Jimma University

School of Graduate Studies

JIMMA INSTITUTE OF TECHNOLOGY

SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

CIVIL ENGINEERING DEPARTMENT STREAM

Causes of Delays During Construction Phase on Road Projects Due to - Failures of Contractor, Consultant And Employer in Addis Ababa City Road Authority**.**

By: Yosef Amare

A thesis submitted to the School of Graduate Studies of Jimma University in Partial fulfillment of the requirements for the Degree of Masters of Science in Construction Engineering and Management

Main Advisor: Prof. Emer T.Quezon

Co-Advisor: Mr. Mamuye Busier

November, 2015
Jimma, Ethiopia

JIMMA UNIVERSITY SCHOOL OF GRADUATE STUDIES

JIMMA INSTITUTE OF TECHNOLOGY

CIVIL AND ENVIRONMENTAL ENGINEERING SCHOOL

Construction Engineering and Management

Causes of Delays During Construction Phase on Road Projects Due to - Failures of Contractor, Consultant And Employer in Addis Ababa City Road Authority.

M.Sc. Thesis By: Yosef Amare

Approved by Board of Examiners

1. _____ Main advisor	_____ Signature	_____ Date
2. _____ Co-advisor	_____ Signature	_____ Date
3. _____ External Examiner	_____ Signature	_____ Date
4. _____ Internal Examiner	_____ Signature	_____ Date
5. _____ Chairperson	_____ Signature	_____ Date

Acknowledgements

Thanks to almighty GOD for everything I was able to achieve and for everything I tried.

I am greatly grateful to my advisor Prof. Emer T.Quezon for his guidance and comment as not only my advisor, but also being very patient to entertain questions which need brief and precise answer.

I would also like to thank my Co Advisor: Mr. Mamuye B. (MSc) for his keen support and advice during the work of this thesis and also the privies' Advisor Asso. Prof. Joselito Rosco Lacuarin and had they not been assisting me this thesis would not have been reached at this stage.

My special thanks go to the professionals from Addis Ababa City Road Authority, consultants and contractors who participated in giving relevant data while conducting the research. As well, I want to express my special thanks for Ethiopian roads authority (ERA) who gave me the chance to attend this master's degree program.

Eventually, I would like to extend my special appreciation to my wife , my three children's and my parents for all their encouragement and support throughout my master's study and during preparation of this thesis.

.

Abstract

Construction delay is considered one of the most recurring problems in the construction industry. For the purpose of this thesis delays have an adverse impact on project success in terms of time. The effects of construction delays are not confined to the construction industry only, but influence the overall economy of a country like Ethiopia. This research was conducted to assess the causes of excessive delays in completion of the road project during the construction phase due to the failures of Employer, Consultant and Contractor in Addis Ababa City Road Authority road projects.

Spearman rank correlation coefficient from Relative importance index analysis were used to test the agreement between different groups of respondents participated in questionnaires survey and to rank the three construction parties and the causes of delay based on their responsibility and importance accordingly.

The research identified 65 causes of delay through literature review. The analysis from the questioner survey part was done by using a total of 51 valid questionnaires, which received back from contractors, consultants and employer (AACRA).

Based on the data gathered from the questioner and analysis ,there were 40.00% of the respondents from the contractors which represent the highest percentage of the responsibility for the causes of delay. Ranked second was the Employer of about 26.15%, while the third was consultant of 23.08% of the respondents and finally 10.77% of the respondents attested that the Shared (the three parties generally shard) has the responsibility for causes of delay

According to the questioner surveyed Poor financial control of the project ,Difficulties in financing project by contractor , Type of project bidding & award (lowest bidder) ,Poor site management and supervision by contractor has , Selecting inappropriate contractors ,Lack of high-technology mechanical equipment , both Ineffective scheduling of project by contractor , Inaccurate initial project scope estimate ,Ineffective control of the project progress and Contractor's staff are not properly trained in professional construction management techniques were the top ten most important causes of delay in Addis Ababa City Road Authority road projects.

***Keywords**: Delay, three construction parties and Road projects*

Table Of Contents

Acknowledgements 2

Abstract 3

Table Of Contents 4

LIST OF FIGURES 9

ABBREVIATIONS 10

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background 1

1.2 Statement Of Problem 5

1.3 Research Questions 6

1.4 Objective 6

1.4.1 General Objective 6

1.5 Scope And Limitation of the Research 7

1.6 Significance Of The Study 7

1.7 Thesis Organization 7

CHAPTER TWO 8

LITERATURE REVIEW 8

2.1. Introduction 8

2.2. Construction Industry 8

2.3. Understanding the Concept of Delays in Project 11

2.3.2. Risks in Construction Projects and Delays 15

2.3.3. Causes of Delays and Disruptions 16

CHAPTER THREE 22

RESEARCH METHODOLOGY 22

3 Introduction 22

3.1 Description of the Study Area 22

3.2 Study Period 22

3.3 Study Design 22

3.4 Research Population And Sample Size 22

3.5 Study Variables 24

3.6 Data collection process 24

3.7. Data Processing And Analysis 26

3.8. Ethical Consideration 27

3.9. Data quality assurance 27

CHAPTER FOUR 29

RESULT AND DISCUSSION 29

4.1. General Information About The Respondent 29

4.2. Questionnaires Response Rate and Respondent's demographics 29

4.3. Composition Of Respondents' Educational Field Of Specialization 31

4.4. DELAY IN RELATED TRAINING 33

4.5. The Respondents Experience Involvement In Construction Sector 34

4.6. Responsibility of the causes of delay 35

4.7. Relative important index (RII) and ranking 39

4.8. Causes of Delay due to the Employer , Contractor and consultant. 48

4.8.1. Correlation Analysis 48

4.8.2. Spearman's Correlation 48

CHAPTER FIVE 51

CONCLUSIONS AND RECOMMENDATIONS 51

5.1. Conclusions 51

5.2. Recommendations 52

REFERENCES 53

Appendix A 56

Questionnaire 56

Appendix B 64

List of respondents replied valid questionnaires 64

List of Consultants 64

List of Contractors 65

Declaration 66

List of Tables

Table 4.1. Type of respondents organization, number and percentage of distributed, received and valid responses from questionnaires..... 30

Table 2 Results of profession of respondents..... 31

Table 3. Result of respondents' educational qualification 32

Table 4 Involvement in construction delay training..... 33

Table 5 Respondents experience in road construction industry 34

Table 6 Responsibility of the causes of delay 35

Table 7 Responsibility of the causes of delay percentage..... 38

Table 8 Relative Important Index (RII) and ranking of causes of delay..... 40

Table 9 the top ten severe causes of Delay..... 47

Table 10 Validity test result by spearman's rho 49

Table 11 Reliability test results by Cronbach's Alpha..... 50

Table 12 Questionnaires to Rate Level of severe of Delay Factors for road Construction Projects. 63

LIST OF FIGURES

Figure 2 Data processing flow diagrams 25

Figure 3 Respondents' Organizational Type Replied as Valid Questionnaires 30

Figure 4 Educational field of specialization 31

Figure 5 Educational level 33

Figure 6 Delay related training 34

Figure 7 Respondents experience in road construction industry 35

Figure 8 The three parties' responsibility % charts 39

Figure 9 Categories of the causes of Delay based on severity 46

ABBREVIATIONS

AA…….....Addis Ababa

AACRA……Addis Ababa City Roads Authority

AATCB……Addis Ababa Transport and Communication Bureau

CEM…….….Construction Engineering and Management

EIA ……..Environmental Impact Analysis

ERA…….....….Ethiopian Roads Authority

ERA……Ethiopian Roads Authority

FI……..……Frequency Index

GDP……....Gross Domestic Product

GE……Geo-technique Engineering

JIT……...Jimma Institute of Technology

JU.....Jimma University

MSc……..Master of Science

RII…….Relative Importance Index

RSDP……Road Sector Development Plan

vs…….....Versus

CHAPTER ONE
INTRODUCTION

1.1 Background

The construction industry is one of the major sectors which involve substantial financial and human resources. Construction play a vital role in the national economy, including the development of road construction, residential housing, office, commercial and retail buildings, as well as industrial plants & the replacement, maintenance, restoration of the nation's infrastructure and other public facilities. The speed of construction is relatively slow and the available resources management knowledge as well as skilled professionals on construction of road projects is relatively low in Ethiopia. This affects the completion of the project on time. Thus, it is essential to identify the delay causes and develop a suitable Management Systems and upgrading the professional's knowledge to minimizing the project delays have important for Ethiopia.

Construction industry is considered as an essential sector and as a key contributor in the socio-economic development of a country. The overall GDP of a country is also upgraded significantly by this sector; in addition, construction industry provides the essential infrastructures like roads, schools, hospitals, and other facilities (Rahman, *et al*., 2013b).

Due to Ethiopia's geography terrain, settlement pattern, and economic activity, road transport plays a critical role in helping economic improvement as 95% of the movement of people and goods are transported by road transport. Specifically, it is road transport, which allows the ways for the movement of peoples and agricultural goods from rural areas to urban areas. Road transport also facilitates a means for usage of land and natural resources, improved agricultural production and marketing, access to social services, and opportunities for sustainable growth (ERA, 2013).

Knowing the significance of road transport in encouraging social and economic development and its importance to reduce poverty, the Government of Ethiopia has given more focus on the improvement of the quality and size of road infrastructures in the country. The Government developed the Road Sector Development Program (RSDP) in 1997 to tackle the limitations of low road coverage and poor condition of the road network (ERA, 2013).

During the period of sixteen years, the RSDP carried out in four consecutive phases, as follows:

- R S D P I - Period from July 1997 to June 2002 (5 year plan)
- R S D P II - Period July 2002 to June 2007 (5 year plan)
- R S D P III - Period July 2007 to June 2010 (3 year plan)
- R S D P IV - Period July 2010 to June 2015 (5 year plan, 4 years elapsed)

Time has special significance for those who participate in construction projects. Therefore, completion of a construction project within the estimated time of project is the key criteria for success of a project. The success of a construction project mainly relies on adequate availability and efficient management of various resources (Rahman, et al., 2013a).

Ethiopia has been investing large amounts of money in infrastructure development to sustain economic growth, improving goods and services competitiveness and encourage private sector investment. In particular, it is noted that the development of road transport has created a network over a wide array of infrastructural facilities so as to improve the accessibility and mobility of agricultural and industrial products. As a result, the road transport in Ethiopia has been the dominant mode of transport and accounts for 90 to 95 percent of the total motorized interurban freight and passenger transport (NBE, 2012).

In conjunction with the yearly annual GDP growth of Ethiopia, the share of construction sector GDP grew by 10.2% in 2009/2010 and increased by 10.6 % in 2010/2011 and grew by 11.5% in 2011/2012 (MoFED, 2012). Road construction is the major sub-sector, which takes the lion's share of construction expenditure, and hence the total road network increased by 4.23% in 2009/2010 and grew faster by 16.67% and 16.87% in 2010/2011 and 2011/2012, respectively.

A well-developed road transport sector in developing countries like Ethiopia is assumed to fuel up the growth process through a variety of activities of the development endeavors of a nation. Among these, creation of market access opportunities for agricultural products is the major one. Moreover, road transport facilities play a role in both the production and consumption decisions of every household in their day-to-day activities. Besides, road transport facilities are essential for expanding education, health service provision, trade facilitation – within the country and the export market, and better public as well as private service provisions. Likewise, roads serve as key infrastructural units, which provide linkages to other modes of transportation like railways, shipping and airways (EDRI, 2011).

In order to administer the country's road network, Ethiopian road authority (ERA) was established in 1967 by proclamation no 256/67 to provide for the control and regulation of travel and transport on the road. Since its commencement, ERA has been responsible for the use of all roads within Ethiopia, all vehicles using these roads, and for all matters relating to road transport activities of the country. After the downfall of the military government, the ERA was restructuring its obligations with a vision to ensure the provision of a modern, integrated, and safe road transport service to meet the needs of all the communities of a strong and unitary economic and political system in Ethiopia.

Even though the road transport in Ethiopia accounts for over 97% of the total domestic traffic carried out by motorized transport system, most of the connecting roads are not properly maintained, which results in frequent accidents costing the life of many people and the loss of valuable resources every year. So, making improvement in the road sector of the country will have a significant impact on economic and social sectors as well. With this objective in mind, this research will assess the critical factors of project delay as well as other undesirable causes that delay road construction projects. Hence, the major output of

this research is to develop a suitable resolution way to mitigate the occurrence of delay on road projects and minimize the risks of project failures.

Delay is the time overrun either beyond the completion date specified in the contract or beyond the date that the parties agreed upon for delivery of the project. A delay in a construction project may cause losses, or negatively affect some or all of the project parties. The effects of delay may include time overrun, cost overrun, disputes, arbitration, litigation and total abandonment. Some studies directly examine delays and attempt to identify their causes as well as ways to minimize them (Baldwin, 1971; Assaf et al, 1995; Al-Ghaffy, 1995; Ongulana and Pramkuntong; Chan and Kumaraswamy, 1997; Odeyinka and Yusuf; Mansfield; Kaming et al, 1997; Al-Momani, 2000; Frimpong et al; Assaf and Al-hejji; Odeh Bettaineh, 2002).

