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St. Mary's University, Ethiopia

ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF PROJECT MANAGEMENT

ASSESSMENT OF DELAY ON ROAD CONSTRUCTION PROJECTS: THE CASE OF ADDIS ABABA CITY ROAD AUTHORITY

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February, 2021

S M U

ADDIS ABABA, ETHIOPIA

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BY

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A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN BUSINESS ADMINISTRATION: DEPARTMENT OF PROJECT MANAGMENT

February, 2021

S M U

ADDIS ABABA, ETHIOPIA

ST. MARY`S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

This is to certify that the thesis prepared by Mrs Semira Hussein entitled "Assessment of delay on road construction projects: The case of Addis Ababa City Road Authority" and submitted in accordance with the requirement of masters of Arts in project management complies with the university regulations and meets the agreed standards in compliance with the specifications of the Master of Arts in Project Management.

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Declaration

I hereby declare that, the thesis entitled “Assessment of delay on road construction projects: The case of Addis Ababa City Road Authority” is my original work with my own initiative and guidance of my advisor and it has not been submitted for a similar or any other degree award and will not be presented to another university. It is conducted for the partial fulfilment of the requirement of the Degree of Master of Arts in Project Management.

Semira Hussein _____

Date _____

Letter of certification

The undersigned certified that he has read and recommends hereby for acceptance by St. Mary`s University school of graduate studies entitled: Assessment of delay on road construction projects: The case of Addis Ababa City Road Authority in fulfilment of the requirement for the Degree of Masters of Arts in Project Management.

Dr. Temesgen Belayneh

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Date and Signature

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Table of Contents

Declaration i

Letter of certification ii

Acknowledgment iii

List of Table vii

List of Figure viii

List of Acronyms ix

Abstract x

CHAPTER ONE 1

INTRODUCTION 1

1.1 Background of the study 1

1.2 Statement of the Problem 3

1.3 Research questions 4

1.4 Research Objectives 4

1.4.1 General objectives 4

1.4.2 Specific Objectives 4

1.5 Significance of the study 5

1.6 Scope of the study 5

1.7 limitation of the study 6

1.8 Organization of the paper 6

CHAPTER TWO 7

REVIEW OF RELATED LITERATURE 7

2.1 Review of Theoretical literature 7

2.1.1 Overview of Project and Project Management 7

2.1.2 Project Management Knowledge Areas 10

2.1.3 Construction Project 14

2.1.4 Parties in construction Project 14

2.1.5 Definition of delay 15

2.1.6 Types of delay 16

2.2 Review of Empirical literature 18

2.2.1 Causes of delay 18

2.2.2 Effects of delay 21

2.2.3 Minimization of delay 23
2.2.4 Research Hypothesis 26
2.2.5 Conceptual framework 27
CHAPTER THREE 29
RESEARCH METHODOLOGY 29
3.1 Introduction 29
3.2 Research Design 29
3.3 Sources of Data 29
3.4 Target Population, sampling technique and sample size 30
3.4.1 Target Population 30
3.4.2 Sampling technique 30
3.4.3 Sample size 30
3.5 Data Collection 30
3.6 Validity and reliability of instrument 31
3.7 Methods of data Analysis 32
3.8 Research Ethics 33
CHAPTER FOUR 34
RESULT AND DISCUSSION 34
4.1 Introduction 34
4.2 Basic Information of the respondents 34
4.2.1 Survey Responses 34
4.2.2 Demographic distribution of the respondents 35
4.2.3 Respondents Perception 37
4.3 The Importance and Ranking of causes of delay 37
4.4 Top Delay Causes 41
4.5 The Importance and Ranking of Effects of Delay 42
4.6 Methods of Minimizing Delays 43
4.7 Discussion of the findings 44
CHAPTER FIVE 46
SUMMARY,CONCLUSIONS AND RECOMMENDATIONS 46
5.1 Introduction 46
5.2 Summary 46

5.2.1 Demographic characteristics of the respondents 47
5.2.2 Identification and Ranking of Causes of delay 47
5.2.3 Identification and Ranking of effects of delay..... 48
5.3 Conclusions..... 48
5.4 Recommendations..... 50
REFERENCES 52
APPENDIX: QUESTIONNAIER 56

List of Table

Table 3.1 Likert scale for frequency of occurrence of related delay causes……..….31

Table 3.2 Likert scale for most influential effects of delay…….……..…..…31

Table 3.3 Cronbach's Alpha test result of causes and effects of delay ……..……..…32

Table 4.1 Rate of response……..……..…..……34

Table 4.2 Distribution of respondents by sex and age…….……..……35

Table 4.3 Distribution of respondents by designation, level of education and years of work experience…….36

Table 4.4 Importance and ranking of client related delay causes.....38

Table 4.5 Importance and ranking of consultant related delay causes.....39

Table 4.6 Importance and ranking of contractor related delay causes.....39

Table 4.7 Importance and ranking of material and equipment related delay causes.....40

Table 4.8 Importance and ranking of external related delay causes.....41

Table 4.9 Top ten delay causing factors.....41

Table 4.10 The Importance and ranking of effects of Delay.....42

Table 5.1 The top ten important causes of delay.....47

Table 5.2 The top five important effects of delay.....48

List of Figure

Figure 1: Project management process groups (PMI, 2017) 9

Figure 2: Four elements of the project quality management process……..……...11

Figure 3: Effects of delay (Tushar et.al, 2016) …….....…...…….22

Figure 4: Conceptual frame work……..…..……....28

List of Acronyms

AACRA: Addis Ababa City Road Authority

ERA: Ethiopian Road Authority

GDP: Global Domestic Product

ISO: International Organization for Standardization

PMI: Project Management Institute

RSDP: Road Sector Development Program

RII: Relative Importance Index

SPSS: Statistical package for the social science

Abstract

Time is a very critical indicator, a key resource, in the life cycle of project management and a crucial criterion for the success of a project in the construction industry. In construction industry, delay can be expressed as an elongation of time beyond what the contracting parties have agreed up on for the total completion of the project. It is well recognised that most road construction projects are exposed to time and cost overruns in Ethiopia and Addis Ababa region or both. As a number of delays rise from time to time, the need to assess and identify the cause of these delays and their effects also rises. Hence, the objective of the study is to identify the causes and effects of delay causing factors in Addis Ababa City Road Authority road projects. 36 potential delay causes and 16 effects were selected from the reviewed literature and the causes were divided in to 5 as client related factors, consultant related factors, contractor related factors, material and equipment related factors and external related factors. These factors were ranked using the Likert scale by a total of 116 professionals from 3 target population and analysed using Relative Importance Index (RII). The research indicates that the top major causes of delay in road construction were delay in relocating utilities, escalation of the material price, delay in paying compensation to land owners, shortage of foreign currency for importation of materials, inadequate management & supervision by contractors. In addition to these, lack of high-technology mechanical equipment, shortage of construction materials, late in revising and approving design documents, slow decision making and ineffective resource management were also mentioned to be among the top major causes of delay. The study further determines that the major effects of delay were time overrun, cost overrun, financial loss, poor quality of work, compromised quality, company's bad reputation, loss of other facilities, disputes, loss of wealth and capacity and breaches of contract.

Keywords: Addis Ababa City Road Authority, Delay, Causes of delays, Effects of delays

CHAPTER ONE
INTRODUCTION

1.1 Background of the study

The construction sector, which is the largest domestic industry in Ethiopia, has also been one of the leading industries in the global economy. Construction industry plays an important role in the economic uplift which approximately accounts for 15.9 % of global domestic product (GDP) and development of the country.

The road construction sector in particular is very important for the development and economic growth of any developing country. M.Haseeb (2011). In developing countries such as Ethiopia, a road transport industry plays an immense role in fuelling the process of economic development by providing a market access incentive for agricultural goods, production outputs in a regular consumption decision. Road infrastructure ‘s role in expansion of education, social and health facilities, trade facilities and providing access to employment is tremendous.

Roads contribute to economic growth and poverty reduction. Road development affects total economic growth, agricultural growth, population growth, urban poverty reduction and rural poverty reduction. Efficient markets, adequate health services, a diversified rural economy and balanced industrial development would remain irrelevant without infrastructure.

Efficient development strategies require a noble infrastructure as their backbone. Transportation infrastructure is an effective factor of production. Power consumption and health problems are also associated favourably with the availability of road infrastructure. Most of Africa’s poor trade performance is the result of weak infrastructure. The convenience and quality of road infrastructure also influences food prices. Road investments help the poor through their impact on the rural non-farm economy. A rise in paved roads is positively and substantially linked to growth in Gross Domestic Product (GDP) per capita in urban areas.

Construction time often serves as a standard for evaluating the performance of a road project and the efficiency of its project organization. Constructing an accessible and efficient road for fulfilling the above mentioned economic and social requirements mostly struggles with accomplishment of

different projects on time and with a specified cost. Time overrun is the most common phenomenon that occurs nearly in almost all the projects related to the road construction industry. It is considered to be one of the most repetitive problems that has an adverse effect on project success in terms of the triple constraints which are time, cost, and quality. Time delay is critical in developing countries where it mostly exceeds 100 % of its estimated time while constructing a project (Muhammad A. *et. al.*, 2017).

In construction projects, delay could be defined as the time overrun either beyond the contract date or beyond the date that the parties agreed upon for delivery of project outcomes (Assaf and Al-Hejji, 2006). Delays can be broadly classified in to: compensable delays (caused by the client) and non-excusable delays (caused by the contractor), critical or noncritical delays, and concurrent or non-concurrent delays. The identification of the types of delays helps to recognize the causes of delays and makes adopting mitigation strategies easier.

Previous researches similar to this study show that the main causes of delay are finance and payments, improper project management, escalation of the materials price and claims. The effects were mentioned to be time overrun, cost overrun, abandonment and disputes which impacts all the parties involved in the project. However, the causes and effects of these delay factors in the road construction industry vary from country to country, due to various environmental situations, financial capacity and the technological advancements used in the construction processes. Therefore, identifying the actual causes and effects of delay in order to minimize and avoid the delays and their corresponding expenses is crucial since delay in government road construction projects has a significant impact on economic and social activities of the country.

This thesis will examine the cause and effect of road construction delay focusing on Addis Ababa city road authority, which is also a part of highway, street and bridge construction contractor's industry in Ethiopia. The perceived causes and effects of delay regarding road construction projects of Addis Ababa City Road Authority will be assessed and identified. Recommendations based on the findings will be given to promote successful completion of the projects.

1.2 Statement of the Problem

Managing uncertainty is one of the most challenging tasks of a project manager at any level. Construction project is a project that is bounded by limited time, physical resources, budget and uncertainty**.** One of the usual phenomenon that happenes due to various uncertain events in a construction project is project delay**.** According to B. Bramble and M. Callahan, (1987) project delay is defined as the duration in which the total project or some part of it has been elongated or not finished due to various unpredictable or uncertain situations.

