedial measure to substantially minimize the problems which results in late completion of road construction projects in Ethiopia.

4.4 Population characteristics

4.4.1 Experience of Respondents

From the response 5.9 % (3) of the respondents have experience between 1 to 3 years at road construction works, 35.3 % (18) of the respondents have experience between 4 to 6 years at road construction works, 41.2 % (21) of the respondents have experience between 7 to 10 years at road construction works and the rest percentage of respondents, 17.6%(9) have experience of more than 10 years

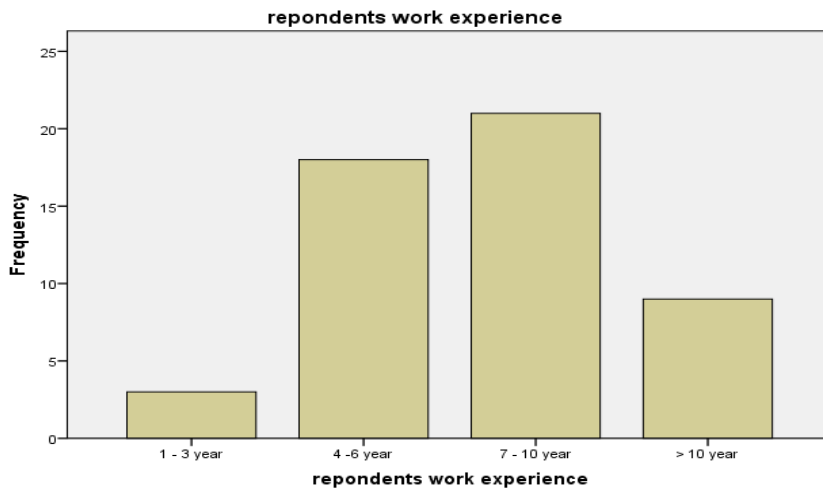


Fig.4.1 respondents work experience

4.4.2 Questionnaire response rate

The questionnaire was distributed by hand directly for a total of 60 respondents, who knows the area or subject matter very well. There are 30 engineers under the contract administration department of the owner, 20 engineers under the contract administration department of contractors and 10 engineers under contract administration department of consultants.

Table 4.1 Questionnaire distribution and response

Group	Distributed number	Number of response	% of number of response
Owner	30	28	93.3%
Contractor	20	17	85%
Consultant	10	6	60%
Total	60	51	85%

From the 60 questionnaires distributed a total of 51 responses were received, consisting of 28 (93.3%) from the owner, 17 (85%) from consultants 6 (60%) from contractors. The overall response rate was 85%.

4.5 Analysis of the Most Important Delay Causes

This part of the paper consists of results and discussion of factors that contribute for time overrun (delay) on the road construction projects in Ethiopia. The factors are discussed into three groups, from viewpoints of owners, Contractors, and consultants. A total of forty-five (45) major factors that contribute to delay of projects are identified from literature review and forwarded for questionnaire survey. These are further divided into seven groups. In this section, causes of delay are analyzed taking their degree of importance. The factors are analyzed in each groups based on their relative importance index.

4.5.1 Owner Related Delay Factors

There are seven factors which are categories of owner related delays are identified from literature review. The ranking of factors is done based on their relative importance index.

Table 4.2 Ranking of Owner related factors

Group	owner related factors	N	Mean	Std. Deviation	A	RII	Rank
owner	failure to remove obstruction & give site	51	4.824	0.385	5	0.965	1
owner	award project to lowest bid price	51	4.549	0.577	5	0.910	2
owner	progress payment delay by owners	51	4.157	0.731	5	0.831	3
owner	Inaccurate time estimation	51	3.961	0.662	5	0.792	4
owner	interference of owner	51	3.706	0.756	5	0.741	5
owner	slowness in decision making process by the owner	51	3.627	0.774	5	0.725	6
owner	change of project scope by owners	51	3.471	0.946	5	0.694	7

From Table 4.2 observed that “failure to remove obstruction & give site” by the owner is the most important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of (RII=0.965), “award project to lowest bid price” ranked second by respondents from the owner related factors with the relative importance index value of (RII=0.910) & “progress payment delay by owners” ranked third by respondents from the owner related factors with the relative importance index value of (RII=0.831), agreed by the three parties.

4.5.2 Labor Related Delay Factors

There are four factors which are categories of labor related delays are identified from literature review. The ranking of factors is done based on their relative importance index.