The concept of success in a construction project can, according to some researchers is evaluated only when the evaluation dimensions are adequately defined (Baker et.al, 1983; Slevin and Pinto, 1986; Morris and Hough, 1987, and Turner 1993). Generally, in any project, the evaluation dimensions correspond to the traditional constraints of time, cost, and quality parameters. Ashley et al (1987, p71) past studies by investigating the success and delay factors they identify. This work examines success and delay factors in an integrated fashion to determine which critical success factors are most influential in avoiding particular critical delay factors. This will provide organizations involved in construction projects with the foundation on which such strategies - on how to avoid delays - can be developed in the future.

Once the critical success factors are identified, the opportunities for improving project performance within the three parties will be discussed on road construction projects. The research will determines the relevance and applicability of these factors for Addis Ababa city road projects.

Time overrun can be defined as the difference between the actual completion time and the estimated completion time. It is measured in number of days. Project delays are those that cause the project completion date to be delayed. From above, time overruns is defined as the time increased to complete the project after planned date which is caused by internal and external factors surrounding the project. Assaf and Hejji defined delay as “Time overrun either beyond completion date specified in a contract, or beyond

the date that the parties agreed upon for delivery of a project slipping over its planned schedule" (S.A.Assaf and S.Al-Hejji,2006)

Stumpf. Defined delay as "Act or event that extends the time required to perform a task under a contract. It is usually an additional days of work or delayed start of an activity." (Stumpf, 2000). And many similar definitions were given. Therefore construction delays can be considered as time lag in completion of activities from a fixed time as per contract or they can be defined as late completion or late start of activities to the planned schedule or contract schedule. When project delay occurs it means project cannot be completed within stated time, which means there will be extensions of time required which will further result in an increased cost due to inflation, termination of contract, court cases etc. or combinations of above stated factors.

Delay can be seen as risk for the project and could be handled at inception stage or at least one can try to mitigate or minimize it. Risk is an integral part of a construction project; it is well known that no project is risk free. If risk is analyzed at inception or planning stage, it could be managed, minimized, shared, mitigated or accepted to give some good results. Delay can be considered similar to risk or a type of risk; as no construction project is free from delays, delay is also integrated part of construction projects. It depends on size of project as well. Therefore, it is expected to analyze and manage delay in same fashion as risk.

Delays are often result of a mismanaged event which must have been managed in a systematic process so as to analyze the effect of that event on the project and how to minimize chances of further delay. (Keane, Caletka, 2008).

1.2 Statement Of Problem

The aforementioned literatures shows that delay is the major problem in road construction industry in developed and developing countries like Ethiopia which needs special and organized consideration to overcome the failure and delay of road construction projects.

Ethiopia has prepared Road Sector Development Program (RSDP) in 1997 to execute within sixteen years by dividing the time in to four RSDP phases. But there are many challenges to perform the strategic plan;

among these, delay is one of the challenges (I.Mahamid 2012) Therefore, this thesis tries to determine and evaluate the causes of delays due to the failures of Employer, Consultant and Contractor in completion of the road project during the construction phase.

1.3 Research Questions

- What are the corresponding factors fall under the responsibility area of the three parties which causes delay during the construction phase?
- Which factors reveal the most recurring causes of delay from the viewpoints of the Employer, Consultant and Contractor?
- What are the factors contributory to the level of severity on the causes of delay?

1.4 Objective

1.4.1 General Objective

To assess the **causes of delays** in completion of the road project during the construction phase due to the failures of **Employer, Consultant and Contractor** in Addis Ababa city road projects.

1.6.2. Specific Objective of the research are

- To identify the corresponding factors fall under the responsibility area by the three parties which causes delay during the construction phase.
- To rank the factors causes delay from the viewpoints of the contractor, Employer and consultant.
- To determine the level of severity among the most significant factors contributory on the causes of delay.

1.5 Scope And Limitation of the Research

The scope of the study is limited to the causes of delay in Addis Ababa city roads Authority projects. Hence, in this research the other federal road projects are not included. And also the scope of the study is limited to roads that have awarded within the last ten years.

1.6 Significance Of The Study

For many studies, the time delays on road construction projects have been a key issue for the government, contractors and consultants in Ethiopia. This is because it has a significant role on the development of the economic and social sector of the country. The government also allocates wage amount of money every year in the road sector development. Since Ethiopia's cities and regions are largely inter- connected through road networks (most of them are poor and not well maintained), the timely completion of any road construction project have a vital contribution on the proper management of the investment, production, distribution and other essential sector activities of the country. So from the finding of this thesis get benefit to the country.

1.7 Thesis Organization

This thesis is divided into five chapters and an Appendix.

The first chapter gives general background information on the delay. It also presents a statement of the problem, the objectives of the study, its scope and significance of the study.

Chapter two: presents the review of related literature on the impact of delay and their consequence on the economic problem of the construction industry.

Chapter three: deals with how the study was conducted, specifically on the method of data collection, sampling techniques and methods of data analysis.

Chapter four: presents the analysis and results of delay in Addis Ababa city road authority.

Finally, in the last Chapter 5 – conclusion and Recommendations

This chapter contains recommendations based on the findings of the study and concludes with suggestions for issues to be considered when delay will mitigate.

CHAPTER TWO
LITERATURE REVIEW

2.1. Introduction

One of the most important problems in the construction industry is delay. Delay occurs in every construction project and the magnitude of these delays varies considerably from project to project. So it is essential to identify the actual causes of delay in order to minimize to any construction project. This chapter reviews literature concerning the major issues of delay in order to recognize the related information look upon delay issue.

2.2. Construction Industry

The construction industry is one of the main sectors that provide important ingredients for the development of an economy. However, many projects experience extensive delays and thereby exceed initial time and cost estimates. Construction delay is considered to be one of the most chronic problems in the construction industry and it has an adverse effect on project success in terms of time, cost, quality, and safety. The study was conducted to investigate the time performance of road construction projects in the West Bank in Palestine to identify the causes of delay and their severity according to contractors and consultants through a questionnaire survey. The field survey included 34 contractors and 30 consultants. Total of 52 causes of delay were identified during the research. Mahamid I, Dmaidi N and Bruland A (2012).The survey concluded that the top five severe delay causes are political situation, segmentation of the West Bank and limited movement between areas, award project to lowest bid price, progress payment delay by owner, and shortage of equipment.(H.Afshari,2011)

A few selected related articles were presented in this section on causes and effects of delay on construction works. Yates (2003) studied construction delays; the study developed a decision support system for construction delay analysis called (DAS). The main categories of delays in DAS according to the study, includes engineering, equipment, external delays, labour, management, material, owner, subcontractors and weather.

Similarly, Mansfield et al., (1994) studied the causes of delay and cost overrun in construction projects in Nigeria. The results showed that the most important factors are financing and payment for completed works, poor contract management, changes in site conditions, shortage of material, and improper planning.

Also, Odeh and Battaineh (1999), and Battaineh (1999) evaluated the progress reports of 164 building and 28 highway projects constructed during the period 1996-1999 in Jordan. The results indicate that delays are extensive: the average ratio of actual completion time to the planned contract duration is 160.5% for road projects and 120.3% for building projects. Likewise, AlMomani (2000), conducted a quantitative analysis of construction delays by examining the records of 130 public building projects constructed in Jordan during the period of 1990-1997. The researcher presented regression models of the relationship between actual and planned project duration for different types of building facilities. The analysis also included the reported frequencies of time extensions for the different causes of delays. The researcher concluded that the main causes of delay in construction projects relate to designers, user changes, weather, site conditions, late deliveries, economic conditions, and increase in quantities.

Moreover, Assaf, Al-Khalil, & Al -Hazmi, (1995) for example, provide a concise summary of the methodologies used by transportation agencies to establish the contract duration used for highway construction projects, and also provides a schedule guide for field engineers during construction. Similarly, Mohammed & Isah (2012) conducted a review on project delays in developing countries during planning and construction stages. In their study they found that the delay and cost overruns of construction projects are dependent on the very early stages of the project.

In another related study, Wilson (1992) examined the role of the owner and architect/engineer's roles in the prevention and resolution of construction claims. Wilson also summarized the causes of construction claims which include: extra work, project delays and acceleration, lack of management, limited site access and change in work schedule.

Divakar k. & Dr Subramanian k (2009) presented a paper on method for computing activity delays and assessing their contributions to project delay. The method consisted of a set of equations, which could be easily coded into a computer program that would allow speedy access to project delay information and activity contributions.

Leishman, D.M. (1993) presented a paper which discussed different delay analysis techniques that are currently used by practitioners in the construction industry. It also discusses a proposed new delay analysis technique called the isolated Delay Type (IDT). These techniques were tested against a case example and their strengths and weaknesses highlighted.

Empirically based time performance research measures either construction time (physical building time) or contract time (performance measured against the date stipulated in contracts). Finally, Bromilow (1998) developed cost and time model that could be used to evaluate delay in projects. One outcome of this study was the development of an empirical relationship between total cost of construction and project duration. The equation describing the average duration as a function of value is T = KCb, where 'T' equals the construction period from possession of site to practical completion in days, 'C' is the final adjusted project value, 'K' is a constant describing how time performance is affected by size, and 'b' a constant indicative of the sensitivity of time performance of cost level. This established the parameters of cost/time performance predictability, although the performance of the individual projects varied significantly.

The relationship was re-tested by Bromilow (1998) in collaboration with the Australian Institute of Quantity Surveyors (AIQS) in two follow-up contract time performance studies, in 1976 and 1988. The former study investigated 408 projects built between 1990 and 1996 and found they despite evidence of greater variation between the time performance of projects of similar value, 'the relationship between construction duration and project cost uncovered in the 1960s still holds.' The 1988 study investigated 408 projects built between 1976 and 1986. It found that the average contract time was about 32% for government contracts and 22% for private contracts (Bromilow, Hinds, & Moody 1998).

2.3. Understanding the Concept of Delays in Project

Many studies have attempted to identify the causes that put construction projects behind planned schedule. For example, Baldwin and Manthei 1971 investigated delay causes in building projects in the United States. Sullivan and Harris 1986 examined delay causes in large construction projects in the United Kingdom. Kaming et al., (1997) analyzed the causes of time and cost overruns in high rise construction projects in Indonesia; Odeh and Battaineh (2002) investigated delay causes in large construction projects in Jordan. The causes identified included design changes, poor labour productivity, and inadequate planning. Furthermore, previous studies showed that delays can be caused by owners, planners/designers, contractors, or acts of God. However, most studies focused mainly on identifying delay causes in the construction phase, rarely emphasizing on the planning and design phases.

McManus et al., 1996, who evaluated delay causes in architectural construction projects, concluded that many delays manifest during all project phases and primarily occur during the construction phase; however delays that start in the design phase include inadequate schedule control by architects, inability of owners to review design in a timely manner, late incorporation of emerging technologies into a design, and ineffective coordination and/or inclusion of project user groups. Basu 2005 identified factors at the start of a project that almost certainly lead to project delays and provided insight into the reasons for the delay and their impact on schedule.

Toor and Ogunlana (2008) studied construction delays in Thailand. They found that the problems faced by the construction industry in developing economies like Thailand could be: (a) shortages or inadequacies in industry infrastructure (mainly supply of resources); (b) caused by clients and consultants and (c) caused by contractor's incompetence/inadequacies. They recommended that there should be concerted effort by economy managers and construction industry associations to provide the necessary infrastructure for efficient project management.

Chan and Kumaraswamy(2008) conducted a survey to determine and evaluate the relative importance of the significant factors causing delays in Hong Kong construction projects. They analyzed and ranked main reasons for delays and classified them into two groups: (a) the role of the parties in the local construction industry (i.e. whether client, consultants or contractors) and (b) the type of projects.

Results indicated that five major causes of delays were: 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. Odeyinka and Yusif (1997) have addressed the causes of delays in building projects in Nigeria. They classified the causes of delay as project participants and extraneous factors. Client-related delays included variation in orders, slow decision-making and cash flow problems. Contractor-related delays identified were: financial difficulties, material management problems, planning and scheduling problems, inadequate site inspection, equipment management problems and shortage of manpower. Extraneous causes of delay identified were: inclement weather, acts of nature, labour disputes and strikes. AlMomani (2000) carried out a quantitative analysis on construction delays in Jordan. The result of his study indicated that the main causes of delay in construction of public projects were related to designers, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity. Similarly, Odeh and Battaineh also conducted a survey aimed at identifying the most important causes of delays in construction projects with traditional type of contracts from the viewpoint of construction contractors and consultants. Results of the survey indicated that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labour productivity, slow decision making, improper planning, and subcontractors were among the top ten most important factors. Frimpong et. al., conducted a survey to identify and evaluate the relative importance of significant factors contributing to delay and cost overruns in Ground water construction project.