Project delay is common in most countries, particularly in the developing ones. it occurs in almost every construction project and the magnitude of these delays varies considerably from project to project, some projects are only a few days behind the schedule, while some are delayed for over a year. (Wael et al, 2007). Most of the road construction projects in Ethiopia and Addis Ababa city are exposed to time and cost overrun. (Fetene Nega, AAU, 2008*)*. Ethiopia prepared a Road Sector Development Program (RSDP) in 1997. Since then, five phases of RSDP were being implemented over the period of 1997 - 2020 (ERA 2016).

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

However, there are many challenges to performing the strategic plan; among these, a delay has been among the major challenges. According to (Shambel and Patel, 2018) the study conducted on 10 completed road construction projects in Addis Ababa, all the projects have suffered from time overrun ranging from a minimum of 25% to the maximum of 264.38%. Since Addis Ababa is the capital city of both Ethiopia and Africa, having modernized, efficient and standardized roads in the city is very crucial. Regardless of the fact that efforts of the city administration are visible, construction delay remains a critical problem and, in terms of time requirement there are various factors that affect the accomplishment of projects as planned.

It is shown in many studies that construction time overrun have negative effects on the project owners, contractors, and consultants (Ghaffari, 2013; Marzouk and El-Rasas, 2014). If the delay is not identified and the corrective project management decision is not taken in time, a project may incur extra cost and extension of project time, which causes various problems and creates disappointment to all the parties involved in the overall constructing process. Nowadays delay has become a major obstruction for the growth of developing countries like Ethiopia and the effects of these delays may be of considerable magnitude on the efficiency and effectiveness of the project. It is possible to reduce these delays through recognition of their real causes. Therefore it is essential to define the actual causes and effects of delays in order to minimize and avoid the delays in any construction project .

The aim of this study is to identify and rank the causes and effects of delays and propose their mitigation measures.

1.3 Research questions

This research has tried to answer the following three questions:

- What are the most important causes of delay in road construction projects of Addis Ababa City Road Authority?
- What are the effects of delay in road construction projects of Addis Ababa City Road Authority?
- What are the mitigation measures used to minimize delay?

1.4 Research Objectives

1.4.1 General objectives

The main objective of the research is to identify the causes and effects of delay in construction of road projects in Addis Ababa city Road Authority. Hence, based on the findings, draws a significant and feasible suggestions.

1.4.2 Specific Objectives

1. To identify the delay causing factors that currently exist in the road construction projects of Addis Ababa City Road Authority.

2. To rank the most significant delay causing factors that affect the sector.

3. To identify the effects of delay on road construction projects of Addis Ababa City Road Authority.

4. To rank the top effects of the delay that is perceived in Addis Ababa City Road Authority.

5.To identify the mitigation measures used to minimize delay.

1.5 Significance of the study

This research will have a great role in identifying the causes and effects of schedule delay in road construction projects. Ibrahim Mohamed (2013), indicates that time, cost and quality have their proven importance as prime measures for project success. Since time is one of the pillars of construction project management and project success, identifying and ranking the delay factors and their effects will have a tremendous impact towards minimization of the delay problem and will contribute to the success of a project. The findings of the study will further add value by proposing ways and inputs of mitigation measures for the management of AACRA to take corrective actions and make informed decisions to facilitate the successful execution of the project by eliminating the most important factors of delay.

In Addition, the study will also be important to the researchers as it will be contributing to add theoretical and practical knowledge on how to conduct research and it may be also useful to those researchers who require bases for further research in this area.

1.6 Scope of the study

The scope of this project research is limited to road construction projects . Addis Ababa city road Authority is selected as the context of this study. The study focuses on the analysis of the causes and effects of schedule delay from different perspectives. The group of the respondents involved are the client/owner, consultant, contractors and employees that are some of the main stakeholders in road construction projects of AACRA.

1.7 limitation of the study

The major limitation encountered in this study is the Covid-19 pandemic. Because of the pandemic, the researcher was not able to collect the relevant data on time, however by using different, relatively novel ,methods the research was able to be completed by the specified time.

1.8 Organization of the paper

This study is organized in five consequent chapters. The first chapter introduces the back ground of the study, statement of the problem, basic research questions, objectives of the study, significance, scope of the study and limitation of the study. The second chapter discusses on review of literatures with descriptions of different researchers related to the topics. The third chapter deals with the research methodology, design, sources of data, target population, sampling technique and sample size, validity and reliability of instrument and research ethics throughout the data collection and analysis. The fourth chapter presents results and discussion which prevails about the most important and frequently occurring causes and effects of delay. And the fifth chapter encompasses the summary, conclusions and recommendations based on the discussions of the previous chapters.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Review of Theoretical literature

2.1.1 Overview of Project and Project Management

Project: - Project Management Institute **(**PMI) defines a project as "a temporary endeavor undertaken to produce a unique product, service, or result".

According to Robert K. Wysocki (2014) Project is a sequence of unique, complex, and connected activities that have one goal or purpose and that must be completed by a specific time, within budget, and according to specification. A business-focused definition of a project by the same author Robert K. Wysocki (2014) is a sequence of finite dependent activities whose successful completion results in the delivery of the expected business value that validated doing the project. Gary R. H. (2003) also defines a project as a temporary endeavour undertaken to achieve a particular aim. A project is essentially the response to a need, the solution to a problem. Further, it is a solution that promises an advantage which is usually a financial advantage. For most ventures, the basic aim is either to make money or save money. It is an investment plan to build and/or grow such facilities to improve the development of products and/or services in a society for a certain period of time. Dr. J. M. Juran, the quality guru, also defines a project as a problem scheduled for solution.

Project Management: - Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMI, 2013)

According to Kerzner H. (2009) Project management is the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Furthermore, project management utilizes the systems approach to management by having functional personnel (the vertical hierarchy) assigned to a specific project (the horizontal hierarchy)

Successful project management can then be defined as having achieved the project objectives within time, cost, desired performance while utilizing the assigned resources effectively and efficiently. Kerzner H. (2009)

Project management is accomplished through the application and integration of the 42 logically grouped project management processes comprising the 5 process groups.

The five process groups as identified in the PMBOK® Guide are:

- Initiation
- Planning
- Execution
- Monitoring and control
- Closure

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition*, Project Management Institute Inc., 2017, Table 1-4, Page 25.

Figure 1: project management process groups (PMI, 2017)

2.1.2 Project Management Knowledge Areas

1. Project Time Management

Time management is one of the vital processes of project management that is important to the successful implementation of a project. The final deliverable from the scheduling process is the estimated time target to complete the entire project. The time beyond the estimated time is considered as time of project delay.

Project time management includes processes required to manage the timely completion of the project. It comprises determining the delivery dates and milestones whilst taking all the known constraints in to account.

Processes involved in the project time management include: define activities, sequence activities, estimate activity resources, estimate activity durations, develop schedule and control schedule.

2. Project Cost Management

Project cost management includes the processes required to ensure that the project is completed within the approved budget. The processes involved are planning, estimating, budgeting, and controlling costs so that the budget can be completed within the permitted budget. The Processes comprises

- Resource planning: determining what resources and quantities of them should be used
- Cost estimating: developing an estimate of the costs and resources needed to complete a project
- Cost budgeting: allocating the overall cost estimate to individual work items to establish a baseline for measuring performance
- Cost control: controlling changes to the project budget

3. Project Quality Management

The International Organization for Standardization (ISO) defines quality as the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs. As per Joseph Juran quality has two meaning. 1, features of products which meet customer needs and thereby provide customer satisfaction and 2, freedom from deficiencies. Such shortcomings are mistakes that involve rework (doing something again or lead to failures after a product has been presented to a consumer). Such deficiencies can lead to grievances, customer frustration or devastating consequences for the consumer. Deficiencies-related quality enhancement normally costs less.

The Project Management Institute defines quality as "the degree to which a set of inherent characteristics fulfil requirements". The set of inherent characteristics may be of a product, processes, or system. The criteria may be those of customers,clients or stakeholders, which are an important category for the project's progress .

The process of project quality management as mentioned in PMBOK Guide are Quality planning , Quality Assurance and Quality control. Juran trilogy describes three slightly different elements: Quality planning, Quality control and Quality improvement. The key elements of project quality management can be better portrayed using the figure below.

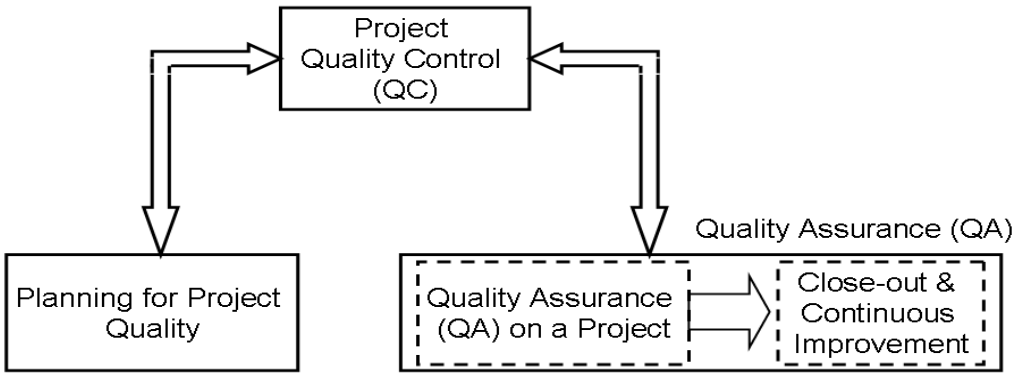

Figure 2: Four elements of the project quality management process

4. Project Scope Management

The main focus of the project scope management knowledge area is the identification and documentation of client requirements. Many ways exist to approach requirements gathering and documentation (Robert K. Wysocki, 2014). Project scope management is the task to make sure that our project includes all the relevant areas to achieving the project ‘s objectives. The process includes: planning scope management, collecting requirements, defining scope, creating work breakdown structure, validating the scope and controlling the scope (PMI, 2013).

5. Project Integration Management

Project integration management includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the project management process groups.

6. Project Human Resource Management

Project human resource management involves organizing and managing a project team. The team is primarily made up of individuals with particular expertise and duties. From the outset of the management, the project team, also known as project members, must be interested in plans and decision-making.

7. Project Risk Management

Risk is an uncertainty that can adversely or positively impact project goals. The uncertainty may be about a potential event that may or may not exist, and whether it does happen, the unclear extent of the effect will disturb project priorities. Thus, the probability of occurrence characterizes a "risk”. The art and science of recognizing, assessing, and reacting to risk over the life of a project and in the best interest of achieving project goals is project risk management. As a diverse aspect of a project, successful project managers consider risk management. The four aspects of their strategy are: risk identification, risk assessment, risk mitigation and risk monitoring.