Table 4.3 Ranking of labor related factors

Group	labor related factors	N	Mean	Std. Deviation	A	RII	Rank
Labor	low productivity of labor	51	4.196	0.825	5	0.839	1
Labor	low skill of man power	51	3.824	0.793	5	0.765	2
Labor	labor supply(insufficient labor)	51	3.569	0.728	5	0.714	3
Labor	non-attendance of labor(absenteeism)	51	3.216	1.006	5	0.643	4

From Table 4.3 observed that “low productivity of labor” is the most important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of (RII=0.839), “low skill of man power” ranked second by respondents from the

labor related factors with the relative importance index value of (RII=0.765) & “labor supply (insufficient labor)” ranked third by respondents from the labor related factors with the relative importance index value of (RII=0.714), agreed by the three parties.

4.5.3 Contractor Related Delay Factors

There are eight factors which are categories of contractor related delays are identified from literature review. The ranking of factors is done based on their relative importance index.

Table 4.4 Ranking of contractor related factors

Group	contractor related causes	N	Mean	Std. Deviation	A	RII	Rank
Contractor	improper planning	51	4.55	.503	5	0.910	1
Contractor	rework due to errors during construction	51	4.39	.750	5	0.878	2
Contractor	poor site management	51	4.08	.744	5	0.816	3
contractor	sub-contractors' delay	51	3.88	.840	5	0.776	4
contractor	poor resource management	51	3.78	.856	5	0.757	5
contractor	inadequate contactors' experience	51	3.67	.864	5	0.733	6
contractor	conflict between labor & management team	51	3.57	.831	5	0.714	7
contractor	incompetent project team	51	3.47	.946	5	0.694	8

From Table 4.4 observed that “improper planning” is the first important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of (RII=0.910), “rework due to errors during construction” ranked second by respondents from the contractor related factors with the relative importance index value of (RII=0.878) & “poor site management” ranked third by respondents from the contractor related factors with the relative importance index value of (RII=0.816), agreed by the three parties.

4.5.4 Financial/Economic Related Delay Factors

There are six factors which are categories of Financial/Economic related delays are identified from literature review. The ranking of factors is done based on their relative importance index.

Table 4.5 Ranking of Financial/Economic related factors

Group	Financial/Economic factors	N	Mean	Std. Deviation	A	RII	Rank
Financial/Economic	inaccurate cost estimation	51	3.843	0.880	5	0.769	1
Financial/Economic	liquidated damage	51	3.706	0.855	5	0.741	2
Financial/Economic	contractors financial problem	51	3.333	0.792	5	0.667	3
Financial/Economic	exchange rate fluctuation	51	3.078	0.913	5	0.616	4
Financial/Economic	bankers' policy for loan	51	2.961	0.894	5	0.592	5
Financial/Economic	Inflation	51	2.824	0.994	5	0.565	6

From Table 4.5 observed that “Inaccurate cost estimation” is the first important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of (RII=0.769), “liquidated damage” ranked second by respondents from the financial/economic related factors with the relative importance index value of (RII=0.741) & “contractors financial problem” ranked third by respondents from the financial/economic related factors with the relative importance index value of (RII=0.667), agreed by the three parties.

4.5.5 Design/Consultant Related Delay Factors

There are six factors which are categories of design/consultant related delays are identified from literature review. The ranking of factors is done based on their relative importance index.

Table 4.6 Ranking of Design/Consultant related factors

Group	Design/Consultant related factors	N	Mean	Std. Deviation	A	RII	Rank
Design/Consultant	design modification	51	4.098	.700	5	0.820	1
Design/Consultant	delayed approval of redesign	51	3.471	.833	5	0.694	2
Design/Consultant	slow decision making by consultants	51	3.392	.750	5	0.678	3
Design/Consultant	quality of assurance/control	51	3.353	4.284	5	0.671	4
Design/Consultant	mistakes in specification and drawings	51	2.765	.862	5	0.553	5
Design/Consultant	complexity of project plan	51	2.431	.985	5	0.486	6

From Table 4.6 observed that “design modification” is the first important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of

(RII=0.820), “delayed approval of redesign” ranked second by respondents from the design/consultant related factors with the relative importance index value of (RII=0.694) & “slow decision making by consultants” ranked third by respondents from the design/consultant related factors with the relative importance index value of (RII=0.678), agreed by the three parties.

4.5.6 External Related Delay Factor

There are seven factors which are categories of External related delays are identified from literature review. The ranking of factors is done based on their relative importance index

Table 4.7 Ranking of External related factors

Group	External related factors	N	Mean	Std. Deviation	A	RII	Rank
External	unforeseen site condition	51	3.71	0.832	5	0.741	1
External	bad weather condition	51	3.51	0.946	5	0.702	2
External	high competition in bids	51	2.88	0.739	5	0.576	3
External	political situation	51	2.76	0.839	5	0.553	4
External	organizational change	51	2.75	1.017	5	0.549	5
External	regulatory changes	51	2.59	0.726	5	0.518	6
External	natural disaster	51	1.98	0.735	5	0.396	7

From Table 4.7 observed that “unforeseen site condition” is the first important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of (RII=0.741), “bad weather condition” ranked second by respondents from the external related factors with the relative importance index value of (RII=0.702) & “high competition in bids” ranked third by respondents from the external related factors with the relative importance index value of (RII=0.576), agreed by the three parties.