One of the key characteristics of the projects, especially construction projects, is executing the scope of work in a specific amount of time. As project time overrun may have bad consequences for the project performing organization such as cost overrun, damage of company's reputation, etc. it is important to clarify between causes of excusable delays and causes of non-excusable delays. Major purpose of this paper is to identify non-excusable delays of executive companies of Mapna Group in order to improve time performance of the project by managing better these causes. The scope of the research is the projects including thermal power plant, steam and power and utility projects which are completed or being executed by these affiliated companies. In this paper top 20 causes of non-excusable delay of construction projects have been identified by a Delphi questionnaire survey and applying Mean Rank method. To determine whether there is degree of agreement among the panel of experts with respect to their ranking of the causes of non-excusable construction delays, a test of hypothesis was developed and a significant degree of agreement among the expert was verified. "Not selecting competent subcontractors" was selected as the most important cause of none-excusable construction delays. (H.Afshari, 2011)

Delay is one of the major problems in Nigeria construction industry. Delay lead to many negative effects such as disputes between clients and contractors, increased costs, loss of productivity and revenue, and termination of contract. The aim of the paper is to investigate the causes of delay in Nigeria construction industry. The survey method was adopted for this work through questionnaire; the questionnaire was distributed to contractors, clients and consultants etc in the construction industry in Nigeria. The data collected was analyzes in rating form to determine the most causes of delay in the construction projects. However the results obtained from ranking analysis shows that improper planning, lack of communication, design errors and shortage of supply are rank high on the causes of delays in Nigeria construction industry. The paper concluded that delays causes more harm than good in construction project, therefore action should be taking to avoid such delay in construction projects in order to improve the efficiency and effectiveness of the industry. Consequently it was recommended that adequate planning; coordination; and proper monitoring of the construction projects by an experience and qualify professionals should be encourage to reduce the impact of delays on construction projects. (K.A. Mohammed, 2012)

Time is one of the major considerations throughout project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success. Time delay is a very frequent phenomenon and is almost associated with nearly all constructing projects. However, little effort has been made to curtail the phenomenon, this research work attempts to identify, investigate, and rank factors perceived to affect delays in the Egyptian construction projects with respect to their relative importance so as to proffer possible ways of coping with this phenomenon. To achieve this objective, researcher invited practitioners and experts, comprising a statistically representative sample to participate in a structured questionnaire survey. Brain storming was taken into consideration, through which a number of delay factors were identified in construction projects. Totally, ninety-nine (99) factors were short-listed to be made part of the questionnaire survey and were identified and categorized into nine (9) major categories. The survey was conducted with experts and representatives from private, public, and local general construction firms. The data were analyzed using Relative Importance Index (RII), ranking and simple percentages. Ranking of factors and categories was demonstrated according to their importance level on delay, especially after 25/1/2011 (Egyptian revolution). According to the case study results, the most contributing factors and categories (those need attention) to delays were discussed, and some recommendations were made in order to minimize and control delays in construction projects. Also, this paper can serve as a guide for all construction parties with effective management in construction projects to achieve a competitive level of quality and a time effective project. (R.F.Aziz, 2013)

2.3.1. Concept of Delays

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). 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. Syed, Azhar, Castillo and Kappagantula, (2002) classify delays into non-excusable delays, excusable noncompensable delays, excusable compensable delays and concurrent delays. Non-excusable delays are delays, which the contractor either causes or assumes the risk for. Excusable non-compensable delays are delays caused by factors that are not foreseeable, beyond

the contractor's reasonable control and not attributable to the contractor's fault or negligence. Compensable excusable delays these are compensable delays are excusable delays, suspensions, or interruptions to all or part of the work caused by an act or failure to act by the owner resulting from owner's breach of an obligation, stated or implied, in the contract. Concurrent delays occur when both owner and the contractor are responsible for the delay.

2.3.2. Risks in Construction Projects and Delays

Management of construction projects involves a great deal of managing risks. Managing risks involves: planning, identifying, analyzing, developing risk handling strategies, monitoring and control. Project team members particularly clients, consultants and contractors should eliminate / mitigate delays when playing their respective roles.

Cohen and Palmer (2004) identify sources of construction risks to include changes in project scope and requirements; design errors and omissions; inadequately defined roles and responsibilities; insufficient skilled staff; force majeure; and new technology. Baloi and Price (2003) categorize construction risks as technical, social, construction, economic, legal, financial, natural, commercial, logistics, and political. Similarly, Mills (2001) lists three most important risks to include: weather, productivity of labour and plant and quality of material. Other researchers such as Finnerty (1996), and Miller and Lessard (2001) have categorized same risks in addition to demand, supply, regulatory, operational, completion and sovereign. Time related risks identified by Zou et al (2006) that are have influence on project delivery are: tight project schedule, design variations, excessive approval procedures in administrative government departments, variations by the client, incomplete approval and other documents, unsuitable construction program planning and inadequate program scheduling. Aiyetan et al (2008) point out that the three most significant factors that adversely impact construction project delivery time performance are: quality of management during construction; quality of management during design, and design coordination.

2.3.3. Causes of Delays and Disruptions

Construction projects are carried out within a specified time the scenario that calls for proper time management in particular eliminating all avenues of delays and disruptions. A study by Kumaraswamy and Chan (1998) on causes of construction delays in Hong Kong found differences in perceptions as to causes of delays by different groups of participants in building and civil engineering works. They suggested that biases of different industry groups might direct blame for delays to other groups. Noulmanee et al (1999) investigated causes of delays in highway construction in Thailand and concluded that delays can be caused by all parties involved in projects; however, main causes come from inadequacy of sub-contractors, organizations that lack sufficient resources, incomplete and unclear drawings and deficiencies between consultants and contractors. Al-Momani (2000) investigated causes of delay in 130 public projects in Jordan and found that main causes of delay were related to designer, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity.

Al-Kharashi and Skitmore (2008) point out that the main cause of delay in Saudi Arabia construction sector for public projects is the lack of qualified and experienced personnel. A study by Ahmed, Azhar, Castillo and Kappagantula, (2002) identified ten most critical causes in Florida as building permits approval, change order, changes in drawings, incomplete documents, inspections, changes in specifications, decision during development stage and shop drawings and approval. Sambasivan and Soon (2007) identify ten most important causes of delay in Malaysian construction industry 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 supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage.
Other researchers looked into delay factors in construction projects. Chan and Kumaraswamy (1997) identified five principal delay factors which are: poor risk management and supervision, unforeseen site conditions, slow decision making, client-initiated variations and work variations.
Other delay factors in a study by Kaming, Olomolaiye, Holt and Harris (1997) are classified under cost and time overruns. The study reveals that the major factors influencing cost overrun are: material cost increase due to inflation, inaccurate material estimation and degree of

complexity. On the other hand, under time overrun, the most important factors causing delays are: design changes, poor labor productivity, inadequate planning, and resource shortages. Haseeb, Xinhai-Lu, Bibi, Maloof-udDyian, and Rabbani (2011) point out that the most common factors of delay are natural disaster in Pakistan like flood and earthquake. The study also acknowledged others which are: financial and payment problems, improper planning, poor site management, insufficient experience, and shortage of materials and equipment.

A study by Aibinu and Jagboro, (2002) revealssix effects of delay on project delivery in Nigerian construction industry which are: time overrun, cost overrun, dispute, arbitration, total abandonment and litigation. Sambasivan and Soon (2007) disclose the same effects of delay in Malaysian construction industry. Haseebet al (2011) identifies effects of delays in Pakistan construction industry as clash, claims, total desertion and slowing down the growth of the construction sector. Ramabodu and Verster (2010) identify critical factors that cause cost overruns in construction projects as changes in scope of work on site, incomplete design at the time of tender, contractual claims (extension of time with cost), lack of cost planning and monitoring of funds, delays in costing variations and additional works. These critical factors in turn are the delay factors. Chileshe and Berko (2010) indicate that causes cost overrun in Ghanian road construction sector are delay in monthly payments to contractors; variations; inflation, and schedule slippage. Again, these explain the causes of delays and the effect of cost overrun. (R. Mc. Caffer, 1998)

Delays are the most common phenomena in the construction industry. During the past time delays have occurred in most types of projects, from simple building projects to the most complex projects such as nuclear power plants or tunneling works. Generally, delays may be caused by: the client (compensable delays); the contractors (non-excusable delays); or acts of God or a third party (excusable delays). Classifies the main causes of non-excusable delays according to the source of occurrence, and then identifies the factors contributing to those causes. It is assumed that the client has more control over the compensable delays and can take action to prevent them. The contractor is expected to have control over the non-excusable delays and, presumably, do more to prevent them. Several studies have discussed the issues relating to these delays, but no major study has been conducted to examine the causes of non-excusable delays in great depth. Understanding the underlying factors that contribute to causes of non-

excusable delays would help in identifying and overcoming the problems faced by contractors during the construction process. To assist in identifying the factors contributing to causes of non-excusable delays, the Ishikawa or fish bone diagram has been used as an analytical tool, and a ranking methodology has been devised. As a report of initial findings of the study, which is currently being undertaken at Laugh borough University, U.K., this paper identifies materials-equipment and labor-related delays as major causes of contractors performance delays.(G.J.Kikwasi,2008)

Delays and disruptions are among the challenges faced in the course of executing construction projects. Delays as well as disruptions are sources of potential risks that current studies are looking into ways to manage such as technical, social, economic, legal, financial, resource, construction and commercial. The purpose of this research is to assess causes and effects and disruptions in construction projects. This study is descriptive, designed to obtain views from clients, consulting firms, regulatory boards and construction firms in regard to causes and effects of delays in construction projects. Two sampling techniques were used to select respondents namely: purposive and random sampling. Literature review, questionnaires and interviews techniques were used to collect data for the study. Findings reveal that the main causes of delays and disruptions are: design changes, delays in payment to contractors, information delays, funding problems, poor project management, compensation issues and disagreement on the valuation of work done. On the other hand, time overrun, cost overrun, negative social impact, idling resources and disputes are the main effects of delays and disruptions. The study concludes that there still exist a number of causes of delays and disruptions and their effects put construction projects at great risk that have an effect on their performance. It is therefore recommended that adequate construction budget, timely issuing of information, finalization of design and project management skills should be the main focus of the parties in project procurement process.(A.S.Faridi,2006)

Construction delay is considered one of the most recurring problems in the construction industry. Delays have an adverse impact on project success in terms of time, cost, quality and safety. The effects of construction delays are not confined to the construction industry only, but influence the overall economy of a country like UAE, where construction plays a major role in

its development and contributes 14% to the GDP. Thus, it is essential to define the most significant causes of delay in order to avoid or minimize their impact on construction projects. A detailed questionnaire was developed and used to get input from professionals associated with the UAE construction industry. The perspective of contractors and consultants has been analyzed to rank the causes of delays based on their Relative Importance Index. Contractors and consultants were in agreement on the most significant causes of delays. The research revealed that 50% of the construction projects in UAE encounter delays and are not completed on time. The top 10 most significant causes of construction delays have been identified by this research. Approval of drawings, inadequate early planning and slowness of the owners' decision making process are the top causes of delay in the UAE construction industry. Construction delay is considered one of the most recurring problems in the construction industry. Delays have an adverse impact on project success in terms of time, cost, quality and safety. The effects of construction delays are not confined to the construction industry only, but influence the overall economy of a country like UAE, where construction plays a major role in its development and contributes 14% to the GDP. Thus, it is essential to define the most significant causes of delay in order to avoid or minimize their impact on construction projects. A detailed questionnaire was developed and used to get input from professionals associated with the UAE construction industry. The perspective of contractors and consultants has been analyzed to rank the causes of delays based on their Relative Importance Index. Contractors and consultants were in agreement on the most significant causes of delays. The research revealed that 50% of the construction projects in UAE encounter delays and are not completed on time. The top 10 most significant causes of construction delays have been identified by this research. Approval of drawings, inadequate early planning and slowness of the owners' decision making process are the top causes of delay in the UAE construction industry. (H. S. Neap, 2004)

Owner/client is a significant contributing party within the management of a project in construction. In addition to the payment of the bills related to the project, owner/client has duties and responsibilities such as selecting the professionals, making his requirements understood clearly by other parties, making decisions to recommendations and placing orders. Owner/client has to perform these duties and responsibilities at the right times and in correct ways to have the required quality and value for his/her investment. In performing his/her duties and

responsibilities owner could introduce positive and negative contributions to the value of the constructed facility. Value-based project management concerns with owner's/client's value system and helps owner/client in performing his/her duties and responsibilities for the optimum positive contributions to the value of the constructed facility in construction. The study highlights the principles of value-based project management in construction and investigates the impact of owner contributions to the value of a constructed facility in practice.

According to Abbas (2006), late 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 expenses) and it often raises the contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts. A cost overrun occurs when the final cost of the project exceeds the original estimates (Azhar & Farouqi, 2008).

There is a relationship between schedule, the scope of work and project conditions. Changes to any one or more of these three can affect the compensation level and time of completion. It has been argued that it is necessary to create awareness of causes of project schedule delays, their frequency, and the extent to which they adversely affect project delivery (Al-Khalil & Al-Gafly, 1999). Kaliba et al. (2009) concluded from their study that the major causes of delay in road construction projects in Zambia were delayed payments, financial deficiencies on the part of the client or contractor, contract modification, economic problems, material procurement, changes in design drawings, staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications, labour disputes, and strikes.