8. Project Procurement Management

Procurement Management includes the processes to purchase or attain the products, services, or results needed from outside for the project team to perform the work. Planning for purchases or

acquisitions, contracting, requesting, seller responses, source selection, and contract administration are all part of procurement management. An effective procurement management life cycle consists of the following five phases:

- Vendor solicitation
- Vendor evaluation
- Vendor selection
- Vendor contracting
- Vendor management

9. Project Stakeholder Management

Stakeholder is an individual, group, or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity or outcome of a project, program, or portfolio.
Stakeholder management defines the processes, procedures, tools, and techniques to effectively engage stakeholders in project decisions and execution based on the analysis of their needs, interests, and potential impact. It includes identifying stake holder, planning stakeholder management, managing stakeholder engagement, and controlling stakeholder engagement.

10. Project Communication Management

Project communication management includes the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information. The communication process is not always easy because there may always be barriers to communication, such as lack of clear communications channels and problems in a global team environment. Therefore, choices of sender-receiver models, media, writing style, presentation techniques and meeting management are crucial for effective communication. Managing project management involves 5 processes. These are identifying stakeholders, planning communications, distributing information, managing stakeholder expectations and reporting performance.

2.1.3 Construction Project

Construction projects are those projects on which the construction of structures, roads and special-purpose services are planned. Classically, tasks are characterized by the requirement to complete a work on schedule, on budget and with acceptable consistency.

Construction projects are broadly classified based on the purpose they have. The most common types are: -

Building construction projects: - Projects that are only associated with the building of private, industrial, educational, leisure, hotel, warehousing and marketing facilities.

Infrastructure projects: - Infrastructure projects include dams and canals, highways, bridges, airport terminals, hydroelectric plants, water treatment and supply lines, waste collection networks, laying of telephones and electric lines, dumps, and any building activities that develop infrastructure that would be the cornerstone of a country's economic development.

Industrial projects: - There are projects that are involved in the development of production and manufacturing facilities, such as steel mills, garment factories, oil refineries, etc.

Special purpose projects: - Projects designed for a specific purpose include satellite stations, nuclear stations, etc.

2.1.4 Parties in construction Project

In every sector, there are multiple players interested in achieving the desired objective or aim successfully. The following are the most frequent participants in road construction projects.

1. **Client/owner**: are those who finance the project and also provide supplies and equipment, and who may eventually be the owner of the project after completion.
2. **Contractors:** are responsible for undertaking the actual construction of projects. Based on the form of contract, the contractor will be responsible for the planning, management, supervision, maintenance of the building site, furnishing of the supplies, machinery and manpower required for the project to be successfully completed. The contractor also

appoints subcontractors with special skills and knowledge to carry out some portions of the project that the contractor is unwilling to build for different purposes.

3. **Consultants:**. Construction consultants help clients make effective plans for their future projects to ensure that the work is completed by contractors with cost efficient manner. They provide cost forecasts, draw schedules, pick vendors, manage building contracts and address disputes between contractors and owners of projects.
4. **Designer:** It is the party that transforms the owner's vision into a real life project (blue print). It is responsible for the implementation of the project's original concept. The design incorporates all the project's architectural, structural, sanitary and electrical elements.

2.1.5 Definition of delay

Construction delay may be described as a time overrun past the time negotiated by the construction parties for the project or the contract date to be finished. (Marzouk & El-Rasas, 2014). Construction delay also applies to the period spent on the completion date or time specified in the completion and submission of the construction project decided by both parties. (Assaf SA. & Al-Hejji S ,2006). In the road construction industry, project delays may occur due to the elongation of the construction time as a result of various troubling factors that influence the construction workflow (Shebob et al., 2012).

Delay may also be described as the difference between the date of actual completion and the expected date (S. Faradi, & S.M. El-Sayegh, 2006; A. Chan, 2001). B. Bramble & M. Callahan, (1987) has also defined it as the period in which the total project or any portion of it has been elongated or not completed due to different unforeseen conditions. Therefore, the delay in construction project can be expressed as the time overrun or extension of time behind the date agreed upon by the contract parties.

Kang sik wei (2010) defined the word ‘‘delay’’ as something that occurs at a later time than expected, scheduled, specified in a contract or past the deadline decided by the parties to deliver a project. Fung I. W. H., L. T. (2006) also defined delay as the slowing down of work without fully halting construction will result in time overlapping either past the contract date or beyond the date decided by the parties to deliver the project.

In the study of Alaghbari *et al.* (2007) delay is addressed as the most common, risky, costly and sophisticated situation encountered in a wide range of construction projects. It is the cause of constant conflicts and lawsuits owing to the high value of time with both the client and the contractor. Bassioni & El-Razek (2008) also identified that the delay in the constructing process is considered one of the most frequent issues forcing the project and its participating stakeholders to have a negative influence on the assembly.

Delays are also described as a condition in which the contractor, the consultant and the customer lead collectively or severally to the failure to finish the project within the initial or stated or negotiated contract duration. Obodoh D.A & Chikasi Obodoh (2016)

For the owner of a project, delay means loss of income and unavailability of facilities, On the other hand, for the contractor, delay means lack of revenue for increased investment on supplies and resources and the hiring of workers and waste of time. All of these negative consequences will lead to lawsuits, negotiation, problems with cash flow and a general sense of concern. Consequently, the reasons of delay for different parties are different.

2.1.6 Types of delay

Several studies have tried to identify the types of delay and differentiate them according to their context (Rosazuwad, 2010; Chai and Yusof, 2015; Elawi *et al*., 2015). Based on the following studies construction delay is grouped in to three major categories.

1. **Concurrent Delay**

Concurrent delay is an issue that occurs in most construction industry programs. In this case, both the owner and the contractor are responsible for the delay. Simultaneous delays involving either two or three excusable delays result in extended time. When excusable delays with compensation and non-excusable delays are concurrent, an extension of time can be issued or the cost of delay can be distributed between the owner and the contractor.

If excusable and non-excusable delays occur concurrently, the contractor can assert the extension of time. If excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to claim extension of time but no delay damages:

If two excusable with compensation delays occur concurrently, the contractor is entitled to claim extension of time and delay damages.

2. Intrinsic and Extrinsic delays

A variety of factors impact construction projects from the planning process to the point when the project is finished. These factors can be categorized into intrinsic and extrinsic factors. Factors that contribute to construction organizations are intrinsic factors, while extrinsic factors comprise diverse aspects varying from the socio-cultural, technical, economic and political contexts in which these organizations work. Extrinsic causes of delay are difficult to monitor, whereas proactive project management may resolve the inherent causes of delay.

Extrinsic causes such as geopolitical risk, inflation and exchange rate declines have been often called global risk factors. Global risk factors range from region to region and each region is considered to have its own region-specific causes of construction project delays.

3. Excusable and Non-Excusable delay

Excusable delay

Excusable delays are triggered by circumstances that are reasonably unforeseeable and not under the contractor ‘s power. There are two types of excusable delays:

Non-compensable delays: It is a delay which is caused by neither the client nor the contractor. No one is held accountable for accidents and both the owner and the contractor are not in charge of the case. These delays are commonly called ***“acts of God”*** because they are not the responsibility or fault of any particular party. Examples include natural disasters, unhealthy conditions and mass misconduct (labor force revolt, explosions, government actions beyond their sovereign capacity, unexpected late delivery of supplies, and unexpected late delivery of materials) (Adam *et al*., 2015) Owing to this, contractor gets extension in time and does not pay any fee to the owner and contractor for delay damages.

Compensable delays: There are delays that are due to an unexpected occurrence outside the control of the contractor or the subcontractor and normally induced by the representatives of the owner or the owner. If contractors face this form of delay, they are entitled to time extension as

well as monetary compensation. An example could be inability of the owner's architect to complete sketches in the necessary period that contributes to the extension of the timeline which in turn causes economic harm on the owner. In this condition, the contractor would have to bear additional indirect expenses for both expanded field office and home office**.** (N. Hamzah et al, (2011).

Non –excusable delay

The contractor or its vendors are responsible for an inexcusable delay. This often arises when the contractor violates negotiated terms in the building contract. Clients will claim a loss as it is spelled out in the contract document. On the grounds of either liquidated losses or direct damages, the contractor will pay. Liquidated penalties are based on the daily average expense amount that the owner of the contractor is expected to suffer in the delay of building contracts. (Muhammad A. *et al*., (2017). Late subcontractor results, late supplier performance, the contractor's inefficiency in handling the building site, the contractor's mismanagement of project finances, lack of labour, inability to manage work according to contract schedule are some of the non –excusable delays**.** In addition to these, regular but avoidable mistakes or failure by the contractor or subcontractors to follow the owner's request defective workmanship, a project-specific labour strike triggered by either the reluctance of the contractor to bargain or unequal work procedures could also result this type of delay.

2.2 Review of Empirical literature

2.2.1 Causes of delay

Prakash and Joseph, (2014) in their study about cause of delay in Indian construction industry mentioned that 7 groups contributed to the construction delay. These are the client, contractor, consultant, material, equipment, labor, and external factor. Among those the top three most vital reasons that contributed to the causes of delays were late in revising and approving design documents, delays in sub-contractors work and poor communication and coordination change orders by owner during construction. Contractor related delays were ranked the most significant group that cause delays, followed by client related delays and consultant related delays.

On the examination of Pakistan large construction projects, M. Haseeb et.al (2011) after analyzing 68 causes of delay quantitatively, they identified 16 important factors influencing the duration of

large construction projects. These are finance and payments (slow and late payments by the clients),inaccurate time estimation ,quality of material (poor quality of materials used in construction projects), delay in payments to supplier and subcontractor (the late payments to suppliers of materials and subcontractors working on the construction project),poor management of site by the contractors, utilization of old techniques and methods for construction, natural disasters (the delays and interruption of work on construction projects due to the severity of natural disasters like floods and earthquake),unforeseen site conditions ,shortage of material ,delays caused by subcontractors, changes in drawings, improper equipment, inaccurate cost estimation, change orders (changes about design or working process), organizational changes and management and regulatory changes.

Dr.Ashraf Samarah & Dr.Ghanim A. Bekr, (2016) on the analysis of causes and effects of Delay in public construction projects in Jordan determined the frequency of occurrence, severity and importance of each of the 55 causes of delay they identified. Among the 55 causes, the top 22 factors were mentioned to be inadequate management and supervision by the contractor, client's changes of the design, inadequate planning and control by the contractor, using lowest bid that led to low performance, changes in the extent of the project, design and contract document error, late progress payments by the client, rework due to faults during construction and changes in the original design. They further identified low level productivity, technical problems faced by the contractor, incorrect construction methods followed by the contractor, lack of cooperation between client and contractor, cash flow problems suffered by the contractor, delay due to sub-contractors works, no approval of contractor submittals, bureaucracy and changes of government regulations, drawings are not efficient enough, non-availability of consultant's staff on site, other public works on site, effect of local community and changes in the cost of resources (labor, material and equipment)

M J Kamanga & W J v d M Steyn (2013) in their study on causes of delay in road construction projects in Malawi identified 72 typical causes of delay. Among those the top ten causes were listed to be shortage of fuel, insufficient contractor cash-flow, shortage of foreign currency for importation of materials and equipment, slow payment procedures adopted by the client in making progress payments, insufficient equipment, delay in relocating utilities, shortage of construction materials, delay in paying compensation to land owners, shortage of technical personnel, and delay in site mobilization.