4.5.7 Equipment/Material Related Delay Factor

There are seven factors which are categories of equipment/Material related delays are identified from literature review. The ranking of factors is done based on their relative importance index.

Table 4.8 Ranking of Equipment/Material related factors

Group	Equipment/Material related factors	N	Mean	Std. Deviation	A	RII	Rank
Equipment/Material	slow equipment movement	51	3.65	0.844	5	0.729	1
Equipment/Material	late delivery of material	51	3.39	0.635	5	0.678	2
Equipment/Material	poor equipment efficiency	51	3.37	4.322	5	0.675	3
Equipment/Material	lack of skill operator for specialized equipment	51	2.94	2.817	5	0.588	4
Equipment/Material	change in material & specification	51	2.61	0.635	5	0.522	5
Equipment/Material	escalation of material price	51	2.37	0.824	5	0.475	6
Equipment/Material	quality of material	51	2.29	0.782	5	0.459	7

From Table 4.8 observed that “slow equipment movement” is the first important factor that contributing time overrun (delay) on the road construction project with the relative importance index value of (RII=0.729), “late delivery of material” ranked second by respondents from the equipment/material related factors with the relative importance index value of (RII=0.678) & “poor equipment efficiency” ranked third by respondents from the equipment/material related factors with the relative importance index value of (RII=0.675), agreed by the three parties.

4.5.8 The top 15 delay factors from the respondents’ point of view

The survey is based on forty-five (45) factors that were grouped into seven groups of causes of delays. The top fifteen delay variables are ranked based on relative importance index in the viewpoint of owner (ERA), contractor and consultants.

Table 4.9 Ranking of the top 15 delay factors

Group	Delay variables	N	Mean	Std. Deviation	A	RII	Rank
Owner	failure to remove obstruction & give site	51	4.824	0.385	5	0.965	1
Owner	award project to lowest bid price	51	4.549	0.577	5	0.910	2
Contractor	improper planning	51	4.549	0.503	5	0.910	3
Contractor	rework due to errors during construction	51	4.392	0.750	5	0.878	4
Labor	low productivity of labor	51	4.196	0.825	5	0.839	5
Owner	progress payment delay by owners	51	4.157	0.731	5	0.831	6
Design/Consultant	design modification	51	4.098	0.700	5	0.820	7
Contractor	poor site management	51	4.078	0.744	5	0.816	8
Owner	Inaccurate time estimation	51	3.961	0.662	5	0.792	9
Contractor	sub-contractors' delay	51	3.882	0.840	5	0.776	10
Financial/Economic	inaccurate cost estimation	51	3.843	0.880	5	0.769	11
Labor	low skill of man power	51	3.824	0.793	5	0.765	12
Contractor	poor resource management	51	3.784	0.856	5	0.757	13
Owner	interference of owner	51	3.706	0.756	5	0.741	14
Financial/Economic	liquidated damage	51	3.706	0.855	5	0.741	15

From Table 4.9, prevails about the views of respondents from the three parties who were involved on the road construction projects under studied to rank the fifteen most significant factors to contribute for time overrun in road construction projects administered by ERA. And let's see each of the ranked delay factors in detail;

- **Failure to remove obstructions & give the site**

According to respondents, “Failure to remove obstructions & give the site” is ranked in the first position with the relative importance index value of (RII=0.965), which indicates the high importance of clearing the project site early to commence and finish the road project on time. The suspension of clearing the project site will certainly disturb the overall plans of the project and will result with delay in commencement and delivering road projects as per the agreement.

- **Award project to lowest bid price**

According to respondents, “award project to lowest bid price” is ranked in the second position with the relative importance index value of (RII=0.911), The idea here is the lowest bidders are unqualified contractors with shortage in resources and low capabilities, which leads to low performance and which causes delay in completion of the work.

- **Improper planning**

According to respondents, “Improper planning” is ranked in the third position with the relative importance index value of (RII=0.910). *Yang et al., (2012)*, stated that construction delays and duration issues are frequently responsible of transforming productive ventures into loosing projects. These delays can be reduced or prevented by an increased pre- project planning and successful project management as they are one of the most critical success factors of the construction project accomplishment poor planning and management of the construction projects may lead to several negative effects on the duration and completion of projects. Construction delays and duration issues are frequently responsible of transforming productive ventures into loosing projects. Everything must be planned properly before starting the actual work. Unless all the activities and the necessary resources are not planned properly, it will be impossible to forecast anything which will happen to affect the success of the project.