Agaba (2009) attributes delays in construction projects to poor designs and specifications, and problems associated with management and supervision. In their study, El-Razek et al., (2008) found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Sambasivan and Soon (2007) established poor

planning, poor site management, inadequate supervisory skills of the contractor, delayed payments, material shortage, labor supply, equipment availability and failure, poor communication and rework, were the most important causes of delays in the Malaysian Construction Industry. Kouskili and Kartan (2004) identified the main factors affecting cost and time overrun as inadequate/inefficient equipment, tools and plant, unreliable sources of materials on the local market, and site accidents. Le-Hoai et al.,(2008) ranked the three top causes of cost overruns in Vietnam as material cost increase due to inflation, inaccurate quantity take - off, and labour cost increase due to environment restriction. Kaliba, et al(2009) conclude that cost escalation of construction projects in Zambia are caused by factors such as inclement weather, scope changes, environment protection and mitigation costs, schedule delay, strikes, technical challenges and inflation. Bubshait and Al-Juwait (2002) list the following as factors that cause cost overrun on construction projects in Saudi Arabia: effects of weather, number of projects going on at the same time, social and cultural impacts, project location, lack of productivity standards in Saudi Arabia, level of competitors, supplier manipulation, economic stability, inadequate production of raw materials by the country, absence of construction cost data. It can therefore be deduced that the most important factors vary from one region to another.

CHAPTER THREE
RESEARCH METHODOLOGY

3 Introduction

The methodologies applied to achieve the objective of the research have used a data of: literature survey, problem identification, design of data collection methods, data collection and data analysis. The surveyed reference materials include: recent journals related to construction delays, text books of project management emphasizing delay, hand book of civil engineering delays, internet exploration etc.

3.1 Description of the Study Area

The study area is limited to Addis Ababa city which represent projects constructed by Addis Ababa City Roads Authority.

3.2 Study Period

This research had been planned to complete within eight months' time frame from the beginning. But the data was collected from May, 2015GC to June, 2015GC because some constraints relative to job reassignment location.

3.3 Study Design

This study is descriptive and explanatory research type in which questionnaires are designed. In this thesis, a case study research approach is used in order to collect relevant secondary and primary data through review of documents, survey of questionnaires with key groups of professionals.

3.4 Research Population And Sample Size

The research population was drawn from three parties, which were participating in road

construction. Attempts have been made so that the samples drawn from population are representative. Most of the respondents were senior staff of the three parties to provide information.

In order to get the required sample size, the purposive sampling approach is applied. The respondents are restricted to the Addis Ababa City Roads Authority projects. A minimum of three samples for each selected projects, senior staffs of the projects professional and different field of disciplines are considered. According to AACRA lists, more than 15 projects are in progress with more than 10 contracting companies and 8 consulting firms. In order to get the required sample size of both consultants and contractors, the statistical concepts of exploratory research is employed. This concepts state that the sample size is calculated by the following (2) equations: (Darwish, 2005):

$n0 = (p*q) / V^2$……. (Eq 1)

$n = n0 / [1+ (n0/N)]$ …… (Eq 2)

Where:

n0: First estimate of sample size.

p: The proportion of the characteristics being measured in the target population.

q: Complement pf 'p' or 1-p.

V: The maximum standard error allowed.

N: The population size.

n: the sample size

Since some of the contractors and consultants have more than one project in the region, the number of N is 10 and 12 for consultants and contractors respectively. To maximize n, p is set to 0.5, while to account for more error in qualitative answers, maximum, standard error V is set to 10% or 0.1 (Darwish, 2005). Substitutes these values in the above equations give the minimum sample size for consultant's are 20 respondents and for contractor 21 respondents. For the Owner 20 respondents are requested which include project managers, engineers, team leaders, director and others technical supporting staffs.

3.5 Study Variables

Causes of delay during the construction phase of road projects will have the following variables:-

- ❖ Independent variables

Factors affecting responsibility area by

- Contractor,
- Consultant and
- Employer.

- ❖ Dependent Variables
  - ➢ Causes of delay

3.6 Data collection process

The preliminary data for this research is collected through literature review and will be surveyed using of a questionnaire targeting Contractors, consultant and employer in AACRA road projects.

Data processing diagram is shown in Figure 2.

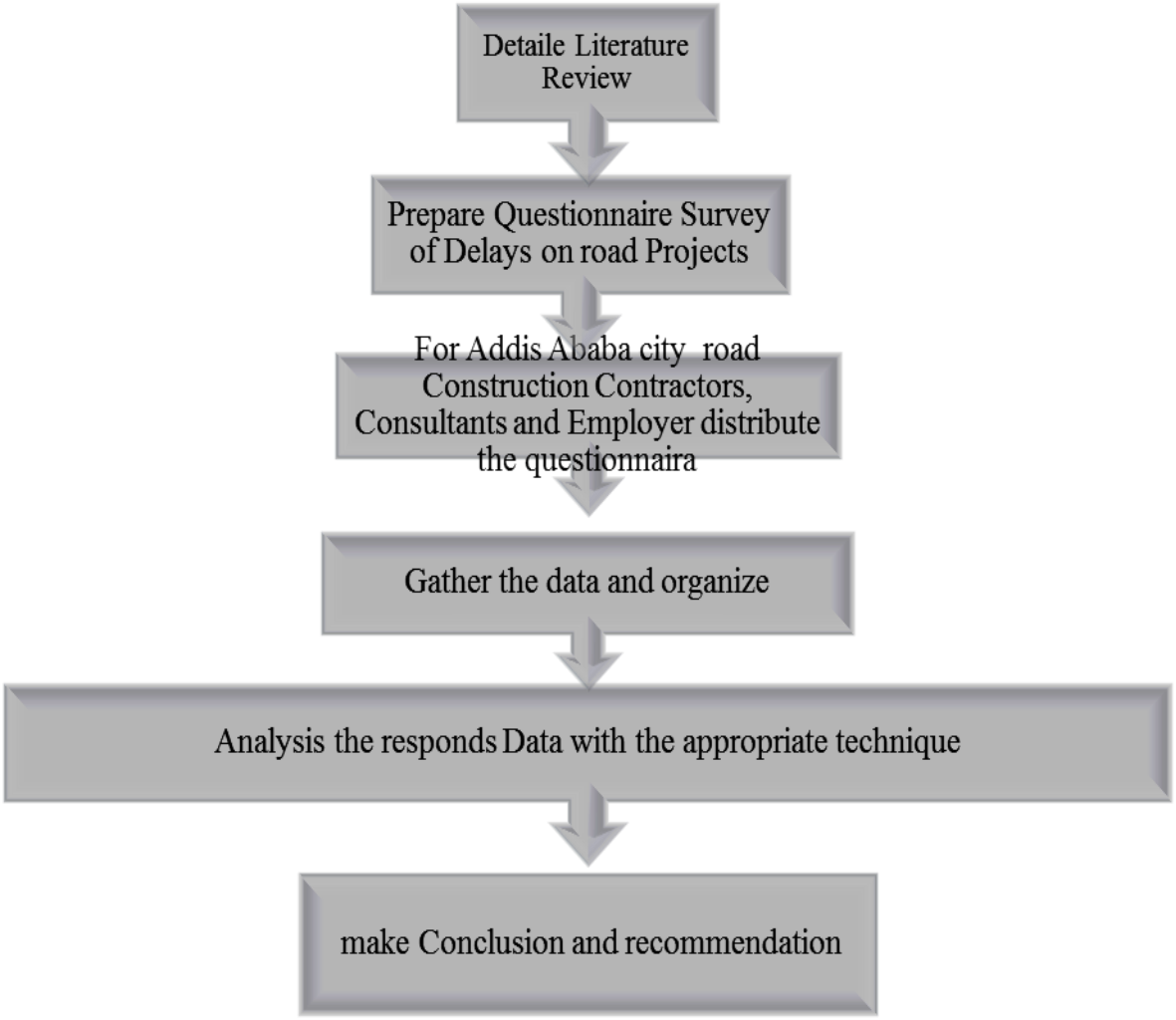

Figure 1 Data processing flow diagrams

The literature review has done through books, Internet and leading construction management and engineering journals. In this step, all the major causes for delays that faced in a construction project have identified and a detail review of published technical papers, recent magazines, newspapers and via Internet.

3.7. Data Processing And Analysis

The collected data were analyzed using Microsoft excel and SPSS package to determine the occurrence of the causes of delay due to employer, contractor and consultant on road construction projects in Addis Ababa City Road Authority and to test whether there is agreement or disagreement among each pair of parties (respondents). The ranking of causes based on importance index were calculated using the formulas shown below.

Kometa et al. 2011 used the relative importance index method to determine the relative importance of the various causes of delays. The same method was adopted in this study within various groups (i.e. clients, consultants or contractors). The five -point scale ranged from 1 (not important) to 5 (extremely important) was adopted and transformed to relative importance indices (RII) for each factor

The Relative Important Index method (RII) was used for analysis of the data. The relative important index is computed as;

$$RII = \sum \frac{W}{A * N}$$

Where

RII= Relative Important Index

W= Weight given to each factor by the respondent and ranges from 1 to 5

A= the highest weight 5

N= the total number of respondents

The RII was used to rank (R) the different causes. These rankings made it possible to cross-compare the relative importance of the factors as perceived by the three groups of respondents (i.e. clients, consultants and contractors). Each individual cause's RII perceived by all respondents were used to assess the general and overall rankings in order to give an overall picture of the causes of construction delays in Malaysian construction industry. The same

procedure was adopted for ranking the effects. The indices (RII) were then used to determine the rank of each item (effect). These rankings made it possible to cross compare the relative importance of the items as perceived by the three groups of respondents. The weighted average for each item for the three groups of respondents was determined and ranks (R) were assigned to each item representing the perception of the three groups

Finally, Spearman's coefficient of rank correlation was used to test whether there is agreement or disagreement among each pair of parties (respondents) in ranking the Cause of delays during the construction phase of road projects due to the frailer of the employer, consultant and contractor.

The pair of parties tested for agreement is employer versus consultants, employer versus contractors, and consultants versus contractors. Spearman's formula is given as

$\rho=1-6\Sigma d2\ (n2-1)$ Salleh (2009)

Where

ρ = Spear man coefficient

d = the difference between ranks

n= number of subjects or pairs of ranks

3.8. Ethical Consideration

The research and data collection were done after the approval was given from Research publication graduate studies & consultancy office of technology institute and Ethiopian roads authority to conduct this thesis. Before the collection of the data the purpose of the data collection was clearly described to the organizations by the data collectors and the principal investigator and also on the research data collection questioners I was clearly stated the purpose and objective of the thesis. The data were collected based on the willingness of the organizations to give information. The data were kept confidential and used only for educational research purpose only if others use this document first they must get permeation from all concerned parties.

3.9. Data quality assurance

Strict caution in processing in order to assure the quality of the collected data, data collectors were guided properly to handle the data carefully and to distribute the questionnaires for the targeted professionals. During the data analysis time the raw data used in excel were checked not less than four times whether the values were exactly the same with the respondents given value in the questionnaires to avoid any wrong results and also further checked by one statistician professional.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. General Information About The Respondent

Based on the research methodology described in chapter three, this part of the study shows the results and discussions to meet the objective of the study ,which was the analysis of severity and responsibility of the identified causes to rank their Relative importance index(RII) .To accomplish the objective ,questionnaires survey were used.

This part includes:

- Questionnaires Response Rate and Respondent's demographics
- To identify the delay causes of failures of employer, consultant and contractor during the construction phase.
- Ranking of the causes based on responsibility of the causes of delay identifies with contractor, employer and consultant
- Ranking of the causes of delay based on Relative Important Index
- Ranking of the causes based on importance and discussion of the most important causes
- Test of agreement between the respondents in ranking causes of Delay

4.2. Questionnaires Response Rate and Respondent's demographics

For this study, the sample population composed of professionals from Employer (AACRA), consulting firms, and contractors, who participated in the construction of AACRA road projects in Addis Ababa. These included project engineers, office engineers, construction professional', construction managers', project team leaders, site project supervisor engineers and resident engineers.

The questionnaire survey that has been structured was used to carry out by distributing to a total of

62 questionnaire sets. It has been distributed to 20 employees, 21 contractors firms, and 21consultant firms. From these distributed questionnaires. There were 52 responses received back. However ,one of the questionnaires were not completed which were considered as invalid and not used for further analysis as shown below in table4.3.

Table 4.1. Type of respondents organization, number and percentage of distributed, received and valid responses from questionnaires.