They further notified that these causes of delays have been observed in other southern African countries like South Africa, Botswana and Swaziland.

Accordingly, major causes and effects of construction project delays in Nigerian construction industries are identified as, Insufficient number of equipment, inaccurate time estimate, interim payment difficulties, change orders, inaccurate cost estimate, poor site management and supervision, inadequate modern equipment, shortage of construction materials, incompetent project team, improper project planning and scheduling and contractors' financial difficulties. (Obodoh D.A & Chikasi Obodoh ,2016)

The top five factors causing delay of construction projects in Sana'a – Yemen were mentioned to be (1) delay in receiving progress payments by contractors, (2) financial difficulties faced by clients, (3) inadequate experience of contractor/ consultants, (4) poor site management and supervision, and (5) lack of sufficient cash for project implementation. Wael Alaghbari et.al (2018)

R.F. Aziz, A.A. Abdel-Hakam(2016) after exploring delay causes of road construction projects in Egypt mentioned 15 groups of delay factors as equipment related group, design related group, contractor related group, material related group, contract related group, consultant related group, financing related group, site related group, scheduling and controlling related group, owner related group, contractual relationship related group, labor related group, project related group, external related group and rules & regulations related group.

In the analysis of causes and effects of delay factors in road construction projects in Sudan also identified the causes as contractor related factors, consultant related factor, and owner / client related factor, government and external related factor respectively on their study of causes and effects of delay factors in road construction projects in Sudan. k.khair et.al (2016)

In an Investigation into factors causing delays in road construction projects in Kenya 141 causes of delay were identified and divided into 25 broad categories. The overall top five causes of delay identified by both consultants and contractors were: payment by client, slow decision-making and bureaucracy in client organization, claims, inadequate planning / scheduling and rain. Msafiri Atibu Seboru (2015)

Y.Amare et.al. (2017) identified 10 causes of delay on the research they made during construction phase of road projects due to the failures of contractor, consultant, and employer in Addis Ababa City Road Authority. According to their study, poor financial control of the project, difficulty in financing a project by contractor, type of project bidding and award (lowest bidder), poor site management and supervision of contractor, selecting inappropriate contractors, lack of high-technology mechanical equipment, inaccurate initial project scope estimate, ineffective project scheduling ,weak control of the project progress and lack of adequate training on construction management techniques for contractor's staffs were identified to be the top 10 causes of delay.

Werku Koshe & K. N. Jha. (2016) on the investigation of causes of construction delay in Ethiopian Construction Industries identified 88 key delay causing factors, the most common and critical factors of construction delay were evaluated and identified to be; difficulties in financing project by a contractor, escalation of the materials price, ineffective project planning, scheduling or resource management,delay in progress payments for completed works, insufficient data collection and survey before design, lack of skilled professionals in the field of construction management in the organization, and inadequate and seasonal availability of experienced labor.

2.2.2 Effects of delay

The causes of time overrun lead to the effects on road construction industry in different aspects**.** Time and cost overruns have been identified as the main effect of delays, which are a recurring problem in the road construction industry. Prakash &Joseph, (2014), Obodoh D. A &Chikasi Obodoh. (2016), The results of k.khair et.al(2016) further indicate that cost and time-overrun factors are the main results of delay in road construction projects in Sudan .However, some researchers have also identified other effects of road construction project delays.

Kikwasi (2013) for example, identified cost and time overrun, compromised quality, arbitration, disputes, litigation, low profit margin or financial loss, revocation of contract, total abandonment of project, loss of wealth and capacity as some of the resulting effects of delays.

As M. Haseeb et.al (2011), articulated the most important delay effects in construction industry of Pakistan are time overrun, cost overrun, abandonment, negotiations, court cases, and disputes. Dr.Ashraf Samarah & Dr.Ghanim A. Bekr. (2016) also mentioned that time overrun, cost overrun, disputes, arbitration, total abandonment and litigation were the identified effects of delay in Public Construction Projects in Jordan.

The findings of Aboubaker Y. Y Alfakhri et.al (2018) on the study of the effects of delays in road construction projects in Tripoli reveal that the major outcomes of road construction project schedule overruns in Tripoli, Libya include cost overruns, time extensions, disputes, loss of profit, breaches of contract, poor quality of work and company's bad reputation.

The consequences of delay are different for different project participants which also depend on the type of project. The general consequences are cost overrun; time overrun etc. For the owner/client delay is the loss of money, loss of time, loss of other facilities etc. For the contractor, delay means the loss of wealth for more expenditure on equipment's, other materials and for hiring the skilled labour. (Tushar, 2016).

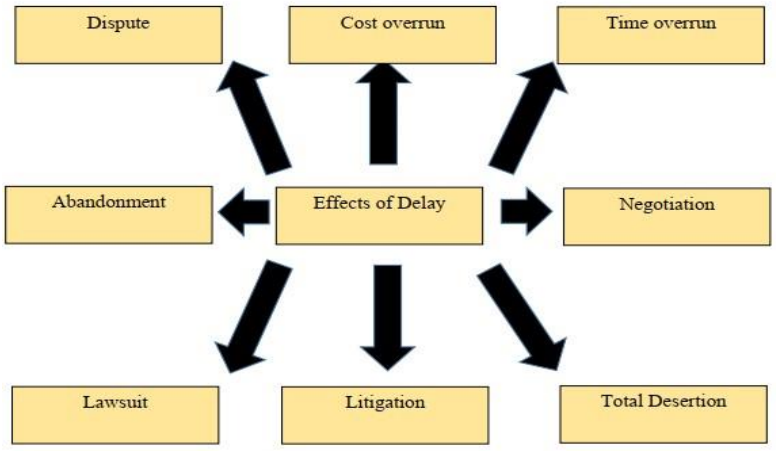

Figure 3: Effects of delay (Tushar.K et.al, 2016).

2.2.3 Minimization of delay

Different studies have in the past proposed different approaches, methods and techniques in an attempt to address project delays in the road construction sector.

Prakash &Joseph, (2014) mentioned 15 measures to be taken for the minimization of delays in construction projects these are frequent progress meeting, using up-to-date technology utilization using proper and modern construction, proper emphasis on past experience, clear information and communication channels, complete and proper design at the right time, site management and supervision, collaborative working in construction, frequent coordination between the parties involved, compressing construction durations, proper project planning and scheduling, proper material procurement, using appropriate construction methods and accurate initial cost estimates and effective strategic planning.

Among the above mitigation measures: site management and supervision, effective strategic planning, clear information and communication channel were considered to be the most effective methods of minimizing construction delays

M. Haseeb et.al (2011) suggested the following points

- The financial issues should be avoided by the client making on time payments to the constructing parties, which is the contractor, subcontractors, suppliers and labor.
- The project's time and expense estimates should be accurate.
- The lack of content and the standard should be carefully tested so that there is less mistake and a problem.
- The subcontractors should finish their job on schedule and the suppliers should deliver the goods in a timely manner.
- The site should be well maintained and the circumstances of the site should be analyzed in depth before work commences.
- Trained labor, necessary machinery, new technologies and accident, geographic and soil conditions should be taken into account in the construction project.
- During the building process, changing orders, structural modifications, legislative and operational changes can be avoided so as not to impact the overall progress of the construction.

According to Obodoh D.A & Chikasi Obodoh (2016) Method of minimizing construction delays include: ensuring adequate and available source of finance, incorporating competent project manager, available supply of resources, frequent progress meeting with in the constructing parties, award of bids to the right consultant and contractor, use of experienced and professional subcontractors and suppliers, competent project team, accurate initial cost estimate, competent and capable client's representative and use of appropriate construction methods. The researcher also recommended

1. Improving the administrative skills of contractors by continuous work training programs for industry workers to update their expertise and to be familiar with project management methods and processes.
2. Participatory growth curriculum for the construction sector.
3. Contract awards should be granted to experienced contractors and consultants with clear track records, and interim payment bottlenecks should be removed.
4. Growing construction efficiency is important, accompanied by developing the experience and capabilities of human resources and holding site meetings more regularly.

Msafiri Atibu Seboru (2015) suggested that clients should develop their cash reporting processes in order to be able to pay contractors in a timely way, to speed up the sluggish decision-making process, paperwork and red tape should be minimized in client organisations. Claims should be easily resolved in order not to become a cause of delays. During the execution of road projects, contractors should also prepare appropriate plans and schedules. Contractors should prepare to carry out operations that are not normally impacted by the weather during the rainy season to reduce delays.

Y.Amare et.al (2017) on their study of causes of delays during construction phase of road projects due to the failures of contractor, consultant, And employer in Addis Ababa City Road Authority recommended to establish a system for financial control of the project and also upgrading on the financial capacity building of the construction sector.

- Establishing consolidated project information database that supports all stakeholders by giving all relevant information about the project area's status is needed and the contractor work repetition.

- Improving the efficiency of professionals and businesses by a capacity-building initiative in the construction sector, such as the ERA Master program for road industry professionals.
- It is easier to set up a framework for exchanging expertise and information between companies and companies, as well as between contractors and contractors.
- Capacity building for construction management short-term and long-term preparation and training programs shall be carried out at the job site.

As k.khair et.al (2016) stated that the choice of a project manager with ample skills and expertise related to project management and the use of suitable resources and procedures for project solutions is the most productive way of reducing delays in road construction projects in Sudan.

Werku Koshe & K. N. Jha. (2016) suggested some actions to be taken by the client/owner, contractor and consultant. Before the start of the construction phase, the client should verify if the sketches have incorporation, the lowest evaluated bidder approach should be avoided, skilled and competent supervisor or consultant should be hired with a good salary, the owner should also release payments depending on the contract duration of the arrangement. In the other hand, the contractor should negotiate benefits to provide preparation for the labor in order to provide a healthier working atmosphere and improved efficiency, appoint the right professional to the right role, establish a culture of time order and stockpiling of daily resources, and develop the right professional and the project manager as well as a top level management should apply proper project management tools and techniques, such as: proper planning, scheduling and monitoring, proper cash flow and resource scheduling together with strict monitoring and evaluation. In order to prevent potential differences, the consultant should always plan a transparent and sufficient detail drawing and quantity bill without any mistakes, fair time and timeline for the project should be set, adequate data collection, survey and thorough site investigation and planning should be carried out before tendering, risk and escalation considerations should be taken into consideration during the calculation process. In order to prevent modifying orders, the requested fees, extra works and variation orders should be accepted on schedule, the scope of work should be specified prior to the construction process and the consultant should further provide the client with orientation on the problems found.