Contractors appoint Project Managers who are expected to draw up workable project plans and modalities for their implementation. A faulty plan will lead to delay in project completion. Most Local Contractors rarely have practicable work programs at the initial stage of project planning. Lack of appropriate work programs impairs monitoring of project progress against the stipulated time.

- **Rework due to errors during construction**

From the respondents’ view, “Rework due to errors during construction” is ranked in the fourth position with the relative importance index value of (RII=0.878). Inexperienced contractors usually make errors during construction. Sometimes contractors employ low skilled staff in order to make more profit by paying them lower salaries. Tendencies of errors are, thus, higher. Rework of an already executed aspect of a scope slows down project progress. This has serious impact if it involves execution of critical tasks.

- **Low productivity of labor**

From the respondents' view, "Low productivity of labor" is ranked in the fifth position with the relative importance index value of (RII=0.839). low productivity of labor may result due to many result, like Labor disputes such as low motivation, strikes slow down construction as time is spent on negotiation and settlement of grievances.

- **Progress payment delay by owner**

From the respondents' view, "Low productivity of labor" is ranked in the sixth position with the relative importance index value of (RII=0.831). If owners can't pay the required money as per the agreement when the project progresses, it will be to add a fuel on the financial problems of contractors which was ranked as the second most important and frequently happening factor by the views of owner respondents. If contractors don't have the required financial adequacy, it will be a very difficult job to make payments for the necessary construction materials, salaries and for anything which will be critically necessary.

- **Design modification**

According to respondents, "Design modification" is ranked in the seventh position with the relative importance index value of (RII=0.820). Change in specifications and scope which were not considered originally or changes of design to address some omissions that were vital to project functionality. Alterations may require temporary stoppages that delay overall project completion.

- **Poor site management**

From the respondents view, "Poor site management" is ranked in the eighth position with the relative importance index value of (RII=0.816). Contractor's employees that are not skilled in project management are not able to manage their project site appropriately, thus, culminating in faulty work, reworks and delay in completion of tasks.

- **Inaccurate time estimation**

From the respondents' view, "Inaccurate time estimation" is ranked in the ninth position with the relative importance index value of (RII=0.792). This could be caused by wrong packaging of the contract document or unprofessional/inexperienced client's staff. Where the stated completion duration is impracticable.

- **Sub-contractor delay**

From the respondents' view, "Sub-contractor delay" is ranked in the tenth position with the relative importance index value of (RII=0.776). Some aspects of construction works are subcontracted to nominated specialized subcontractors. These subcontractors must be properly coordinated by the Prime contractor to ensure timely delivery of assigned aspects of works. Contractors must therefore ensure that each subcontractor delivers at the stipulated time expected and to specifications.

- **Inaccurate cost estimation**

From the respondents' view, "Inaccurate cost estimation" is ranked in the eleventh position with the relative importance index value of (RII=0.769). Inaccurate cash flow leads to delay in delivery of materials and equipment to the site and delay in payment of workers' salaries

- **Low skill of manpower**

From the respondents' view, "Low skill of manpower" is ranked in the twelfth position with the relative importance index value of (RII=0.765). Employment of unskilled personnel at the project sites impedes execution of work to specification and leads to error or mistakes during construction. Time is then spent on alterations and corrections.

- **Poor resource management**

From the respondents' view, "Poor resource management" is ranked in the thirteenth position with the relative importance index value of (RII=0.757). Funds, manpower, materials, equipment are inadequate to complete the project because project owners or clients have not properly assessed whether they have the required resources to complete such projects, it leads delay to the completion period.

- **Interference of owner**

From the respondents' view, "Interference of owner" is ranked in the fourteenth position with the relative importance index value of (RII=0.741). Top management staff of the Client's establishment could interfere in project execution because of vested interest. For instance, some scope could be introduced without due authorization.

- **Liquidated damage**

From the respondents' view, "Liquidated damage" is ranked in the fifteenth position with the relative importance index value of (RII=0.741).as liquidated and ascertained damages are damages whose amount the parties designate during the formation of contract for the injured party to collect as compensation upon late performance.

4.6 Extent of Time Overruns

Table 4.10 The extent of time overruns

Extent of time overruns	N	Mean	Std. Deviation	A	RII
how did you rate the extent of time overrun	51	3.843	0.857	5	0.769

From Table4.10 the extent of time overrun ranked with the relative importance index value of (RII=0.769). The value of importance index ranges between 0 and 1, as the result from the perspective of the stakeholders (owner, contractor & consultants) the extent of time over run is high on the road construction projects administered by ERA.