Respondents Organization	Number of questionnaires Distributed	Number of questionnaires Received	%of response received	Number of valid questionnaires	%of valid responses
Employers	20	15	75.00	15	75.00
Consultant	21	19	90.48	19	90.48
Contractor	21	18	85.71	17	80.95
Total	62	52	83.87	51	82.26

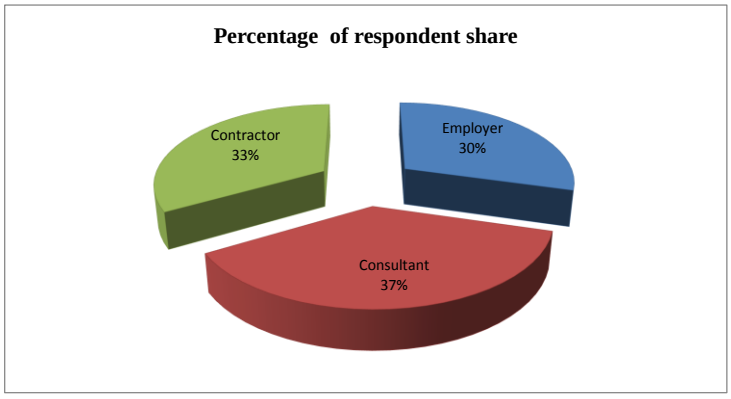

Figure 2 Respondents' Organizational Type Replied as Valid Questionnaires

In this research,29.41%(15)Employer,37.25%(19)consultants and 33.33%(17) contractors replied valid questionnaire as shown at Figure 3. From the received questionnaires are currently working in Addis Ababa regions o f A A C R A road projects.

4.3. Composition Of Respondents' Educational Field Of Specialization

Table 2 Results of profession of respondents

S/N	PARTICULAR	FREQUENCY	PERCENTAGE
1	Civil Engineer	21	41.18%
2	Highway Engineer	1	1.96%
3	Construction management	17	33.33%
4	Transportation Engineer	2	3.92%
5	Geotechnical Engineer	8	15.69%
6	Structural Engineer	2	3.92%
7	Others	0	0.00%
	Total	51	100.00%

Source: Questioner Survey (2015)

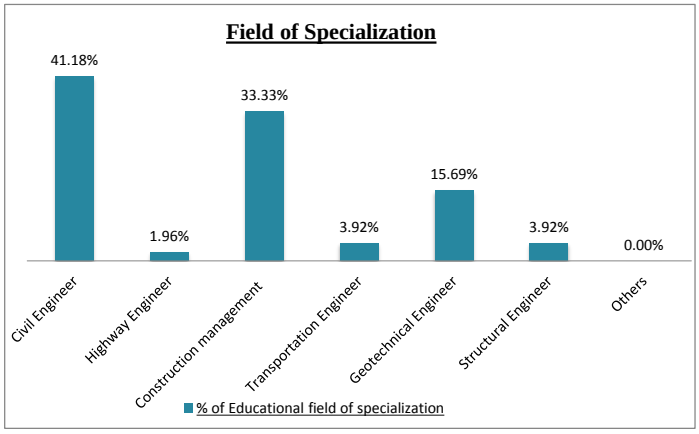

Figure 3 Educational field of specialization

In this study, purposive sampling was used in selecting the respondents, 62 professionals in the construction industry were selected, and sixty two(62)numbers of those selected were able to distribute the questionnaire, while Ten(10)of sixty two(62)were ignored and one (1)for incorrect entry. Based on the response obtained from Table 4.1, (21) 41.18%of the respondents are Civil Engineers, (1)1.96% of the respondents is Highway Engineer, (17)33.33% are Construction Management Engineers, (2)3.92%are Transportation Engineers, (8) 15.69% are Geotechnical Engineers and (2)3.92%of the respondents are Structural Engineers while (0)0% of the respondents fall on others.

From the analysis above, the Civil engineer shows the highest percentage among the respondent while the Construction management has 33.33%. The combination of their professional gave generous response to the information which has been sought for the analysis

Table 3. Result of respondents' educational qualification

S/N	**PARTICULAR**	**FREQUENCY**	**PERCENTAGE (%)**
1	Diploma	6	11.54%
2	BSC	31	59.62%
3	MSC	15	28.85%
4	PHD	0	0.00%
5	other	0	0%
	TOTAL	51	100%

Source:-Questioner Survey (2015)

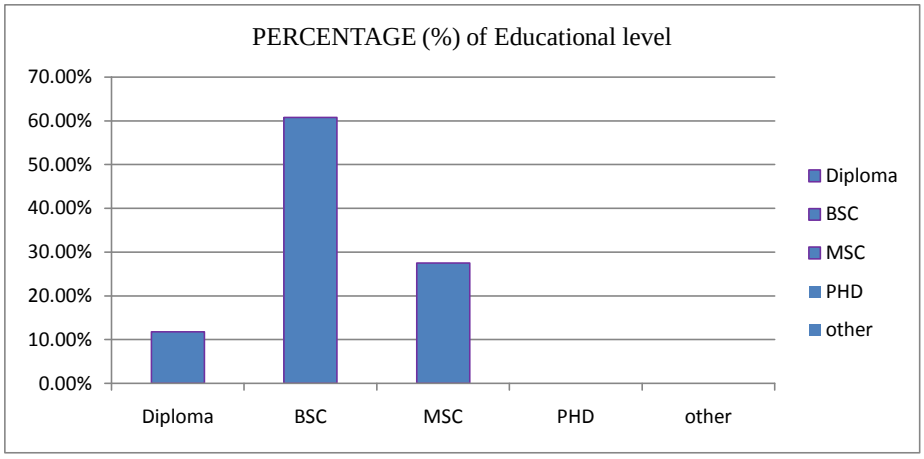

Figure 4 Educational level

Table4.2 shows of about 11.54% of the respondents are Diploma , (31)59.62% of the respondents are BSc holders, (15)28.85% of the respondents are MSc holders, none of the respondent had PHD and also (0) 0% of the respondent from other cztegory.

4.4. DELAY IN RELATED TRAINING

Table 4 Involvement in construction delay training

Delay related training	% of respondent
yes	10
no	41

From the collected questioner on table 4.3, most of the respondent have not taken delay related training 80% while the respondents who had taken delay training comprised of 20%. These values are represented in the following figure .

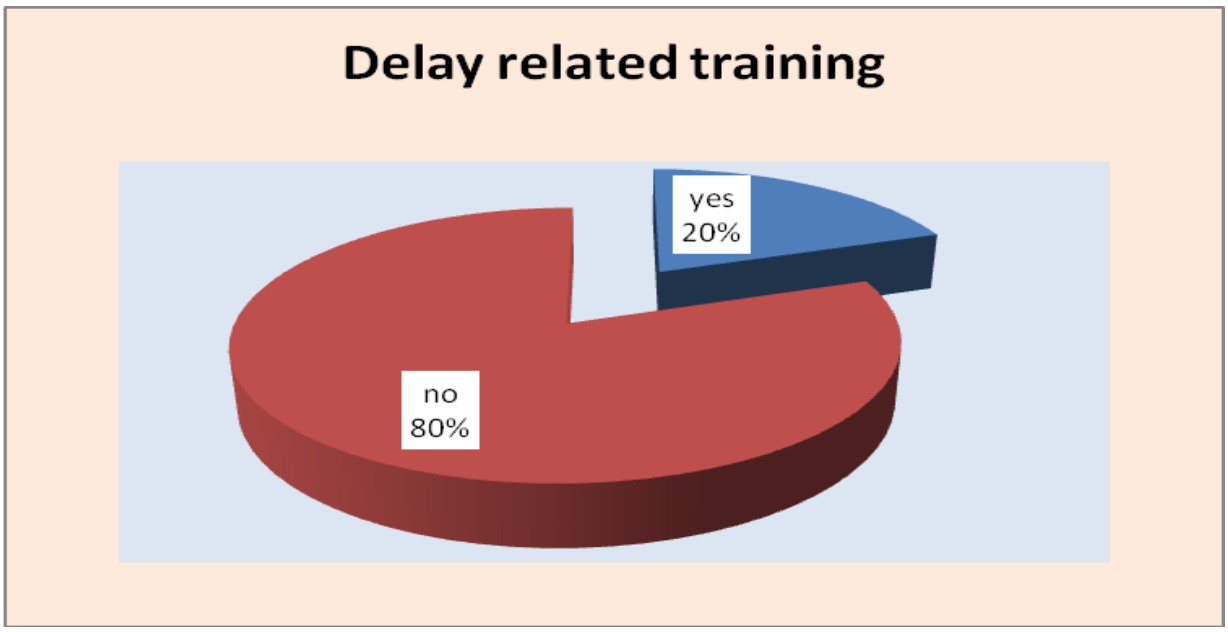

Figure 5 Delay related training

4.5. The Respondents Experience Involvement In Construction Sector

Table 5 Respondents experience in road construction industry

Experience in years	Respondent % of experience
0 to 3year	0
3 to 5 years	0
5 to 10years	69
greater than 10 years	31

Figure 4.3 below shows the overall experience of the respondents in road construction projects. As shown from Figure 2, the majority (69.00%) of the respondents had 5-10 years of professional experience, about 31.00 % had over 10 years of professional experience, 0.00% had between 0 and 3 years of professional experience and the remaining 0.00% of the respondents had between 3 and 5 years of experience in road construction industry.

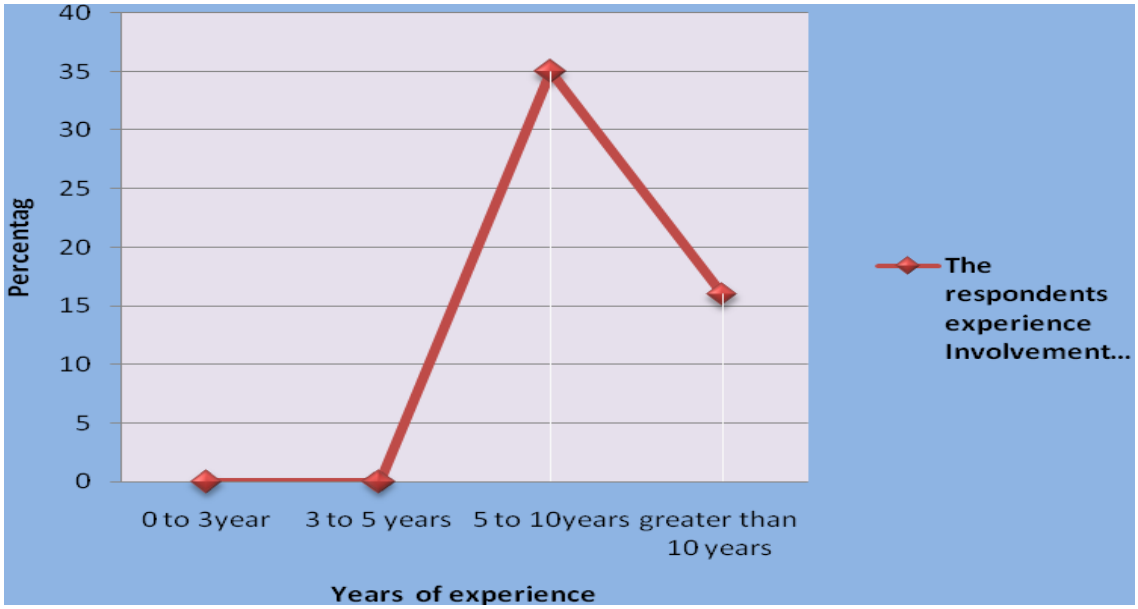

Figure 6 Respondents experience in road construction industry

4.6. Responsibility of the causes of delay

Table 6 Responsibility of the causes of delay

S/N	Factor Causing Delays	Responsibility
1	Contractor experience	contractor
2	Ineffective scheduling of project by contractor	contractor
3	Delay in the preparation of contractor submissions	contractor
4	Improper technical study by the contractor during the biding stage	contractor
5	Poor qualification of the contractors' technical staff	contractor
6	Difficulties in financing project by contractor	contractor

7	Poor site management and supervision by contractor	contractor
8	Conflicts between contractor & other parties (consultant & Employer)	shared
9	Frequent change of sub-contractors because of their inefficient work	contractor
10	Ineffective control of the project progress by the contractor	contractor
11	Late in resolving right of way issues	Employer
12	Delay in performing inspection by consultant	Consultant
13	Poor communication by consultant with other construction parties	Consultant
14	Insufficient inspectors by consultant	Consultant
15	Delay in approval of work permit by consultant	Consultant
16	Improper construction method	contractor
17	Incomplete drawings/specifications	Consultant
18	Design errors and omissions	Consultant
19	Excessive extra works orders	Employer
20	Inadequate design team experience	Consultant
21	Delays in producing design documents	Consultant
22	Rework due to wrong drawings	Consultant
23	Insufficient data collection and survey before design	Consultant
24	Long period for approval of tests and inspections by consultant	Consultant
25	Unfamiliarity with or lack of knowledge by the consultant's supervision staff regarding new construction methods, materials and techniques	Consultant
26	Lack of application of construction management tools and techniques by consultant's project and site staff	Consultant
27	Conflicts between drawings and specifications	Consultant
28	Frequent design changes requested by Employer during construction	Employer
29	Inaccurate initial project scope estimate	Employer