R.F. Aziz, A.A. Abdel-Hakam (2016) gave recommendations based on the top results. He suggested that the owner must pay the workers on time to make it easy for the contractor to fund and run the work smoothly, prevent a lack of equipment, whether for road construction or some other form of construction, the supply of construction equipment must be examined. In order to prevent errors caused by inadequate work experience of the contractor, it is important to select a contractor with a good reputation and adequate work experience more over in road construction, shortages of construction materials such as bitumen may trigger a significant delay, especially when the shortage is due to fluctuations in prices. Price variations in the contracts should be considered.

Trained employees should be assigned to deal with equipment, have routine maintenance and appoint contractors with appropriate equipment because failure of equipment due to lack of maintenance, inadequate employees or high equipment costs may make contractors rely for a long time on a certain equipment. The researcher further recommended that in order to prevent design mistakes, the owner should employ professional designers who are willing to change the favorable and unfavorable conditions of the projects they make. And also, an appropriate laboratory should be chosen because the first stage in the decision on the design of roads with traffic capacity, road loads, number of pavement layers is soil investigation. In addition to these, it is suggested that it is important to pick experienced subcontractors with strong credibility and job experience.

Rework due to design modification or variance order makes it helpful to agree on the design and have the final approval to meet the demand of the owner and the work power of the contractors; and contractors may recruit management experts or develop the expertise of engineers responsible for site management and oversight by training courses.

2.2.4 Research Hypothesis

The hypothesis was developed from the empirical review (M. Haseeb et.al (2011), Dr.Ashraf Samarah & Dr.Ghanim A. Bekr, (2016) Y.Amare et.al. (2017), Wael Alaghbari et.al (2018) Werku Koshe & K. N. Jha. (2016). Based on reviewed literatures the research hypothesis is identified as follows.

H_{01}: Slow and late payments by the clients have no impact on road construction project delay.

H_1: Slow and late payments by the clients have a significant negative impact on road construction project delay.

H_{02}: Inadequate experience of consultants does not affect the completion time of a road construction negatively.

H_2: Inadequate experience of consultants is expected to affect the completion time of a road construction negatively.

H_{03}: Inadequate management and supervision by the contractor has no impact on road construction project delay.

H_3: Inadequate management and supervision by the contractor has an impact on road construction project delay.

H_{04}: Escalation of the materials price has no impact on road construction project delay.

H_4: Escalation of the materials price have a significant negative impact on road construction project delay.

H_{05}: Company's bad reputation is not expected to be the effect of road construction delay in AACRA.

H_5: Company's bad reputation is expected to be the effect of road construction delay in AACRA.

H_{06}: Compromised quality is not expected to be the effect of road construction delay in AACRA.

H_6: Compromised quality is expected to be the effect of road construction delay in AACRA.

2.2.5 Conceptual framework

The aim of this section is to summarize the idea of the past literatures described above and to bring out the contribution for this study area. A number of studies have been conducted in regard to road construction delays and the effects they have. From the literature reviewed 36 causes and 16 effects are identified. According to R.F. Aziz, A.A. Abdel-Hakam(2016) the causes of road construction delays are grouped as equipment related group, design related group, contractor related group, material related group, contract related group, consultant related group, financing related group, site related group, scheduling and controlling related group, owner related group, contractual relationship related group, labor related group, project related group, external related group and rules and regulations related group. K.khair et.al (2016) summed up these groups in to contractor related, owner related, consultant related, government and external related factor. Therefore, this

study re-clustered these factors in to 5 categories as client related, consultant related, contractor related, material and equipment related and external related factors.

As per the reviewed literatures, the effects of road construction delay are mentioned to be cost - overrun, time-overrun, compromised quality**,** arbitration, disputes, negotiations, court cases**,** litigation, low profit margin or financial loss, revocation of contract, total abandonment of project, loss of wealth and capacity**,** breaches of contract, poor quality of work and company's bad reputation and loss of other facilities.

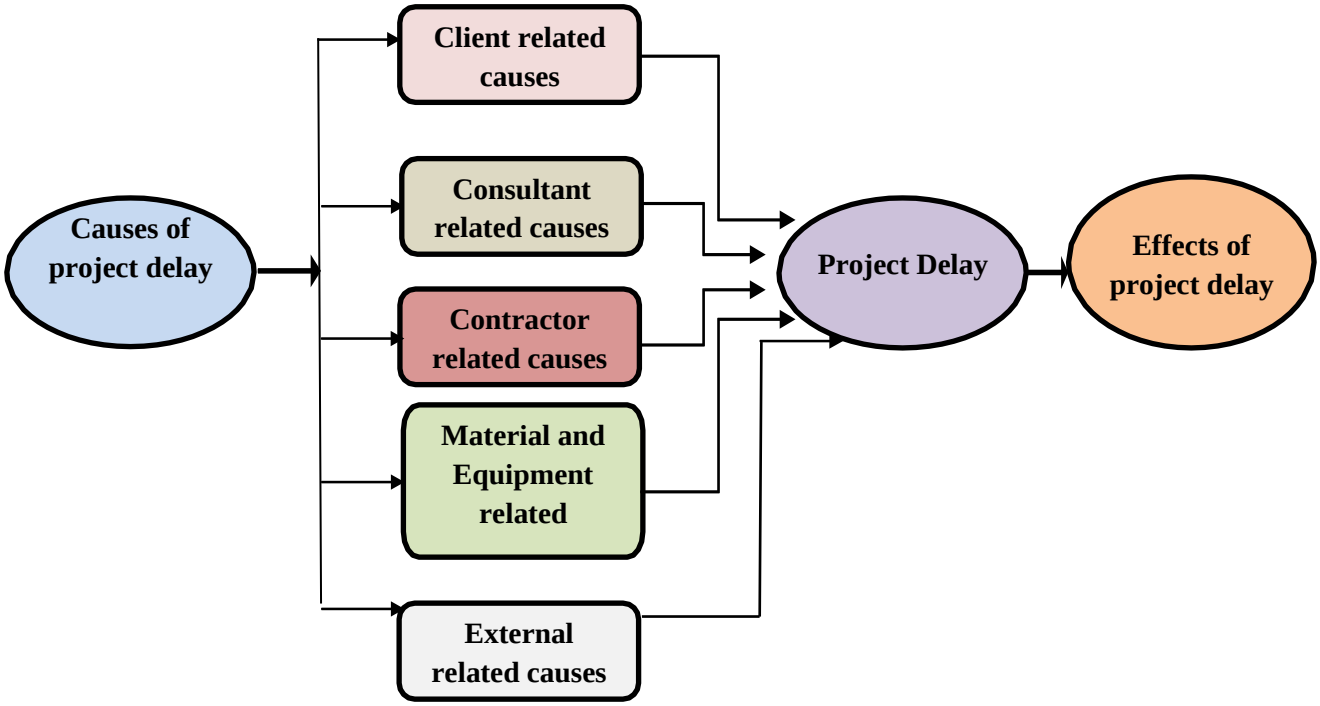

Figure 4: Conceptual Frame work

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the methodology and procedures that were followed to determine the style and methods of collecting information and data from the study population through office and field sources. The study identified and ranked the factors that influence the duration of Addis Ababa city road construction projects and their effects based on the results of all the reviewed studies. This chapter discusses research design, population, sample size and sampling design, data collection methods, validity and reliability of instrument, methods of data analysis as well as research ethics that was followed in the research.

3.2 Research Design

This study adopted a descriptive research design which is used to provide quantitative or numerical description of attitude, or opinions of participants to evaluate the perception of parties involved in the road construction process. Case study research approach was used to collect relevant secondary data and primary data through review of documents. Quantitative research methods were employed to analyse the total delay causing factors and effects of projects.

3.3 Sources of Data

Primary and secondary data were used in relation to the topic under discussion. The primary source of data was obtained through direct personal investigations of respondents and survey using questionnaires. The collection modes were through; printed questionnaire's, emails and google forms. The secondary data refers to that information which have already been collected, analysed, documented and published by some other researchers or people. Therefore, the study or findings were supported by the secondary data. The sources of data were the main parties in the construction namely; owner/ client, contractor and consultant.

3.4 Target Population, sampling technique and sample size

3.4.1 Target Population

The focus population of this study were among the client/owner, consultants, contractors, the project managers, office engineers, site engineers and supervisors with an experience in the road construction industry and currently involved in AACRA projects.

3.4.2 Sampling technique

In this study, respondents were selected based on their experience, knowledge and participation in road construction projects.

The study adopted a purposive sampling method. Tayie (2005) explains a purposive sample as one that comprises of subjects who are selected based on certain specific characteristics needed for a study and rules out subjects who do not meet this standard. This necessitated the use of purposive sampling technique for the study.

3.4.3 Sample size

The study participants are composed of 116 professionals from the 3-target population who have been engaged in AACRA road construction projects. From the target population the researcher has purposively distributed 52 questionaries to the client to reach out the population with adequate engineering background who were able to answer the research questions and 36 questionaries were distributed to the contractor and 28 to the consultant for those who have been actively engaged in the AACRA road construction projects.

3.5 Data Collection

To get primary data a structured questionnaire was developed by the researcher which helped to obtain direct information from the targeted population. Thus, five points Likert rating scale ranging

from strongly disagree (1) to strongly agree (5) was used in the study which is shown in the table 3.1 and 3.2 below.

Among the available techniques of secondary data collection methods, document review was employed to collect relevant secondary data from secondary sources (project completion reports, books, articles, magazines, internet, reports, contract documents and other's research papers). The information, which is relevant, was used as a benchmark against primary data which was collected to support the research.

Table 3.1Likert scale for frequency of occurrence of related delay causes

Category	Never	Rarely	Sometimes	often	Greatly often
Rating	1	2	3	4	5

Table 3.2 Likert scale for most influential effects of delay

category	Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree
Rating	1	2	3	4	5

3.6 Validity and reliability of instrument

According to Kothari (2004) validity is defined as the extent to which a test to measure what is the actual accuracy and precision of a measurement procedure. Validity of content is also mentioned to be the degree to which the content element of the questionnaire instrument covers the concept being evaluated. The validity of data collection instruments was checked against the available literatures. Moreover, to check the validity of the contents enclosed in the questionaries, the advisor and other responsible parties were asked whether the issues in the questionnaire satisfactorily covered the important aspects in the assessment of delay on road construction projects.