In general, the severity of the problem observed from the referred cases shows the necessity of giving due attention to the issue and the need for investigating the root causes of the problem and from the questioner survey, the research identified the most significant delay causes in a wider perspective. The most significant delay causing factors are identified, the parties to the projects shall then be able to channel their energies and resources to the specific factors thereby reducing delays to the projects in order to be able to substantially minimize time overrun on the upcoming projects.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of the Major Findings

The major groups of delay variables were identified. Out of forty-five (45) variables the top fifteen most important factors that contribute for the road construction time overrun were identified, five from owner related factors, two from financial/economic related factors, five from contractor related factors, two from labor related factors and one form design/consultant related factors. These variables are; Failure to remove obstructions & give the site, Award project to lowest bid price, Improper planning, Rework due to errors during construction, Low productivity of labor, Progress payment delay by owner, Design modification, Poor site management, inaccurate time estimation, sub-contractor delay, inaccurate cost estimation, low skill of manpower, poor resource management, interference of owner & liquidated damage are the top fifteen delay factors from the perspective of the stakeholders.

5.2 Conclusion of the Study

There are many causes of delays in road construction projects and several studies have pointed out various factors based on the underlying conditions that the specific study is concerned. Therefore, this research attempted to investigate the problems particularly for road construction projects in Ethiopia. The research has been achieved by undertaking a review of literature, which was used to identify the possible variables causing delays in the road construction projects.

Furthermore, cases on sample completed road projects were demonstrated to assess the causes of delay and to highlight the extent of time overrun. Accordingly, it was noted that for some of the projects the additional time required was even more than the original contract period.

The main objective of this research is to identify delay causes & rank the most important delay factors that contribute time overrun on the road projects administered by ERA. Secondary data (project completion report) was used to investigate the causes of time over run on sample completed road projects under ERA. Questionnaire survey was used to identify the most important causes of time overrun & rate the extent of time overrun on the road project in Ethiopia.

Owner, contractors and consultants were asked to identify the most important delay factors that contribute for time overrun on the road projects in Ethiopia. The RII method was used to rank the identified factors based on the views of the three respondents.

This chapter focuses on answering all the research questions. The most important delay factors have already been identified in Chapter 4, and it is believed that mitigating these factors would substantially minimize the problems of delays in road construction projects of Ethiopia. After distributing the questionnaire for professionals who have experience in road construction projects in Ethiopia. Based on the respective importance indices the variables were ranked.

- A total of forty-five (45) causes of delays are identified, they are grouped in to seven related factors. The top fifteen (15) most important factors that contributed to the causes of delays from the perspective of owners (ERA), contractor and consultants are: failure to remove obstruction & give site, award project to lowest bid price, improper planning, rework due to errors during construction, low productivity of labor, progress payment delay by owners, design modification, poor site management, inaccurate time estimation, sub-contractor delay, inaccurate cost estimation, low skill of manpower, poor resource management, interference of owner & liquidated damage.
- Based on the views of the three respondents (owners, contractors & consultants) the extent of time over run is high on the road construction projects in Ethiopia.
- From the case study on the completed sample road projects, some of the delay causes are: poor cooperation from local administration, unforeseen site condition, un favorable weather condition, poor site management, Improper planning, delayed approval by consultants & low productivity of labor.

Road construction projects are vital for developing countries like Ethiopia in particular as infrastructure development is a key for economic development of those countries, hence, untimely delay of road projects in that country will directly affect the country's economic development program.

Therefore, carrying out a research in this area will have a paramount importance to reduce the frequency of untimely delivery (time overrun) of road projects and to avoid it if it is possible. Identification of the most important causes of time overrun on the road project is a prerequisite to minimize or to avoid time overrun to other ongoing road projects.

5.3 Recommendations

From this study, some recommendations are given as follows:

- Timely removal of obstructions and late issue of site hand over are also the main causes of road construction delays resulting from the poor communication between the Federal and Local Road Authorities and poor organization of right of way departments and responsibilities. Therefore, a need to communicate with the local authorities and strengthen the right of way departments is important.
- Selection of best performing contractors and consultants through performance evaluation system and awarding bids to the right/experienced consultant and contractor is also an important way of minimizing road construction delays.
- All parties involved in project agreed that delay occurs mostly during the construction phase. Therefore, in resolving those problems, suggestion to increase construction productivity, followed by enhancing the expertise and skill of human resources, and conduct site meetings more frequently. A strategic view of solving delay problems should be considered as an importance of management aspects, the effects of knowledge and information flow between the organization levels, and importance of top management contribution in solving the problems.
- A need to install a fast decision making procedures for problems during the construction contract implementation process are among the effective method in reducing road construction time overruns.

Lastly, Further research work on more delay and related cases are suggested and arranging forums of discussion among parties in construction sector is crucially important to save extra money and upgrade professional commitments of those involved in the construction sector.