30	Unrealistic time estimation	Employer
31	Slow decision-making process by Employer departments	Employer
32	Inefficient f low of information from Employer departments	Employer
33	No or small time extensions associated with change orders initiated by Employer	Employer
34	Understaffed consultant's project and site personnel	Consultant
35	Poor communication and coordination by Employer and other parties	Employer
36	Delays in work approval of Employer	Employer
37	Employer-initiated variations	Employer
38	Poor qualifications and inadequate experience of contractor's supervisors	contractor
39	Ineffective planning and scheduling of project	Shared
40	Equipment allocation problems	contractor
41	Materials management problems	contractor
42	Misinterpretation of drawings and specifications	shared
43	Rework due to errors during construction	shared
44	Delay in site mobilization	shared
45	Late delivery of materials and equipment	contractor
46	Poor procurement programming of materials	contractor
47	Type of project bidding and award (lowest bidder)	Employer
48	Ineffective delay penalties	Employer
49	Legal disputes between/with various parties	shared
50	No application of construction management procedures on the part of Employer contributes to late detection of construction problems	Employer
51	Unrealistic schedule program submitted by contractor	contractor
52	Contractor's staff are not properly trained in professional construction management techniques	contractor

53	Poor judgment and inexperience in estimating procedures by contractor	contractor
54	Shortage of construction materials (bitumen, cement and steel)	contractor
55	Shortage of technical personnel	Employer
56	Insufficient equipment	contractor
57	Shortage of labour	contractor
58	Price escalation	Employer
59	Low level of equipment operators' skills	contractor
60	Low productivity and efficiency of equipment	contractor
61	Lack of high-technology mechanical equipment	contractor
62	Unqualified workforce	contractor
63	Low productivity of labour	contractor
64	Selecting inappropriate contractors	Employer
65	Poor financial control of the project	shared

Table 7 Responsibility of the causes of delay percentage

Responsibility	% of Responsibility
Employer	26.15%
Contractor	40.00%
Consultant	23.08%
Shared	10.77%

Table4.5. above shows a table showing the highest percentage of causes of delay amongst the Employer, contractor, consultant and the shared of three parties. (26)

40.00% of the respondent to the fact that the contractors are have the highest percentage of the responsibility for the causes of delay, then (17) 26.15% of the respondent attested to the fact that the Employer has the highest percentage of the responsibility for causes of delay, while (15)23.08% of the respondents attested to the fact that the consultant has the highest percentage of the responsibility for causes of delay. And finally (7)10.77% of the respondents attested to the fact that the Shared (the three parties generally shard) has the responsibility for causes of delay and also this is shown on finger 6 below.

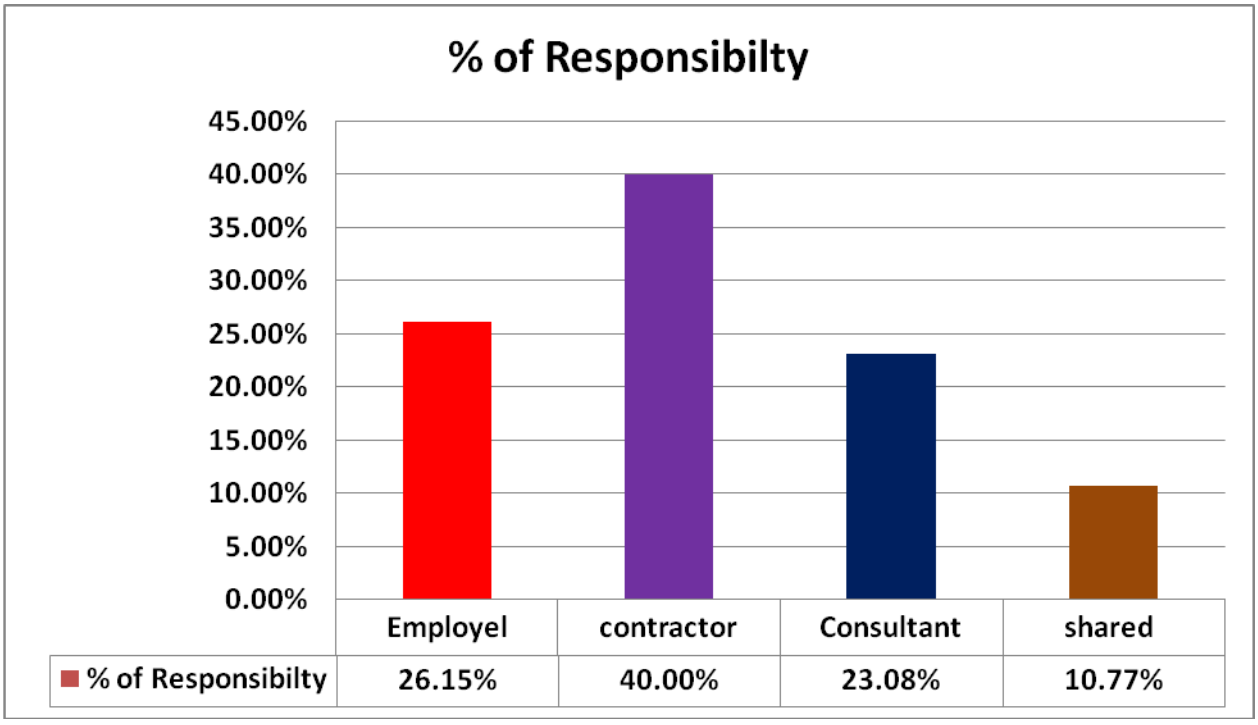

Figure 7 The three parties' responsibility % charts

4.7. Relative important index (RII) and ranking

The table as indicated below shows the calculated Relative important index values and rank for each

causes of delay based on their severity as cause of delay from contractors, consultants, and Employer (AACRA) and overall respondent's viewpoints.

Table 8 Relative Important Index (RII) and ranking of causes of delay

	Factors that Causes Delays Causes	**Consultant**		**Contractor**		**Employer**		**OVER all of the three party**	
		RII	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**
1	Contractor experience	0.737	25	0.670	24	0.707	33	**0.705**	**30**
2	Ineffective scheduling of project by contractor	0.768	10	0.764	8	0.893	2	**0.803**	**7**
3	Delay in the preparation of contractor submissions	0.684	43	0.6	55	0.640	54	**0.643**	**50**
4	Improper technical study by the contractor during the biding stage	0.716	35	0.741	11	0.760	20	**0.737**	**20**
5	Poor qualification of the contractors' technical staff	0.705	39	0.729	20	0.747	23	**0.725**	**23**
6	Difficulties in financing project by contractor	0.853	3	0.847	3	0.867	5	**0.854**	**2**
7	Poor site management and supervision by contractor	0.821	6	0.823	4	0.880	3	**0.839**	**4**
8	Conflicts between contractor & other parties (consultant & Employer)	0.653	48	0.658	28	0.640	54	**0.650**	**46**
9	Frequent change of sub-contractors because of their	0.379	65	0.411	65	0.400	65	**0.396**	**65**

	inefficient work								
10	Ineffective control of the project progress by the contractor	0.747	13	0.788	5	0.840	6	**0.788**	**9**
11	Late in resolving right of way issues	0.726	27	0.623	44	0.587	59	**0.650**	**46**
12	Delay in performing inspection by consultant	0.663	47	0.600	55	0.680	45	**0.647**	**49**
13	Poor communication by consultant with other construction parties	0.589	51	0.623	44	0.693	40	**0.631**	**51**
14	Insufficient inspectors by consultant	0.642	50	0.635	41	0.680	45	**0.650**	**46**
15	Delay in approval of work permit by consultant	0.726	27	0.588	59	0.680	45	**0.666**	**40**
16	Improper construction method	0.726	27	0.611	50	0.640	54	**0.662**	**43**
17	Incomplete drawings/specifications	0.684	43	0.635	41	0.653	50	**0.658**	**44**
18	Design errors and omissions	0.705	39	0.729	20	0.760	20	**0.729**	**22**
19	Excessive extra works orders	0.747	13	0.647	31	0.733	26	**0.710**	**27**
20	Inadequate design team experience	0.674	46	0.611	50	0.720	30	**0.666**	**40**
21	Delays in producing design documents	0.726	27	0.670	24	0.693	40	**0.698**	**33**
22	Rework due to wrong drawings	0.484	63	0.552	63	0.480	63	**0.505**	**64**
23	Insufficient data collection and survey before design	0.768	10	0.741	11	0.787	15	**0.764**	**14**

24	Long period for approval of tests and inspections by consultant	0.653	48	0.647	31	0.707	33	**0.666**	**40**
25	Unfamiliarity with or lack of knowledge by the consultant's supervision staff regarding new construction methods, materials and techniques	0.684	43	0.623	44	0.667	48	**0.658**	**44**
26	Lack of application of construction management tools and techniques by consultant's project and site staff	0.747	13	0.741	11	0.800	12	**0.760**	**15**
27	Conflicts between drawings and specifications	0.716	35	0.600	55	0.693	40	**0.670**	**39**
28	Frequent design changes requested by Employer during construction	0.705	39	0.623	44	0.707	33	**0.678**	**38**
29	Inaccurate initial project scope estimate	0.800	7	0.776	6	0.840	6	**0.803**	**7**
30	Unrealistic time estimation	0.737	25	0.741	11	0.787	15	**0.752**	**17**
31	Slow decision-making process by Employer departments	0.547	60	0.658	28	0.693	40	**0.627**	**53**
32	Inefficient f low of information from Employer departments	0.589	51	0.623	44	0.667	48	**0.623**	**54**
33	No or small time extensions associated with change orders initiated by Employer	0.747	13	0.741	11	0.787	15	**0.756**	**16**
34	Understaffed consultant's project and site personnel	0.726	27	0.670	24	0.707	33	**0.701**	**31**
35	Poor communication and	0.558	58	0.588	59	0.653	50	**0.596**	**58**

	coordination by Employer and other parties								
36	Delays in work approval of Employer	0.568	56	0.611	50	0.653	50	**0.607**	**57**
37	Employer-initiated variations	0.589	51	0.611	50	0.640	54	**0.611**	**55**
38	Poor qualifications and inadequate experience of contractor's supervisors	0.579	55	0.611	50	0.653	50	**0.611**	**55**
39	Ineffective planning and scheduling of project	0.716	35	0.647	31	0.707	33	**0.690**	**36**
40	Equipment allocation problems	0.747	13	0.647	31	0.733	26	**0.709**	**27**
41	Materials management problems	0.747	13	0.647	31	0.733	26	**0.709**	**27**
42	Misinterpretation of drawings and specifications	0.568	56	0.541	64	0.640	54	**0.580**	**59**
43	Rework due to errors during construction	0.474	64	0.588	59	0.480	63	**0.513**	**63**
44	Delay in site mobilization	0.747	13	0.647	31	0.707	33	**0.701**	**31**
45	Late delivery of materials and equipment	0.758	12	0.752	10	0.840	6	**0.780**	**11**
46	Poor procurement programming of materials	0.716	35	0.729	20	0.760	20	**0.733**	**21**
47	Type of project bidding and award (lowest bidder)	0.842	5	0.870	2	0.840	6	**0.850**	**3**
48	Ineffective delay penalties	0.747	13	0.670	24	0.747	23	**0.72**	**24**
49	Legal disputes between/with various parties	0.558	58	0.564	62	0.520	61	**0.549**	**62**
50	No application of construction management procedures on the	0.747	13	0.647	31	0.773	19	**0.721**	**24**

	part of Employer contributes to late detection of construction problems								
51	Unrealistic schedule program submitted by contractor	0.726	27	0.635	41	0.720	30	**0.694**	**35**
52	Contractor's staff are not properly trained in professional construction management techniques	0.747	13	0.741	11	0.880	3	**0.784**	**10**
53	Poor judgment and inexperience in estimating procedures by contractor	0.547	60	0.6	55	0.547	60	**0.564**	**60**
54	Shortage of construction materials (bitumen, cement and steel)	0.726	27	0.729	20	0.787	15	**0.745**	**18**
55	Shortage of technical personnel	0.705	39	0.647	31	0.707	33	**0.686**	**37**
56	Insufficient equipment	0.747	13	0.741	11	0.747	23	**0.745**	**18**
57	Shortage of labor	0.589	51	0.623	44	0.693	40	**0.631**	**51**
58	Price escalation	0.779	8	0.741	11	0.800	12	**0.772**	**12**
59	Low level of equipment operators' skills	0.516	62	0.647	31	0.507	62	**0.556**	**61**
60	Low productivity and efficiency of equipment	0.747	13	0.658	28	0.733	26	**0.713**	**26**
61	Lack of high-technology mechanical equipment	0.853	3	0.776	6	0.827	10	**0.819**	**6**
62	Unqualified workforce	0.726	27	0.647	31	0.720	30	**0.698**	**33**
63	Low productivity of labor	0.779	8	0.741	11	0.800	12	**0.772**	**12**
64	Selecting inappropriate	0.874	2	0.764	8	0.827	10	**0.823**	**5**

	contractors								
65	Poor financial control of the project	0.895	1	0.882	1	0.947	1	**0.905**	**1**

Based on the overall respondents of the Relative Importance Index, it was categorized in to four classes according to the level of severity causing delays in construction. Firstly, the factors representing with extreme to very severe cause of delay RII value lies between 0.800 and 1.000. Based on this the top eight causes from the identified 65 causes of delays are positioned in this group, which account only 12.31% of the causes from the listed 65 causes of delay in construction phase in Addis Ababa City Road project.