The questionnaires reliability was checked by the Cronbach´s Alpha test coefficient using SPSS software. The values of Cronbach's alpha have a range between 0 and 1. The lower values represent

lower internal consistency and larger values represent greater internal consistency. The criteria introduced by J. Nunally (1978) for the interpretation of this coefficient were considered to evaluate the results of the analysis. Cα> 0.8, 'Excellent'; 0.8> Cα> 0.7 'Good'; 0.7> Cα>0.5 'Satisfactory' and Cα <0.5 ' Poor'. Therefore, as per the analysis of the data, the reliability of the data is mentioned in the table below.

Table 3.3 Cronbach's Alpha test result of causes and effects of delay

Scale	Cronbach's Alpha
Client related causes of delay	**0.758**
Consultant related causes of delay	**0.879**
Contractor related causes of delay	**0.835**
Material and Equipment related causes of delay	**0.773**
External related causes of delay	**0.535**
Effects of delay	**0.908**
Average	**0.781**

3.7 Methods of data Analysis

The collected data was analysed using Microsoft Excel and SPSS package to determine the occurrence of the causes and effects of the road construction delay.

The Relative Importance Index (RII) The relative index technique has been broadly used in Construction research for measuring attitudes with respect to surveyed variables. (Prakash & Joseph, (2014); Dr. Ashraf Samarah & Dr. Ghanim A. Bekr. (2016))used RII in their analysis to rank the different causes and effects from different perspectives.

RII is used to rank the different causes of delays from the perspective of clients, consultants, contractors and other stakeholders. The approach is also used to evaluate the different causes of delays, among different categories, the same methodology is used for this analysis. (i.e., Clients, consultants and contractors). The five-point scale ranged from 1 (not important) to 5 (extremely important) is adopted and transformed to relative importance index (RII) for each factor. The relative important index is computed as;

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

Where:

RII= Relative Important Index

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

A= the highest weight 5

N= the total number of respondents

3.8 Research Ethics

The researcher had followed ethically and morally acceptable processes throughout the research process. The data was collected with the full consent of the participants and they were aware about the purpose of the study**.** Documents reviewed from the organization remained confidential. The findings and results from this study will not be used for another purpose. During this study respondents were free to respond their own opinion from their experience, and their personal information such as name and detailed information was not mentioned.

CHAPTER FOUR
RESULT AND DISCUSSION

4.1 Introduction

This chapter deals with the presentation of data collected from the distributed questionnaire. A total of 36 potential delay causes were selected from the previous studies and grouped in to 5 namely, client related factors, consultant related factors, contractor related factors, material and equipment related factors, and external related factors. Similarly, 16 effects that have been selected from the past studies and reviewed literatures were ranked based on their potential effect. Both the causes and effects were ranked in a five-point likert rating scale ranging from strongly disagree (1) to strongly agree (5). The data obtained through questionnaire was developed to assess the perceptions of owners, contractors and consultants on the relative importance of causes and effects of delays in the AACRA projects. The data collected through these methods were analysed and the results are presented

4.2 Basic Information of the respondents

4.2.1 Survey Responses

A total of 116 questionnaires (52 to the client,36 to the contractor,28 to the consultant) were distributed to the respondents. Among the distributed questionnaire 91 were returned. Two of them were rejected making 88 responses applicable in the data analysis which makes a percentage of 76 return rate.The general characteristics of the respondents is presented below

Table 4.1: Rate of response

Group of respondents	Questionnaire distributed	Questionnaire collected	Percentage
Client	52	48	54.5
Contractor	36	21	23.9
Consultant	28	19	21.6
Total	116	88	100.0

4.2.2 Demographic distribution of the respondents

The demographic characteristics of the respondents were presented in terms of frequency and percentage distribution. The variables included under this section were sex, age, respondent designation, level of education and years of work experiance of respondents.

Table 4.2: Distribution of Respondents by Sex and Age

S. No.	Demographic Variable	Category	Frequency	Percentage (%)
1	Sex	Male	74	84%
		Female	14	16%
		Total	88	100%
2	Age	18-30 years	53	60%
		31-40 years	27	31%
		41-50 years	6	7%
		51-60 years	2	2%
		Above 60 years	-	-
		Total	88	100%

As shown in table 4.2 the majority of the respondents 74 (84%) were male while 14 (16%) were female respondents.In terms of age category, the data shows that the majority of population that participated were aged between 18-30 years making 60% ,and those aged between 31-40 years made 31% out of the total respondents, followed by those aged between 41-50 years accounting 7% , and 2% of the respondents were aged between 51-60 years .On the other hand, there were no respondent above the age category of 60 years.

Table 4.3 below presents the distribution of respondents in terms of respondent designation,level of education and years of experience .Accordingly respondents who are resident engineers were 44 in number with a percent of 50,3(3.4 %)of the participants were the owners, 7 (8 %)of them were the project managers, 17 of them holding 19.3% were supervisors,9 (10.2%) of the respondents were the site engineers and 8(9.1%) of them were participants having other designation.

In terms of level of education respondents with a first degree dominated the study with a number 53 having a percent of 60, they were followed by respondents having masters with a frequency 30 and a percentage of 34. Only 5 (6%) respondents had a diploma which implies that the majority of the participants attained the intended qualification to be able to accomplish their job. Moreover, the respondents were amongst the employees with engineering educational background, which indicates the respondents had enough knowledge of the construction industry with issues related to causes and effects of delay.

Table 4.3 Distribution of Respondents by designation, level of education and years of work experience

S. No.	**Demographic Variable**	**Category**	**Frequency**	**Percentage (%)**
1	Respondent Designation	Owner	3	3.4%
		Resident Engineer	44	50 %
		Project Manager	7	8 %
		Supervisor	17	19.3%
		Site Engineer	9	10.2%
		Other	8	9.1%
		Total	88	100%
2	Level of Education	Diploma	5	6%
		First Degree	53	60%
		Masters	30	34%
		Total	88	100%
3	Years of work experience	1-5 years	45	51%
		6-10 years	24	28%
		11-15 years	10	11%
		Greater than 15 years	9	10%
		Total	88	100%

In terms of work experience respondents percentage shows that 45(51%) of the respondents had 1-5 years of experience , 24(28%) of the respondents had 6-10 years of experience, 10 (11%) of the respondents had 11-15 years of experience and 9(10%) respondents had an experience which is greater than 15 years.This implies that most of the respondents were having the necessary work experience to be able to perform their job.

4.2.3 Respondents Perception

After the data has been collected from the required respondents and document review, the datum was analyzed quantitatively by the help of statistical package for the social science (spss) software and a microsoft excel. The analysed data are presented in sub sections which are in direct relationship of the objective of the study and the items asked in the questionnaire. The first objective of the study was related to identifying the delay causing factors that currently exist in the road construction project of Addis Ababa City Road Authority that have been identified and grouped in to five major groups. These delay causing factors were ranked in each group based on their Relative Importance Index(RII). The following is the detailed description of the importance and ranking of delay causing factors.

4.3 The Importance and Ranking of causes of delay

Delays in road construction projects happen due to various causes and factors. A total of 36 delay causing factors were identified and grouped in to 5 as client related factors, consultant related factors, contractor related factors, material and equipment related factors, and external related factors. Regarding to this respondents were asked to rank the delay causing factors based on the frequency of occurrence in road construction projects by using five points likert scale.

From table 4.4 the results show that the most important client related delay causes of road construction projects in Addis Ababa city road Authority were delay in paying compensation to land owners(RII=0.761), slow decision making(RII=0.711),type of project bidding and award (lowest bidder)(RII=0.690), change orders (changes about design or working process)(RII=0.679), slow and late payments by the clients(RII=0.613), delay in site mobilization(RII=0.611),

bureaucracy in client organization(RII=0.604), and lack of sufficient cash for project implementation(RII= 0.568).Hence,The hypothesis H_1: slow and late payments by the clients have a significant negative impact on road construction project delay is proven to be correct since slow and late payments by the clients is ranked to be the 5th client Related Delay Cause while the null hypothesis H_{01}: slow and late payments by the clients have no impact on road construction project delay is proven to be incorrect.

Table 4.4 Importance and ranking of Client related delay causes

Client Related Delay Causes	RII	Rank
Delay in paying compensation to land owners	0.761	1
Slow decision making	0.711	2
Type of project bidding and award (lowest bidder)	0.690	3
Change orders (changes about design or working process)	0.679	4
Slow and late payments by the clients	0.613	5
Delay in site mobilization	0.611	6
Bureaucracy in client organization	0.604	7
Lack of sufficient cash for project implementation	0.568	8

According to table 4.5 the most important and highly ranked consultant related causes of road construction projects in Addis Ababa city road Authority were late in revising and approving design documents(RII=0.718), inaccurate cost estimation(RII=0.697), improper project planning and scheduling(RII=0.686), inaccurate initial project scope estimate(RII=0.661), inadequate experience of contractor/ consultants(RII=0.656), insufficient data collection and survey before design(RII=0.65), design and contract document error(RII=0.609), non-availability of consultant's staff on site(RII=0.588), and no approval of contractor submittals(RII=0.552). Therefore, the hypothesis H_2: Inadequate experience of consultants is expected to affect the completion time of a road construction negatively is proven to be right since Inadequate experience of consultants is the 6th consultant related delay cause while the null hypothesis H_{02}: Inadequate experience of consultants does not affect the completion time of a road construction negatively is proven to be wrong.

Table 4.5 Importance and ranking of consultant related delay causes

Consultant Related Delay Causes	RII	Rank
Late in revising and approving design documents	0.718	1
Inaccurate cost estimation	0.697	2
Improper project planning and scheduling	0.686	3
Inaccurate initial project scope estimate	0.661	4
Inadequate experience of consultants	0.656	5
Insufficient data collection and survey before design	0.650	6
Design and contract document error	0.609	7
Non-availability of consultant's staff on site	0.588	8
No approval of contractor submittals	0.552	9

According to table 4.5 the most important and highly ranked contractor related causes of road construction projects in Addis Ababa city road Authority were inadequate management and supervision by the contractor (RII=0.727), ineffective resource management(RII=0.711), utilization of old techniques and methods for construction(RII=0.677), lack of adequate training on construction management techniques for contractor's staffs(RII=0.670), delays in sub-contractors work(RII=0.652),incorrect construction methods followed by the contractor(RII=0.643), inadequate experience of contractor (RII=0.631) and rework due to faults during construction(RII=0.613).Accordingly the hypothesis H_3: Inadequate management and supervision by the contractor has an impact on road construction project delay is proven to be correct since inadequate management and supervision by the contractor was ranked 1st among the contractor related delay causes, and the null hypothesis H_{03}: Inadequate management and supervision by the contractor has no impact on road construction project delay is proven to be incorrect.