References

- Abbas, M.I. (2006) causes and effects of delays in Czech construction industry, master's thesis, university technology*
- Abd. Majid, M.Z. and McCaffer, R. (1998) Factors of Non-Excusable Delays that Influence Contractors' Performance. Journal of Management in Engineering, ASCE, 42-49.*
- AbebeDinku (2000) Insurance Requirements & Practices of Ethiopia's Construction Sector.*
- AdedejiBadiru, AbidemiBadiru, AdetokunbohBadiru Industrial Project Management 2008, 1st Ed*
- AdiamAtfraw (2016), Identification of causes for late completion of Federal roads projects in Ethiopia & suggested remedial measures.*
- Alade, K. TI, A (2016) Causes & effects of delays in construction projects in Akure, Ondo state, Nigeria.*
- Amin, M.A. (2005). Social Science research: Conceptions, methodology and analysis, Kampala,*
- B.P. Sunjkal and U. Jacob (2013) Significant causes & Effects of project delays in the Niger Delta region, Nigeria.*
- Australasian Journal of Construction Economics and Building, 10(1/2): 103–116.*
- Bryman, Allan (2006). Integrating quantitative and qualitative research, how is it done? Qualitative research, Vol. 6 (1) 97- 113. SAGE Publications, London, Thousand Oaks, CA and New Delhi.*
- Divya.R1, S. Ramya2, Causes, Effects and Minimization of Delays in Construction Projects National Conference on Research Advances in Communication, Computation, Electrical Science and Structures (NCRACCESS-2015)*
- ERA; RSDP-II, (2006).*
- ERA, (December, 2017) RSDP 20 years Performance Assessment.*
- ERA-Ethiopian Roads Authority (2014) Road Sector Development Program IV. Planning and Programming Division, 1-21*
- FeteneNega (2008) causes and effects of cost overrun on public construction projects in Ethiopia,*
- Fugar, F.D. and Agyakwah-Baah, A.B. (2010). Delays in building construction projects in Ghana.*

Haseeb, M., Xinhai-Lu, Aneesa Bibi, A., Maloof-ud-Dyian, Rabbani, W. (2011). *Journal of Business and Management Research*, 1 (5) pp 41-50.

James GacheruKimemia, *Project Planning & Management of the University of Nairobi*. (2015)

Jekale, W. (2004). *Performance for public construction projects in developing countries: Federal road and educational building projects in Ethiopia*. Norwegian University of Science & Technology.

James p.lewis (1995), *Fundamentals of project management*.

Keith Tabler,(2017), *The use of Crobach's alpha when developing & reporting research instruments in science education*.

Kothari, C.R. (2004). *Research methodology. Methods and techniques*. (2nd Ed). India. New Age.

M. Haseeb ,Xinhai-Lu, Aneesa Bibi, Maloof-ud-Dyian, Wahab Rabbani, (2011), *Causes and Effects of Delays in Large Construction Projects of Pakistan, Kuwait Chapter of Arabian Journal of Business and Management Review Vol. 1 Makerere University press*.

Ministry of Works and Urban Development (MoWUD), (2006), *Plan for Accelerated and Sustained Development t End Poverty (PASDEP), (2005/06-2009/10); Urban Development & Construction Industry component of PASDEP*.

Momin Mukherjee (2017). *International Journal of Advanced Engineering and Management Vol. 2, No. 3, pp. 56-59*,

Mugenda, O., &Mugenda, A.G. (2003): revised. *Research Methods; Quantitative Qualitative Approaches: ACTS Press, Nairobi*.

Nega, F. (2008). "Causes and effects of cost overrun on public building construction projects in ethiopia." *M.S. thesis, Addis Ababa University, Addis Ababa, Ethiopia*.

N. Braimah, *understanding construction delay analysis and the role of preconstruction programming, J. Manage. Eng. 30 (5) (2014)*,

Paul Newton, (2015) *Principles of project management*. [WWW free-management-ebooks.com](http://WWW.free-management-ebooks.com)

Pickavance, K. 2005. *Delay and disruption in construction contracts, 3rd edition*.

Polit D.F. & Beck C.T. (2010) *Essentials of Nursing Research: Appraising Evidence for Nursing Practice, 7th edn*. Wolters Kluwer Health / Lippincott Williams & Wilkins, Philadelphia.

Robel Assef, (April 2015) *Schedule Delay Identification and Assessment on Addis Ababa Light Rail Transit Construction Project*.

Saunders, M., Lewis, P. & Thornhill, A. (2012) "Research Methods for Business Students" 6th edition, Pearson Education Limited.

Som,r.J, (1996), Practical sampling technique.

Soon, T.K. (2010). Dispute resolution in relation to delay of construction projects. MSc diss. Universiti Teknologi Malaysia.

Talukhaba, A. A. (1999). An Investigation into Factors Causing Construction Project Delays in Kenya: A Case Study of High Rise Building Projects in Nairobi (PhD Thesis). University of Nairobi.