Furthermore, the causes of delay with very to moderate Severe of RII lies between 0.600 and 0.800 was obtained based on this criterion ,48 causes ranked in the table from 9th to 57th are replaced under this category. These 49 causes of delay positioned in this group accounts 75.38% of all the factors.

similarly, the causes of delay reprinting moderate to slightly severe causes of RII value lies between 0.600 and 0.400. Based on these criterion 7 causes are ranked in the table from 58^{th} to 64^{th} were also classified in this category. These 7 causes accounted of 10.77% of the overall listed 65 group of factors causing delays.

Finally, the causes of delay with slightly to none severe of RII value lies between0.400 and 0.000.From these results, only one cause ranked in the table representing 65th and classified in this category. Only the last factor causes delay which ranked 65 out of the 65 causes is positioned in this group, and it consisted of about a 1.54%. The figure below shows the Relative important index ranges of the 65 identified causes and their respective percentage.

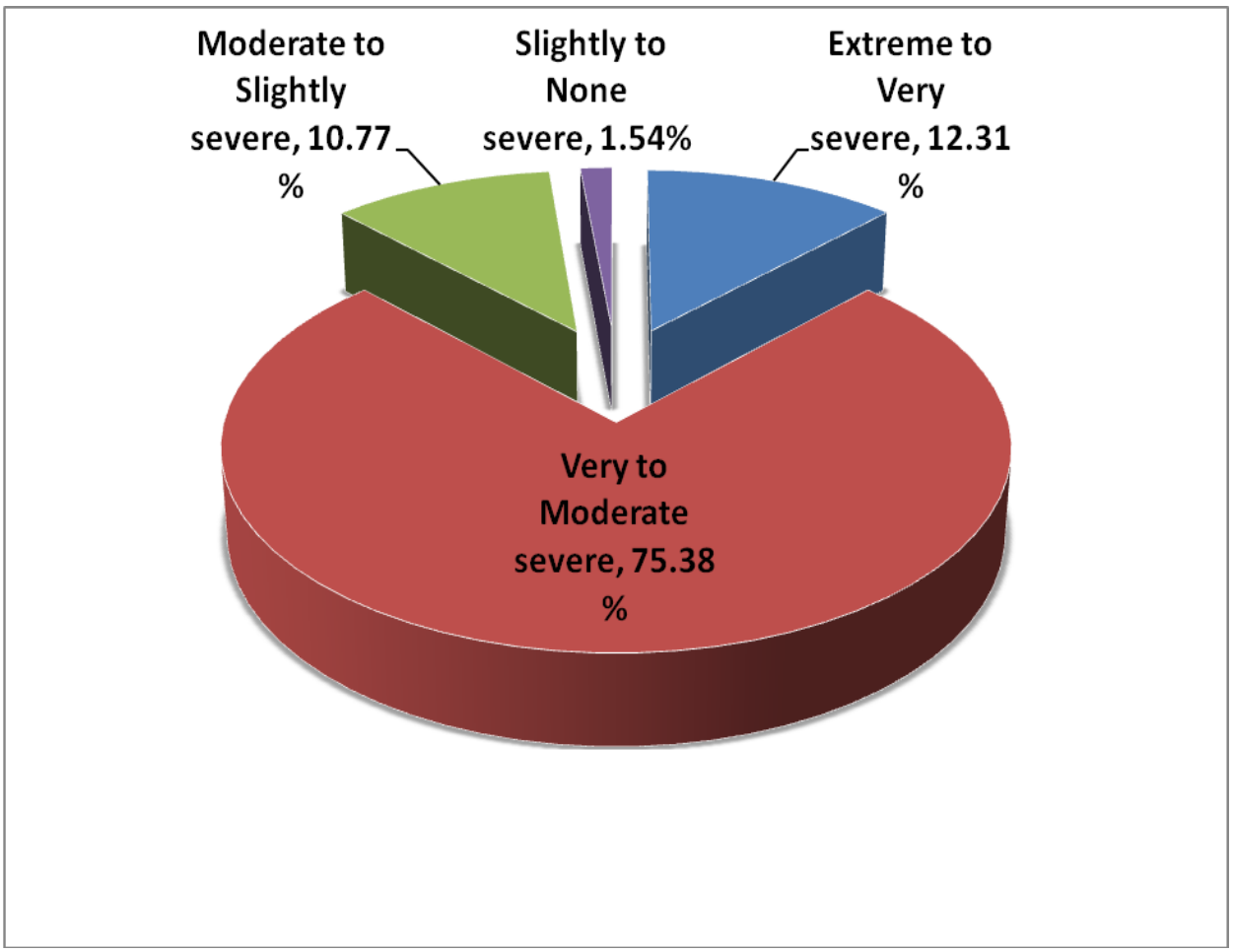

Figure 8 Categories of the causes of Delay based on severity

In the next Table 9, the top ten most severe causes of Delay are listed in descending order of rank factors with their relative important index (RII) values by group under the corresponding responsibility area.

Table 9 the top ten severe causes of Delay

S/N	Factors Causing Delay	Responsible Group						Grand Total of the three party	
		Employer		Contractor		Consultant			
		RII	Rank	RII	Rank	RII	Rank	RII	Rank
65	Poor financial control of the project	0.947	1	0.882	1	0.895	1	0.906	1
6	Difficulties in financing project by contractor	0.867	5	0.847	3	0.853	3	0.855	2
47	Type of project bidding and award (lowest bidder)	0.840	6	0.871	2	0.842	5	0.851	3
7	Poor site management and supervision by contractor	0.880	3	0.824	4	0.821	6	0.839	4
64	Selecting inappropriate contractors	0.827	9	0.765	8	0.874	2	0.824	5
61	Lack of high-technology mechanical equipment	0.827	9	0.776	6	0.853	3	0.820	6
2	Ineffective scheduling of project by contractor	0.893	2	0.765	8	0.768	8	0.804	7
29	Inaccurate initial project scope estimate	0.840	6	0.776	6	0.8	7	0.804	7
10	Ineffective control of the project progress by the contractor	0.840	6	0.788	5	0.747	9	0.788	9
52	Contractor's staff are not properly trained in professional construction management techniques	0.880	3	0.741	10	0.747	9	0.784	10

Table 9 shows according to group of respondents, Poor financial control of the project was the most severe cause of delay as it has the first rank among all causes with RII value of 0.906. Difficulties in financing project by contractor has been ranked by overall of the three party respondents in the second position with RII value equal to 0.855 and Type of project bidding and award (lowest

bidder) was ranked as the third significant cause with RII value equal to 0.851. Poor site management and supervision by contractor has been ranked by over all of the three party respondents in the fourth position with RII value equal to 0.839 and Selecting inappropriate contractors was ranked as the fifth significant cause with RII value equal to 0.824. Lack of high-technology mechanical equipment has been ranked by over all of the three party respondents in the sixth position with RII value equal to 0.820 and both Ineffective scheduling of project by contractor and Inaccurate initial project scope estimate were ranked as the seventh significant cause with RII value equal to 0.804. Ineffective control of the project progress by the contractor has been ranked by over all of the three party respondents in the ninth position with RII value equal to 0.788 and Contractor's staff are not properly trained in professional construction management techniques was ranked as the tenth significant cause with RII value equal to 0.784.

4.8. Causes of Delay due to the Employer , Contractor and consultant.

Inferential statistical method was practiced to the survey results in the above section the Employer, Contractor and consultant different results are presented. Essential statistical tests were used to verify some basic elements in the structure of the questionnaire. These tests are described below.

4.8.1. Correlation Analysis

The strength of associations of pairs of variables under study was determined by correlation relationships. The commonly used methods for ascertaining the strength of association between two variables is the Spearman rank correlation method.

4.8.2. Spearman's Correlation

The correlation coefficient ρ (spearman coefficient) ranges from -1.0 to +1.0. The closer ρ is to +1 or -1, the closer the two variables are related. The value of ρ close to 1 implies there is strong positive linear relationship between the two variables while the value of ρ close to -1 shows a strong negative linear relationship between the two variables (Daud, Ahmad, & Yusof, 2009) cited in (karim, et al., 2013).

Ideally, the correlation coefficient value of ± 1 is said to be a perfect correlation. If the correlation coefficient value lies between ± 0.5 and ± 1, it is said to have a high degree of correlation. For correlation coefficient value between ± 0.3 and ± 0.5, the degree of correlation is moderate. The low degree of correlation occurs when the correlation coefficient lies between ± 0.1 and ± 0.3. Meanwhile, zero coefficient value represents no correlation at all (Cohen, 1998).

Table 10 Validity test result by spearman's rho

	Category	Spearman's rho
1	contractor	0.411
2	consultant	0.379
3	Employer	0.400

The significance for both categories values were less than 0.05 or 0.01, so the correlation coefficients of both the fields are significant at $\alpha = 0.01$ or $\alpha = 0.05$. It can be said that the fields are valid to measure what it was set for to achieve the main aim of the study.

Cronbach's Alpha

Coefficient Alpha or (Cronbach's Alpha) method is one of the most widely used methods for measuring reliability and it supports correlation for all possible ways of dividing the measure into two halves (Polit and Hungler, 1978) cited by (Abdalaziz, 2009).

As shown in Table 3, the summary of the reliability coefficient of the scale was established by Cronbach's Alfa using the SPSS package, which reflected Alfa coefficient to be in the range from 0.882 to 0.947. This is considerably higher than the modest reliability in the range 0.50 - 0.60 as cited by (Akintoye & Fitzegerald, 2000). The result ensures that the questionnaire is reliable.

Table 11 Reliability test results by Cronbach's Alpha

	Category of data /Factors	Cronbach's Alpha
1	contractor	0.882
2	consultant	0.895
3	Employer	0.947

There are 65 well-recognized causes of delay which are identified and provided in questionnaire form. Determining the important degree of each cause was sought as it leads to the main objectives of this survey. The following parts present and discuss the data collected regarding the occurrence and severity of the factors.

The results of this part of study provide an indication of the relative importance index and rank causes of delay in Addis Ababa city Road Authority. Table 4 shows the ranking for causes of delay, according to each type of target group.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The outcome of analysis from this study can be said to be of great relevance to the construction industry.

- Majority of the respondents are fully involved in the construction industry with at least 5 years of construction experience. This means that the respondents have a wealth of knowledge and they had been supplied with the necessary information on the questionnaires sent out to all groups of respondent.
- Survey revealed that there are 65 different causes of delays were identified and ranked based on their relative important index (RII).
- According to the results based on questionnaire, the top ten most significant factors causing delay in Addis Ababa City Road Authority road projects are:
  - Poor financial control of the project,
  - Difficulties in financing project by contractor,
  - Type of project bidding & award (lowest bidder),
  - Poor site management and supervision by contractor,
  - Selecting inappropriate contractors
  - Lack of high-technology mechanical equipment,
  - Ineffective scheduling of project by contractor
  - Inaccurate initial project scope estimate,
  - Ineffective control of the project progress and
  - Contractor's staff s are not properly trained in professional construction management techniques
- Also, these factors represent the level of severity which is contributory on the causes of delay. It could be noted that Delay of projects is one of the factors that affect the country economy and budget allocation every year.

5.2. Recommendations

- Based on the analysis and findings of the study the following recommendations are made in order to minimize the problem associated to Delay.
  - Establish a system for financial control of the project and also upgrading on the finance capacity building of the construction sector.
  - Establishing centralized project information database that helps all stakeholders by giving all relevant information.
  - Improve performance of technical personnel and firms through capacity building program in the construction industry like ERA Master program for professionals in road sectors.
  - Establish a system to share experience and knowledge between firms and firms as well as between contractors and contractors.
  - Create good atmosphere Capacity building work of construction project managers on a Short term and long term training program to mitigate the causes of delay.

REFERENCES

A. S. Faridi and S. M. El-Sayegh, "Significant factors causing delay in the UAE construction industry," Construction Management and Economics, vol. 24. pp. 1167–1176, 2006.

Abd Majid, M. Z., and McCaffer, R. (1998). "Factors of non-excusable delays that influence contractors' performance." J. Manage. Eng., 14(3), 42–49.

Ahmed, S., Azhar, S., Kappagantula, P., and Gollapudi, D. (2003). "Delays in construction: A brief study of the Florida construction industry." Proc., 39th Annual Conf. of the Associated Schools of Construction, Clemson Univ., Clemson, SC.

Aibinu, A. A., and Jagboro, G. O. (2002). "The effects of construction delays on project delivery in Nigerian construction industry." Int. J. Proj. Manage., 20(8), 593–599.

Al-Khalil, M., and Al-Ghafly, M. (1999). "Important causes of delay in public utility projects in Saudi Arabia." Constr. Manage. Econ., 17(5), 647–655.

Al-Khalil, M., Assaf, S., and Al-Hazmi, M. (1995). "Causes of delays in large building construction projects." J. Manage. Eng., 11(2), 45–50. Al-Momani, A. H. (2000). "Construction delay: A quantitative analysis."

Al-Najjar, J. M., 2008. Factors Influencing Time and Cost Overruns on construction projects in the Gaza Strip, Gaza: The Islamic University of Gaza.

Ameh, O. J., Soyingbe, A. A. and Odusami, K. T., 2010. Significant factors causing cost overruns in telecommunication projects in Nigeria. Journal of Construction in Developing Countries, Volume 15.