Table 4.6 Importance and ranking of contractor related delay causes

Contractor Related Delay Causes	RII	Rank
Inadequate management and supervision by the contractor	0.727	1
Ineffective resource management	0.711	2
Utilization of old techniques and methods for construction	0.677	3

Lack of adequate training on construction management techniques for Contractor's staffs	0.670	4
Delays in sub-contractors work	0.652	5
Incorrect construction methods followed by the contractor	0.643	6
Inadequate experience of contractor	0.631	7
Rework due to faults during construction	0.613	8

According to table 4.6 the most important and highly ranked material and equipment related causes of road construction projects in Addis Ababa city road Authority were escalation of the materials price(RII=0.79), lack of high-technology mechanical equipment(RII=0.727), shortage of construction materials(RII=0.725), insufficient equipment(RII=0.706) and quality of material(RII=0.647).Thus the hypothesis H_4: Escalation of the materials price have a significant negative impact on road construction project delay is proven to be correct since escalation of the materials price was ranked 1st among the material and equipment related causes while the null hypothesis H_{04}: Escalation of the materials price has no impact on road construction project delay is proven to be incorrect.

Table 4.7 Importance and ranking of material and equipment related delay causes

Material and Equipment related causes	RII	Rank
Escalation of the materials price	0.790	1
Lack of high-technology mechanical equipment	0.727	2
Shortage of construction materials	0.725	3
Insufficient equipment	0.706	4
Quality of material	0.647	5

According to table 4.7 the most important and highly ranked external related causes of road construction projects in Addis Ababa city road Authority were delay in relocating utilities(RII =0.818), shortage of foreign currency for importation of materials(RII =0.743), unforeseen site conditions(RII=0.615), effect of local community(RII=0.597), bureaucracy and changes of government regulations(RII=0.529) and natural disasters(RII=0.425)

Table 4.8 Importance and ranking of external related delay causes

External related causes	RII	Rank
Delay in relocating utilities	0.818	1
Shortage of foreign currency for importation of materials	0.743	2
Unforeseen site conditions	0.615	3
Effect of local community	0.597	4
Bureaucracy and changes of government regulations	0.529	5
Natural disasters	0.425	6

4.4 Top Delay Causes

As mentioned in table 4.8 below, the top ten delay causing factors of road construction regarding Addis Ababa City Road Authority are ranked and summarized in the table by analysing the data collected from the respondents perception.

Delay in relocating utilities is suggested to be the most important factor causing delay with RII=0.818 followed by escalation of the material price with RII= 0.790. Delay in paying compensation to land owners with RII=0.761 and shortage of foreign currency for importation of materials with RII=0.743 was ranked to be the 3rd and 4th important delay causing factors respectively. Inadequate management & supervision by contractors and lack of high-technology mechanical equipment was ranked to be the top 5th and 6th delay causing factors having the same RII value of 0.727. This is closely followed by shortage of construction equipment with RII=0.72.Late in revising and approving design documents with RII=0.718 comes 8th followed by Slow decision making and ineffective resource management with equal RII value of 0.711.

Table 4.9 Top ten delay causing factors

Top ten delay causing factors	RII	Rank
Delay in relocating utilities	0.818	1
Escalation of the material price	0.790	2
Delay in paying compensation to land owners	0.761	3
shortage of foreign currency for importation of materials	0.743	4
Inadequate management & supervision by contractors	0.727	5

Lack of high-technology mechanical equipment	0.727	6
Shortage of construction materials	0.725	7
Late in revising and approving design documents	0.718	8
Slow decision making	0.711	9
Ineffective resource management	0.711	10

4.5 The Importance and Ranking of Effects of Delay

Road construction delays result various effects,from the reviewed literatures 16 important effects were identified.

According to the primary data that is collected from the client, consultant and contractors of Addis Ababa City Road Authority, the ranking order of effects of road construction delay is presented by the table below.

The analysis of data from the distributed questionnaire shows that the top five important effects of delay are time overrun(RII=0.854), cost overrun(RII= 0.816), financial loss (RII= 0.743), poor quality of work(RII=0.731) and compromised quality(RII=0.706)**.**Therefore, the hypothesis H_5: Company's bad reputation is expected to be the effect of road construction delay in AACRA and H_6: Compromised quality is expected to be the effect of road construction delay in AACRA are proven to be right while the null hypothesis H_{05}: Company's bad reputation is not expected to be the effect of road construction delay in AACRA and H_{06}: Compromised quality is not expected to be the effect of road construction delay in AACRA are proven to be wrong.

Table 4.10 The Importance and Ranking of Effects of Delay

Effects of Delays	RII	Rank
Time overrun	0.854	1
Cost overrun	0.816	2
Financial loss	0.743	3
Poor Quality of work	0.731	4
Compromised quality	0.706	5
Company's bad reputation	0.704	6
Loss of other facilities	0.695	7

Disputes	0.679	8
Loss of wealth and capacity	0.675	9
Breaches of contract	0.659	10
Revocation of contract	0.652	11
Total abandonment of project	0.641	12
Arbitration	0.631	13
Negotiation	0.622	14
Court cases	0.606	15
Litigation	0.600	16

4.6 Methods of Minimizing Delays

From the perceptions of the respondents the basic mitigation measures of minimizing delay in road construction were mentioned to be: -

- Preparing the site and solving the right of way issues before commencement of the projects.
- Changing the bidding process and giving the projects to the well organized and qualified construction companies.
- Working on the ways to hinder corruption so that it will not affect the tendering process.
- Spending more time on planning, scheduling and reviewing the design and the overall plan in the preconstruction phase of the project so that it could help in defining the project accurately and making the implementation easier.
- Frequently supervising and checking the progress of the project from the procurement to project follow up and contract administration.
- Selection of appropriate contractors and consultants who have a good work ethics and experience.
- Creating a system to control project scope and design change issues.
- Improving the capacity of the employer with better professionals and well-developed structures in order to manage all the city`s road projects from design to construction stages.
- Project management should be modernized and the construction process should stick to the schedules provided.
- A good relationship and communication between the construction parties must be promoted.

4.7 Discussion of the findings

The main purpose of this study was to identify the causes and effects of road construction projects in Addis Ababa City Road Authority. Accordingly, the first objective of the research was to identify the delay causing factors that currently exist in the road construction projects of Addis Ababa City Road Authority. Results of the data analysis as depicted on table 4.8 shows that the first influential factor for the cause of delay is found to be delay in relocating utilities with RII value of 0.818 which was included in external related causes of delay.

As per the research of M J Kamanga & W J v d M Steyn (2013) delay in relocating utility was ranked as the sixth important factor among the top 10 causes of delay. Escalation of the material price, which is the second common and critical factor with RII value of 0.790 grouped under material and equipment related causes of delay, is also ranked to be the second influential factor on the study of Werku Koshe & K. N. Jha. (2016). Delay in paying compensation to land owners , the third important factor with RII value of 0.761 grouped under the client related factors and the fourth influential factor which is shortage of foreign currency for importation of materials with RII value of 0.743 under the category of external related were also ranked to be the eighth and third top causes of delay respectively on the study made by M J Kamanga & W J v d M Steyn (2013).

Inadequate management and supervision by contractors, which is the fifth important cause of delay in the study is also mentioned to be the prominent factor on researches made by Eyasu Tolera (2013), Y.Amare et.al. (2017), Dr.Ashraf Samarah & Dr.Ghanim A. Bekr, (2016), Obodoh D.A & Chikasi Obodoh ,(2016) and M. Haseeb et.al (2011).On the study made by Eyasu Tolera (2013), and M. Haseeb et.al (2011) the factor is similarly mentioned to be the fifth important factor of delay. While on the studies of Dr.Ashraf Samarah & Dr.Ghanim A. Bekr, (2016), Y.Amare et.al. (2017) and Obodoh D.A & Chikasi Obodoh, (2016) the factor was ranked to be the first, fourth and sixth important factor of delay respectively.

The sixth important factor as per ranked in the study, Lack of high technology mechanical equipment with RII value of 0.727, is also consistent with the ranking of the factors of delay on the study made by Y.Amare et.al. (2017) and shortage of construction materials with RII value 0.725

which is the seventh significant factor of delay is mentioned to be the eighth important factor on the study made by Obodoh D.A & Chikasi Obodoh, (2016). The eighth vital factor, late in revising and approving design documents with RII value of 0.718 is also mentioned on the research result of Y.Amare et.al. (2017) in which the factor is ranked to be the fifth vital cause of delay on the study.

Slow decision making, the ninth important cause of delay with RII value of 0.711, was mentioned to be the second important cause of delay on the study made by of Msafiri Atibu Seboru (2015) and the tenth important causes of delay, ineffective resource management was ranked as the fourth important cause of delay on the study made by Werku Koshe and K. N. Jha. (2016). However , the overall ranking of the causes of delays of the study does not conside with the top rankings of the other studies. Since project is a unique endeavor, delay causing factors and their rankings may vary from country to country and also from project to project. Hence, the ranking of the causes and their classification of their group as client related, consultant related,contractor related, material and equipment related and external related also varies with other studies.

Based on the Importnace and Ranking of Effects of Delay on Table 4.9 , the top effects were mentioned to be time over run(RII=0.854) and cost over run(RII=0.816). These results correspond with the results reached by Prakash & Joseph,(2014), Eyasu Tolera (2013), Obodoh D.A & Chikasi Obodoh.(2016), Dr. Ashraf Samarah & Dr.Ghanim A. Bekr. (2016), Firdissa Yadeta (2018), and Aboubaker Y. Y Alfakhri et.al (2018). In addition to this, Financial loss which was identified to be the third effect of delay in the study, is mentioned to be the sixth identified effect on the study of kikwasi(2013).The fouth identified effect ,poor quality of work, was mentioned as the sixth effect of delay on the study made by Aboubaker Y. Y Alfakhri et.al (2018) and compromised quality, which was identified as the fifth effect of delay on the study was also identified as the third effect on the study made by kikwasi(2013).

CHAPTER FIVE
SUMMARY,CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter includes the summary,conclusions and recommendations that could be imperative to minimize the delay caused in road construction projects of AACRA and their effects.

5.2 Summary

The main purpose of this study was to identify the causes and effects of delay in road construction of AACRA. The specific objectives of the study were to identify the delay causing factors that currently exist in the road construction projects of AACRA, to rank the most significant delay causing factors that affects the sector , to identify the effects of delay on road construction project of AACRA and to rank the top effects of delay that is perceived in the company. For achieving those objectives three vital research questions have been stated and answered in the study. These were:

1.What are the most important causes of delay in road construction projects of Addis Ababa City Road Authority?

2. What are the Effects of delay in road construction projects of Addis Ababa City Road Authority?
3. What are the mitigation measures used to minimize delay?