Theodore, T. (2009). Types of Construction Delays. Understanding them clearly, analyzing them correctly. 2nd Edition. Oxford: Elsevier Inc.

Twana A. Muhammed. (2015) Delays in construction projects.

Woody, Clifford (1924) A survey of educational research in 1923. The Journal of Educational Research Methods, 9(5), 357-381

Zinabu Tebeje, (2016), causes and effects of cost overrun on public building construction

Annex A:

St. Mary's University
School of Graduate Studies
Department of project Management
MBA Program

Questioner for Actors in the Road Construction sectors in Ethiopia.

This questionnaire is prepared to conduct a study in the partial fulfillment of a Master’s Degree in Project management (MBA) program entitled with “**Analysis of Factors contributing Time overrun on road construction projects in the case of Ethiopian Roads Authority(ERA)**”.

Hence, you are kindly requested to give the necessary information for the research questions.

There is no need to write your name and address and the information that you provide will be kept confidential. The accuracy, honesty, and fairness of your response will have a great impaction the outcome of the research.

Aim of the questionnaire: This questionnaire is developed to assess the views of owners, Consultants, and contractors to identify the major factors contributing for time overrun on the road projects administered by Ethiopian Roads Authority (ERA).

General guidelines:

Please read each question (hypothesized factor) carefully and make a tick or a circle under each value and you can write your opinion on the remark section.

SECTION A: General organization information

1. Name of organization: -----

2. Respondents designation:

Owner

Consultant

Contractor

3. Relevant work experience:

1-3 Years 4-6 years 7-10 years > 10years

4. Sex of respondent:

Male Female

SECTION B: Factors contributing for time overrun on the road construction projects in Ethiopia.

1. Please indicate the **significance** of each factor (Causes of delay) by ticking the appropriate boxes. Add any remarks relating to each factor on the last column.

N.B:

1= very Low 3= Moderate

2. = Low 4 = High 5= Very high

No	Variables	1	2	3	4	5	Remark
I	Owner related causes						
1	Inaccurate time estimation						
2	Award project to lowest bid price						
3	Interference of owner						
4	Progress payment delay by owners						
5	Slowness in decision making process by the owner						
6	Change of project scope by owners						

7	Failure to remove obstruction & give site					
II	Labor related causes					
1	Labor supply (insufficient labor)					
2	Non-attendance of labor (absenteeism)					
3	Low skill of manpower					
4	Low productivity of labor					
III	contractor related causes					
1	Rework due to errors during construction					
2	Poor site management					
3	Poor resource management					
4	Improper planning					
5	Incompetent project team					
6	Conflict between labor & management team					
7	Sub-contractors delay					
8	Inadequate contractors' experience					
IV	Financial/Economical related causes					
1	Exchange rate fluctuation					
2	Inflation					
3	Contractors' financial problem					
4	Bankers' policy for loan					
5	Inaccurate cost estimation					
6	Liquidated damage					

V	Design Consultant related causes						
1	Design modification						
2	Complexity of project design						
3	Mistakes in specifications and drawings						
4	Slow decision making by consultants						
5	Delayed approval of redesign						
6	Quality assurance/control						
VI	External factors related						
1	Bad weather condition						
2	Natural disaster						
3	Regulatory changes						
4	Unforeseen site condition						
5	Organizational change						
6	Political situation						
7	High competition in bids						
VII	Equipment/material related causes						
1	Poor equipment efficiency						
2	Quality of material						
3	Late delivery of material						
4	Change in material & specification						
5	Slow equipment movement						
6	Escalation of material price						
7	Lack of skilled operator for specialized equipment						

SECTION C: The extent of time overrun on the road construction projects in Ethiopia.

1. Questionnaire to rate the extent of time overruns in the road construction projects.

Please rate the extent of time overruns according to the scheduled time by thick and fill in the blanks on the table below.

N.B:

1= Very low 3=Moderate

2. = Low 4 = High 5= Very high

NO	Extent of time overrun	1	2	3	4	5
1	How did you rate the extent of time overrun on the road construction projects in Ethiopia?					