Anderson, S., Molenaar, K. & Schexnayder, C., 2007. Guidance for Cost Estimation and Management for Highway Projects During Planning, Programming,and Preconstruction, Washington, D.C.: National Cooperative highway Research Program.

Arcila, S. G., 2012. Avoiding cost overruns in construction projects in the United Kingdom, United Kingdom: The University of Warwick.

Assaf, S. A., and Al-Hejji, S. (2006). "Causes of delay in large construction projects." Int. J. Proj. Manage., 24(4), 349–357.

Azhar, N., Farooqui, R. U. & Ahmed, S. M., 2008. Cost Overrun Factors In Construction Industry of Pakistan. Karachi, Pakistan, First International Conference on Construction In Developing Countries (ICCIDC–I).

Chang, A. S., 2002. Reasons for cost and schedule increases for engineering design projects projects. Journal of Management and Engineering, pp. 29-36.

Chitkara, K. K. (2004). Construction project management, planning, scheduling, and controlling, 4th Ed., Tata McGraw-Hill, New Delhi, India.

Creedy, G. D., 2006. Risk factors leading to cost overrun in the delivery of highway construction projects, Australia: Queenland University of Technology.

Douglas, I., 1996. Review of the Florida department of transportation's performance in controlling cost overruns and delays when building roads and bridges, Florida: State of Florida office of program policy analysis and government accountability.

EDRI, 2011. Road sector Development and Economic Growth in Ethiopia, Addis Abeba: Ethiopian Development Research Institute.

Enshassi, A., Al-Hallaq, K., and Mohamed, S. (2006). "Causes of contractor's business failure in developing countries: The case of Palestine."J. Constr. Dev. Countries, 11(2), 1–14.

Enshassi, A., and Abu Mosa, J. (2008). "Risk management in building projects: Owners' perspective." Islamic Univ. J., 16(1), 95–123.

ERA, 2013. Modernization and transformation initiative series II, A.A: ERA design management team

Ethiopian Roads Authority, 2013. Assessment of 15 years Performance of Road Sector

Flyvbjerg, B., Holm, M. S. & Buhl, S., 2002. Understanding costs in public works projects error or lie?. Journal of the American Planning Association, 68(3), pp. 279-295.

Frimpong, Y., Oluwoye, J., and Crawford, L. (2003). "Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study." Int. J. Proj. Manage., 2 1(5), 321–326.

G. J. Kikwasi, "Causes and Effects of Delays and Disruptions in Construction Projects in Tanzania," 2008.

H. Afshari, S. Khosravi, A. Ghorbanali, M. Borzabadi, and M. Valipour, "Identification of Causes of Non-excusable Delays of Construction Projects," Management, vol. 3, pp. 42–46, 2011.

H. S. Neap and S. Aysal, "Owner's Factor in Value-Based Project Management in Construction," Journal of Business Ethics, vol. 50, no. 1, pp. 97–103, Mar. 2004.

I. Mahamid, A. Bruland, and N. Dmaidi, "Causes of Delay in Road Construction Projects," no. July, pp. 300–310, 2012.

Jackson, S., 2002. Project cost overruns and risk management, s.l.: The University of Reading. Kaming, P., Olomolaiye , P., Holt , G. & Harris, F. C., 1997. Factors influencing construction

K. A. Mohammed, "I NTERDISCIPLINARY J OURNAL O F C ONTEMPORARY R ESEARCH I N B USINESS CAUSES OF DELAY IN NIGERIA CONSTRUCTION INDUSTRY," 2012.

Kaliba, C., Muya, M., and Mumba, K. (2009). "Cost escalation and schedule delays in road construction projects in Zambia." Int. J. Proj. Manage., 27(5), 522–531.

Kaming, P., Olomolaiye, P., Holt, G., and Harris, F. (1997). "Factors influencing construction time and cost overruns on high rise projects in Indonesia." Constr. Manage. Econ., 15(1), 83–94.

Koushki, P., Al-Rashid, K., and Kartam, N. (2005). "Delays and cost increases in construction of private residential projects in Kuwait." Constr. Manage. Econ., 23(3), 285–294.

Leibing, R. (2001). The construction industry: Processes, players, and practices, Prentice Hall, Upper Saddle River, NJ.

Leishman, D. M. (1991). "Protecting engineer against construction delay claims: NDC." J. Manage. Eng., 7(3), 314–333.

Lo, T., Fung, I., and Tung, K. (2006). "Construction delay in Hong Kong civil engineering projects." J. Constr. Eng. Manage., 132(6), 636–649.

Mansfield, N. R., Ugwu, O. O., and Doran, T. (1994). "Causes of delay and cost overruns in Nigerian construction projects." Int. J Project Manage., 12(4), 254–260.

R. F. Aziz, "Ranking of delay factors in construction projects after Egyptian revolution," Alexandria Engineering Journal, vol. 52, pp. 387–406, 2013.

R. McCaffer and M. Z. A. Majid, "Factors of Non-Excusable Delays That Influence Contractors' Performance," Journal of Management in Engineering, vol. 14. pp. 42–49, 1998.

S. A. Assaf and S. Al-Hejji, "Causes of delay in large construction projects," International Journal of Project Management, vol. 24. pp. 349–357, 2006.

time and cost overruns on high-rise projects in Indonesia. Journal of Construction Management and Economic, 15(1), pp. 83-94.

Appendix A

Questionnaire

TO. _____

Addis Ababa

RE: Application to conduct research in Addis Ababa City Government road Construction projects for educational purpose.

My name is Yosef Amare. I am currently undertaking MSC in CONSTRUCTION ENGINEERING AND MANAGEMENT in JIMMA University of Technology. In accordance with the protocol of Ministry of education, I wish to seek permission for collecting necessary data to my research.

My area of research Thesis is on road construction delay during the construction phase of road projects.

Your cooperation and kind consideration in this matter is highly appreciated.

Sincerely

YOSEF AMARE

MscCandidate

DEPARTMENT of CIVIL Engineering

(CONSTRUCTION ENGINEERING AND MANAGEMENT)

JIMMA University

Emails: yosefamare139@yahoo.com

Mobile No. 09-11-603036

Introduction

Delays on construction projects are a universal phenomenon .It is almost always accompanied by time over runs. Construction project delays have due to the effect on all parties (owner, contractor, and consultant) to a contract in terms of time delay.

Objectives

Theobjectivesofthisstudywouldbetoidentifythemajorcausesofdelaysinconstruction projects in the Addis Ababa City through a survey; and find the perception of the different parties towards the problem, what their responsibilities are and how they carry them out. It is expected that this study will provide some good empirical data on the extent and type of delays in construction projects in AA.

Please take a look at the following questionnaire and try to answer correctly and accurately, as all questions as possible. All the information gathered here will be kept strictly confidential and will be used only for educational research and analysis without mentioning the person or company names. Thank you very much for your cooperation in advance.

For more details, please contact:

YOSEF AMARE

Msc candidate

DEPARTMENT of CIVIL Engineering

(CONSTRUCTION ENGINEERING AND MANAGEMENT)

JIMMA University

Emails: yosefamare139@yahoo.com

Mobile No. 09-11-603036

THANK YOU VERYMUCH IN ADVANCE FORYOURKIND COOPERATION AND TIME

Questioner

I. The questions below are intended to identify the Causes of delays during the construction phase on road projects due to the failures of Contractor, Consultant and Employer: a case study in Addis Ababa road projects.

1. Which sides of the project are you working? Please tick……

A) Contractor B).Consultant

C). Employer D). Other

2. What is you educational background?

A. Diploma B. BSC C. MSC

D. PHD E. Others Please specify…… ….

3. What is your field of specialization?

A. Civil engineer B. Geotechnical engineer C. Highway engineer

D. Structural engineer E. Transportation engineer

F. Construction management & engineering G. Others please specify……

4. Have you received any delay related training? A) Yes B) No

If yes please specify the level of training you received? _____

5. How long have your been involved in construction sector in general?

A. Less than 3 years

B. 3-5 years

C. 5-10 years

D. More than 10 years

6. Does AA city road authority provide training for contractors before and during construction phase?

A. Yes B. Sometimes C... Not at all

II. ***Which of the following are most important delays associated with your ongoing project(s)? Please rate the Chance of Occurrence and Responsibility by circling a suitable figure as indicated below:***

Scale for the Delay cases of Occurrence:-

(5) = Strongly Agree,
(4) = Agree
(3) = Neutral,
(2) = Disagree,
(1) = Strongly Disagree

Scale of Responsibilities:

Emp=Employer,

Cont= Contractor,

Cons= Consultant,

Shard=when they are equally

	B	C				D				
No.	***Delays Causes***	**Responsibility**				**Chance of Occurrence**				
1	Contractor experience	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
2	Ineffective scheduling of project by contractor	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
3	Delay in the preparation of contractor submissions	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
4	Improper technical study by the contractor during the biding stage	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
5	Poor qualification of the contractors' technical staff	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
6	Difficulties in financing project by contractor	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**

7	Poor site management and supervision by contractor	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
8	Conflicts between contractor & other parties (consultant & Employer)	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
9	Frequent change of sub-contractors because of their inefficient work	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
10	Ineffective control of the project progress by the contractor	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
11	Late in resolving right of way issues	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
12	Delay in performing inspection by consultant	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
13	Poor communication by consultant with other construction parties	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
14	Insufficient inspectors by consultant	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
15	Delay in approval of work permit by consultant	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
16	Improper construction method	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
17	Incomplete drawings/specifications	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
18	Design errors and omissions	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
19	Excessive extra works orders	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
20	Inadequate design team experience	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
21	Delays in producing design documents	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
22	Rework due to wrong drawings	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**

23	Insufficient data collection and survey before design	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
24	Long period for approval of tests and inspections by consultant	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
25	Unfamiliarity with or lack of knowledge by the consultant's supervision staff regarding new construction methods, materials and techniques	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
26	Lack of application of construction management tools and techniques by consultant's project and site staff	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
27	Conflicts between drawings and specifications	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
28	Frequent design changes requested by Employer during construction	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
29	Inaccurate initial project scope estimate	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
30	Unrealistic time estimation	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
31	Slow decision-making process by Employer departments	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
32	Inefficient f low of information from Employer departments	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
33	No or small time extensions associated with change orders initiated by Employer	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
34	Understaffed consultant's project and site personnel	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
35	Poor communication and coordination by Employer and other parties	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
36	Delays in work approval of Employer	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**

37	Employer-initiated variations	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
38	Poor qualifications and inadequate experience of contractor's supervisors	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
39	Ineffective planning and scheduling of project	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
40	Equipment allocation problems	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
41	Materials management problems	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
42	Misinterpretation of drawings and specifications	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
43	Rework due to errors during construction	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
44	Delay in site mobilization	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
45	Late delivery of materials and equipment	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
46	Poor procurement programming of materials	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
47	Type of project bidding and award (lowest bidder)	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
48	Ineffective delay penalties	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
49	Legal disputes between/with various parties	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
50	No application of construction management procedures on the part of Employer contributes to late detection of construction problems	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
51	Unrealistic schedule program submitted by contractor	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
52	Contractor's staff are not properly trained in professional construction management	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**

	techniques									
53	Poor judgment and inexperience in estimating procedures by contractor	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
54	Shortage of construction materials (bitumen, cement and steel)	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
55	Shortage of technical personnel	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
56	Insufficient equipment	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
57	Shortage of labour	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
58	Price escalation	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
59	Low level of equipment operators' skills	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
60	Low productivity and efficiency of equipment	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
61	Lack of high-technology mechanical equipment	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
62	Unqualified workforce	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
63	Low productivity of labour	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
64	Selecting inappropriate contractors	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**
65	Poor financial control of the project	**Emp**	**Cont**	**cons**	**shard**	**1**	**2**	**3**	**4**	**5**

Table 12 Questionnaires to Rate Level of severe of Delay Factors for road Construction Projects.

* Please also provide other delay(s) (if you think it is important in Addis Ababa city road projects) and give reason why? And rate in column C& D. _____

Appendix B

List of respondents replied valid questionnaires

List of Consultants

I. Metaferia Consulting Engineers Plc.
II. Construction Design Share Company
III. Intercontinental Consultants and Technocrats Pvt. Ltd.
IV. United Consulting Engineers Plc.
V. Eng. Zewdie Eskinder and Co. Plc.
VI. Towers Consult Plc.
VII. Associated Engineering Consultants Plc.
VIII. Highway Engineers and Consultants
IX. Omega Consult

List of Contractors

I. CGC Overseas Construction Group Co. Ltd.

II. Hunan Huanda Road and Bridge Cons. Corp.

III. Deriba defarsha construction

IV. Yencomad Inc. Plc.

V. Akir Construction Plc.

VI. Alemayehu Ketema General Contractor

VII. Sattcon Construction Plc.

VIII. Gemshu Beyene Construction Plc

IX. Defense Conatruction Enterprise

X. Ethiopian Roads Corporation Construction

Declaration

This thesis entitles "Causes of delays during the construction phase on road projects due to the failures of Contractor, Consultant and Employer the case of Addis Ababa City Road Authority" is my original work and has not been presented for a degree in any other university and that all sources of material used for the thesis have been dully acknowledged.

Candidate

Yosef Amare

Signature. . . . . .