In order to meet the objective of the study a descriptive research design was used to provide quantitative description of the perception of the participants. The relevant data was obtained using close-ended questionnaires comprising the five points likert rating scale ranging from strongly disagree (1) to strongly agree(5) was used which was developed to get the perceptions from the client, consultant and contractor groups. From the total 116 questionnaires, 52 questionnaires were distributed to the client, 36 to the contractor and 28 to the consultants. Out of the totally distributed questionnaire 88 (76%) were properly filled and returned back. The collected data was then analyzed quantitatively using statical package for social science (SPSS) software and microsoft

excell. Relative importance index was used to rank the identified causes and effects in the study. Thus, based on the data analysis the following major findings were obtained.

5.2.1 Demographic characteristics of the respondents

Results of the data analysis with regard to demographic characteristics of the respondents showed that (a) Majority of the respondents were male (84 %) showing that the issue of gender equality is still not dealt with or answered (b)The age category 18-30(60%) has covered the majority of the respondents compared to the other age ranges (c) In terms of level of education 60 % of the respondents obtained first degree and 34% of the respondents had their masters degree which shows that the study participants are a qualified professionals (d) the respondents reported that 51% of them had 1-5 years of experience and 49% of them have above 6 years of experience.

5.2.2 Identification and Ranking of Causes of delay

There are many factors that cause delay on road construction projects, However in this study the delay causing factors are limited to 36 and they are grouped in to five major categories. Thus, the factors were ranked according to relative importance index.

The factors delay in relocating utilities,escalation of the material price, delay in paying compensation to land owners, shortage of foreign currency for importation of materials, inadequate management & supervision by contractors ,lack of high-technology mechanical equipment,shortage of construction materials, late in revising and approving design documents, slow decision making and Ineffective resource management were found to be the top ten most important causes as per identified and ranked in the study.

Table 5.1 The top ten important causes of delays

Top ten delay causing factors	RII	Rank
Delay in relocating utilities	0.818	1
Escalation of the material price	0.790	2
Delay in paying compensation to land owners	0.761	3
shortage of foreign currency for importation of materials	0.743	4

Inadequate management & supervision by contractors	0.727	5
Lack of high-technology mechanical equipment	0.727	6
Shortage of construction materials	0.725	7
Late in revising and approving design documents	0.718	8
Slow decision making	0.711	9
Ineffective resource management	0.711	10

5.2.3 Identification and Ranking of effects of delay

Identification of the effects of road construction delay was also made based on 16 factors which were reviewed from different literatures. Those factors were ranked using relative importance index and time overrun,cost overrun, financial loss, poor quality of work and compromised quality were found to be the top five important effects of delay.

Table 5.2 The top five important effects of delay

Effects of Delays	RII	Rank
Time overrun	0.854	1
Cost overrun	0.816	2
Financial loss	0.743	3
Poor Quality of work	0.731	4
Compromised quality	0.706	5

5.3 Conclusions

The road construction industry is regarded as an important field of every economy in the world. This is due to the fact that the success of the industry helps support socio-economic development and the overall progress of economy and the growth of a nation . In road construction industry time is a very important project success measure and an important resource and tool in project management life cycle.

Delays are one of the most series challenges that usually occur in road construction projects and the severity of these delays varies greatly from country to country and from project to project.Thus, identifying sources of delay and analysing them is the basic requirement for reducing or avoiding delays in project execution. Therefore, This research was aimed at identifying the major cause and effects of delay at AACRA projects through a survey. The analysis was made based on the perceptions of the responsible parties involved in the construction process,namely, the client, consultant and the contractor.

Based on the literature reviews and the outcomes of the questionnaire responses the following conclusions are drawn.

1) The following causes are identified as a top delay causes of Addis Ababa City Road Authority projects as per there categories.
    a. Client related causes: Delay in paying compensation to land owners & Slow decision making were ranked to be the 3rd and 9th top delay causing factors respectively.
    b. Consultant related causes: Late in revising and approving design documents was ranked to be the 8th among the top ten delay causing factors.
    c. Contractor related causes: Inadequate management & supervision by contractors was ranked 5th among the top delay causing factors. And Ineffective resource management was ranked to be the 10th important cause of delay.
    d. Material and equipment related causes: Escalation of the material price, Lack of high-technology mechanical equipment and Shortage of construction materials were ranked to be the 2nd, 6th and 7th among the top 10 delay causing factors respectively.
    e. External related causes: Delay in relocating utilities which were found to be the most influential cause was ranked 1st and shortage of foreign currency for importation of materials were ranked to be the 4th important cause of delay.

2) Time overrun, Cost overrun, Financial loss, Poor Quality of work and Compromised quality are found to be the top five influential effects of delay as identified and ranked in the study.

5.4 Recommendations

In the light of the identified causes, this study draws the following recommendation.

- Delay in relocating utilities**:** it is important to advance in subsurface utility engineering (SUE) technology to improve the quality of utility design and develop innovative contractual and procedural practices to facilitate ontime utility relocations.
- Escalation of material price**:** Contractors usually increase their bid price to account for the anticipated escalation of material price for the projects already in contract. However, it causes hiderance on the over all performance of the project since it is a direct treat to contractors profitability, hence the remedy to this issue could be an addition of material escalation clauses on the construction contract. Since material escalation clauses provide an adjustment of the contract price if an escalation occurs above the agreed threshold.
- Delay in paying compensation to land owners**:** The client has to resolve the right of way issues before the commencement of the project since it is time taking to discuss with society found along the proposed project. Therefore, the compensation payments have to be made before the handing over of the project to the contractor.
- Shortage of foreign currency for importation of material**:** the availability of hard currency has made it difficult to import different construction materials which is found to be among the top causes of delay based on the study. Therefore, the responsible sector of the government has to find a way to make the exchange process easier for the road construction and other industries. In relation to this, lack of high technology mechanical equipment is also among the top ten causes. Similarly, the government has to motivate the use of high technology mechanical equipment to fasten the progress of the construction to increase the quality and be efficient and effective.
- Inadequate management and supervision by contractor**:** repeated follow up and supervision is crucial for the timely completion of the project. More attention have to be given on effective site management, labour management and resource management to avoid reworks occuring due to the absence of the contractor on site.

- Shortage of construction materials**:** makes it important to study the availability of construction materials needed whether it is for the road construction or any other type of construction.
- Consultants must revise and approve the design documents on time and clients also shall make a timely and prompt decision.

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APPENDIX: QUESTIONNAIER

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St. Mary's University, Ethiopia

DEPARTMENT OF PROJECT MANAGEMENT

Research Questionnaire on Perceived causes and effects of delay on road construction project: The Case of Addis Ababa City Road Authority

Dear Respondent

My name is Semira Hussein. I am currently doing my MA in project management at St. Mary`s University School of graduate studies. I am conducting a research about perceived causes and effects of delay on road construction project. The focus of the study is at Addis Ababa city road Authority. I believe that your experience and knowledge related to road construction projects will help me acquire valuable information on the cause and effects of road construction delay. I kindly invite you to help me in completing the attached questionnaire as honestly as possible. I guarantee that your identity will be kept confidential and the information will only be used for academic purposes. Your kind assistance in this aspect is highly appreciated. Thank you for sharing your precious time.

Note: Writing your name is not necessary.

Yours sincerely

Semira Hussein

Graduate Student, Project Management

Tel: +251910799600 Email: Semirahadem@gmail.com

Advisor: Dr. Temesgen Belayneh

SECTION A : General Information

Please thick on the answer which describes you

1. Gender

Male ☐ Female ☐

2. Age

18-30 yrs ☐ 41-50 yrs ☐

31-40 yrs ☐ 51-60 yrs ☐

Over 60 yrs ☐

3.Responsibility of state Respondent

Client ☐ Contractor ☐ Consultant ☐

4.Respondent Designation in the company

Owner ☐ Project Manager ☐ Site Engineer ☐

Resident Engineer ☐ Supervisor ☐ Other, specify _____

5. Level of Education

Diploma ☐ 2nd Degree ☐

1st Degree ☐ PHD ☐

6. Relevant working Experience (years)

1-5 Years ☐ 11-15 years ☐

6-10 years ☐ Greater than 15 years ☐

SECTION B: Causes of Delays

Please rank the delay causing factors below based on frequency of occurance in road construction projects.

Category	Never	Rarely	Sometimes	Often	Greatly often
Rating	1	2	3	4	5

Please indicate on boxes using the following criteria

Causes of Delay		**Frequency**				
		1	2	3	4	5
1. Client Related	1. Slow and late payments by the clients					
	2.Change orders (changes about design or working process					
	3.Delay in paying compensation to land owners					
	4. Lack of sufficient cash for project implementation					
	5.Bureaucracy in client organization					
	6. Type of project bidding and award (lowest bidder)					
	7. Delay in site mobilization					
	8. Slow decision making					
2. Consultant Related	1.Late in revising and approving design documents					
	2. Inaccurate cost estimation					
	3.Design and contract document error					
	4. No approval of contractor submittals					
	5.Non-availability of consultant's staff on site					
	6. Improper project planning and scheduling					
	7. Inaccurate initial project scope estimate					
	8. Insufficient data collection and survey before design.					

	9. Inadequate experience of consultants					
3.Contractor Related	1. Delays in sub-contractor's work					
	2. Utilization of old techniques and methods for construction					
	3.Inadequate management and supervision by the contractor					
	4. Rework due to faults during construction					
	5.Incorrect construction methods followed by the contractor					
	6. Lack of adequate training on construction management techniques for Contractor's staffs					
	7.Ineffective resource management					
	8. Inadequate experience of contractor					
4. Material and Equipment Related	1. Quality of material					
	2. Shortage of construction materials					
	3. Lack of high-technology mechanical equipment					
	4. Escalation of the materials price					
	5. Insufficient equipment					
5.External Related	1. Unforeseen site conditions					
	2. Natural disasters					
	3. Bureaucracy and changes of government regulations					
	4. Effect of local community					
	5.Shortage of foreign currency for importation of materials					
	6. Delay in relocating utilities					

If you have any comments or suggestion regarding the causes of delay on road construction projects of Addis Ababa city road Authority or their importance, please specify here

_____
_____
_____
_____

SECTION C: Effects of Delays

Please rank effects of delay below in which you consider to be the most influential.

Category	Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree
Rating	1	2	3	4	5

Please indicate on boxes using the following criteria

	Effects of Delays	**1**	**2**	**3**	**4**	**5**
1	Cost -overrun					
2	Time-overrun					
3	Compromised quality					
4	Arbitration					
5	Disputes					
6	Negotiation					
7	Court cases					
8	Litigation					
9	Financial loss					
10	Revocation of contract					
11	Total abandonment of project					
12	Loss of wealth and capacity					
13	Breaches of contract					
14	Poor quality of work					
15	Company's bad reputation					
16	Loss of other facilities					

If you have any comments or suggestion regarding the Effects of delay on road construction projects, please specify here

_____
_____
_____
_____

SECTION D: Mitigation Measures

Please suggest your recommendation to minimize delay on road construction projects .

_____
_____
_____
_____
_____
_____

Thank you!