Annex B:

Rank of all the identified delay factors

Group	Delay variables	N	Mean	Std. Deviation	A	RII	Rank
owner	failure to remove obstruction & give site	51	4.824	0.385	5	0.965	1
owner	award project to lowest bid price	51	4.549	0.577	5	0.910	2
Contractor	improper planning	51	4.549	0.503	5	0.910	3
Contractor	rework due to errors during construction	51	4.392	0.750	5	0.878	4
Labor	low productivity of labor	51	4.196	0.825	5	0.839	5
owner	progress payment delay by owners	51	4.157	0.731	5	0.831	6
Design/Consultant	design modification	51	4.098	0.700	5	0.820	7
Contractor	poor site management	51	4.078	0.744	5	0.816	8
owner	Inaccurate time estimation	51	3.961	0.662	5	0.792	9
contractor	sub-contractors' delay	51	3.882	0.840	5	0.776	10
Financial/Economic	inaccurate cost estimation	51	3.843	0.880	5	0.769	11
Labor	low skill of man power	51	3.824	0.793	5	0.765	12
contractor	poor resource management	51	3.784	0.856	5	0.757	13
owner	interference of owner	51	3.706	0.756	5	0.741	14
Financial/Economic	liquidated damage	51	3.706	0.855	5	0.741	15
External	unforeseen site condition	51	3.706	0.832	5	0.741	16
contractor	inadequate contactors' experience	51	3.667	0.864	5	0.733	17
Equipment/Material	slow equipment movement	51	3.647	0.844	5	0.729	18
owner	slowness in decision making process by the owner	51	3.627	0.774	5	0.725	19
contractor	conflict between labor & management team	51	3.569	0.831	5	0.714	20

Labor	labor supply(insufficient labor)	51	3.569	0.728	5	0.714	21
External	bad weather condition	51	3.510	0.946	5	0.702	22
owner	change of project scope by owners	51	3.471	0.946	5	0.694	23
contractor	incompetent project team	51	3.471	0.946	5	0.694	24
Design/Consultant	delayed approval of redesign	51	3.471	0.833	5	0.694	25
Design/Consultant	slow decision making by consultants	51	3.392	0.750	5	0.678	26
Equipment/Material	late delivery of material	51	3.392	0.635	5	0.678	27
Equipment/Material	poor equipment efficiency	51	3.373	4.322	5	0.675	28
Financial/Economic	contractors financial problem	51	3.333	0.792	5	0.667	29
Labor	non-attendance of labor(absenteeism)	51	3.216	1.006	5	0.643	30
Financial/Economic	exchange rate fluctuation	51	3.078	0.913	5	0.616	31
Financial/Economic	bankers' policy for loan	51	2.961	0.894	5	0.592	32
Equipment/Material	lack of skill operator for specialized equipment	51	2.941	2.817	5	0.588	33
External	high competition in bids	51	2.882	0.739	5	0.576	34
Financial/Economic	Inflation	51	2.824	0.994	5	0.565	35
Design/Consultant	quality of assurance/control	51	2.765	0.651	5	0.553	36
Design/Consultant	mistakes in specification and drawings	51	2.765	0.862	5	0.553	37
External	political situation	51	2.765	0.839	5	0.553	38
External	organizational change	51	2.745	1.017	5	0.549	39
Equipment/Material	change in material & specification	51	2.608	0.635	5	0.522	40
External	regulatory changes	51	2.588	0.726	5	0.518	41
Design/Consultant	complexity of project plan	51	2.431	0.985	5	0.486	42
Equipment/Material	escalation of material price	51	2.373	0.824	5	0.475	43
Equipment/Material	quality of material	51	2.294	0.782	5	0.459	44
External	natural disaster	51	1.980	0.735	5	0.396	45

Annex C:

Summary of Case Study Projects

No.	Project	Contractor	Commencement Date	Original Completion Date	Revised Completion	EOT granted	Reason for EOT
1	Jimma-Mizan Road Upgrading Project 120.2KM	MIS Keangnam Enterprise Ltd. (Korea)	23 rd May, 2008	22 nd December, 2011	28 th February, 2016	167	-poor cooperation from local administration -Unfavorable weather condition -poor site management -conflict between labor & management team -Delayed removal of obstruction
2	Mega-Moyale Rehabilitation Road Project 109 KM	JMC Enterprise Ltd. (India)	2 nd September, 2013	1 st September, 2016	28 th March, 2018	365	-Delayed removal of obstruction -Delayed approval by consultants -Late delivery of material -Bad weather condition -Improper planning
3	Sawla-Laska road Upgrading project 52.32 KM	SATCON Construction PLC. (Ethiopia)	11 th September, 2011	12 th September, 2014	17 th January, 2018	368	-Delayed removal of obstruction -poor site management -Unforeseen site condition -Bad weather condition -Improper planning
4	Koka-Adulala-Debrezeit road Project 50.88 KM	Net. Engineers & Architects PLC. (Ethiopia)	9 th March, 2015	8 th March, 2017	1 st February, 2018	116	-Delayed removal of obstruction -Low productivity of labor -Unforeseen site condition -Improper planning
5	Zagora-Gassay road project 44.5 KM	China Rail Way Seventh Group Co. Ltd. (China)	25 th June, 2014	24 th June, 2016	29 th May, 2017	331	-Delayed removal of obstruction -Progress payment delay -Change project scope by Owner.