SAINT MARY'S UNIVERSITIY

SCHOOL OF GRADUATE STUDIES

MASTER OF BUSINESS ADMINISTRATION

DELAY IN ROAD CONSTRUCTION PROJECT:

A CASE STUDY OF ADDIS ABABA CITY ROAD AUTHORITY

BY: NANATI ERMIYAS DEMERE **ID: SGS/0402/2014A**

JUNE, 2023

ADDIS ABABA, ETHIOPIA

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CAUSE AND EFFECTS OF DELAY ON ROAD CONSTRUCTION PROJECT

(CASE STUDY OF ADDIS ABABA CITY ROAD AUTHORITY)

BY

NANATI ERMIYAS

APPROVED BY BOARD OF EXAMINERS

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Dean, Graduate Studies	Signature
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Advisor	Signature
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External Examiner	Signature
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Internal Examiner	Signature

DECLARATION

Candidate's Declaration

I, **Nanati Ermiyas,** the under signed, declare that this thesis entitled: that "**Cause and Effects of Delay on Road Construction Project In The Case of Addis Ababa City Road Authority"** is my original work. I have undertaken the research work independently with the guidance and support of the research supervisor. This study has not been submitted for any degree or diploma program in this or any other institutions and that all sources of materials used for the thesis has been duly acknowledged.

Candidate's Name: **Nanati Ermiyas**

Signature: _____ Date: _____

ENDORSEMENT

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

Advisor	Signature
_____	_____

Saint Mary's University, Addis Ababa

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List of Acronyms

AACRA: Addis Ababa City Road Authority

ERA: Ethiopian Road Authority

GDP: Global Domestic Product

ISO: International Organization for Standardization

PMBOK: Project Management Body of Knowledge

PMI: Project Management Institute

RSDP: Road Sector Development Program

RII: Relative Importance Index

SPSS: Statistical package for the social science

GTPII: Growth and Transformation Plan II

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Abstract

Delays in road construction projects have detrimental effects on project performance, including time, cost, and quality. This research investigates the causes and impacts of delays within the Addis Ababa City Road Authority. A cross-sectional mixed method design was employed, combining quantitative and qualitative data collection methods. The study involved 44 participants representing clients, consultants, and contractors. Questionnaires and interviews were conducted to gather primary data, while secondary data from project progress reports and literature reviews were also utilized. The collected data were analysed using descriptive statistics and the Relative Importance Index (RII) to rank the causes and effects of delays. The study identified key causes of delay, such as slow approval of drawings, payment delays, inadequate planning, right-of-way issues, traffic congestion, material shortages, and poor site management. The effects of delay were assessed, including time and cost overruns. Recommendations were provided to mitigate delays, including expedited decision-making, timely payments, improved communication, enhanced coordination, and training. By implementing these recommendations, road construction projects can improve efficiency, reduce delays, and deliver high-quality infrastructure.

Keywords: *Delays, Causes, Time, Cost, Quality, Mixed methods, Road construction.*

CHAPTER ONE
INTRODUCTION

1.1. Background of The Study

Construction industry is an essential sector of every economy in the world because the outputs of the industry's activities to facilitate socio-economic growth and advancement of every economy (Ofori, n.d.; Singapore, 2012). Industries across the globe contribute significantly to the growth of economies, primarily by providing the essential infrastructure that supports the development of other sectors. The construction industry, for example, plays a crucial role in supplying the necessary physical structures for economic activities, such as road networks, social service infrastructure, government offices, railways, and factories for the production and distribution of goods and services. As a result, the construction industry enables national productivity, facilitates efficient distribution systems, and ensures the effective delivery of services.

When construction sectors are productive, they contribute to and sustain a country's economic growth, and therefore provide the financial resources to do everything else (Bailliu, n.d.). For landlocked countries, transportation facilities (road construction) to links to port countries are more important, since they often determine the cost and affordability of other infrastructure. The livelihoods of the people depend on the effectiveness of the construction industry (Chinn et al., 2020) .A flourishing construction industry in many countries over the world contributes significantly to the Gross Domestic Product (GDP) of those countries.

African Economic Outlook further explained the importance of road infrastructure in terms of its impact on the overall economic growth, agricultural growth, urban growth, urban poverty reduction, and rural poverty reduction.(Sewell et al., 2019), assert that roads contribute to economic growth and poverty reduction because without infrastructure, efficient markets, adequate health care, a diversified rural economy, and sustainable economic growth will remain elusive. Likewise, the road construction industry plays a crucial part in generating employment opportunities. In many developing nations, this sector serves as a significant source of employment, particularly for unskilled workers. Additionally, women have been found to benefit from employment opportunities within the industry. As a result, the sector holds the unique ability to directly contribute to the economic growth of countries.

According to the African Economic Outlook (Sewell et al., 2019), public construction projects in Ethiopia are parts of the country's development initiatives the construction sector also receives a significant portion of the limited financial resources of the country. Public investments, particularly in infrastructure, serve as the primary drivers of growth and development in the short and medium term. In Ethiopia, the contribution of the construction sector to the Gross Domestic Product (GDP) is substantial, accounting for 21.2%. The construction sector's contribution to the national economy is highly prioritized, largely due to the impactful performance of road construction projects. Well-constructed and safe roads, for example, play a crucial role in facilitating the timely and efficient transportation of goods from production areas to marketing centers or depots, thereby serving as the backbone of the country's economy (Sewell et al., 2019)

As Ethiopia's economy is based on agriculture, transportation allows farming communities to enter the economy and the world; Better connectivity between rural communities and essential services such as education, health, employment and trade is an important factor in the country's economic development, business and relations. For this reason, a construction project is often considered an important part of economic and social development because it provides the necessary connections to do business. More than 95% of cargo and passenger traffic in Ethiopia takes place on roads that are considered the backbone of the country. Since the start of the Project Development Program in 1997, the infrastructure has been significantly improved, with road length increasing 137% over the last 15 years. However, traffic demand is increasing.
In this context, the Ethiopian government has addressed the country's development plan "Growth and Transformation Plan II" (hereinafter referred to as GTPII), emphasizing the importance of good infrastructure and supporting institutions to maintain bloc rapid growth. To ensure the stability of the infrastructure structures, the government is developing relevant measures

Various performance indicators related to variables such as time, cost, quality, customer satisfaction, operational efficiency, health and safety can be used to measure and evaluate the effectiveness of the construction project compared to the planned work (Chan and Chan, 2004). According to their argument, the predominant dimensions for evaluating performance in construction projects are time, cost, and quality. These three factors are considered crucial in assessing the overall success and effectiveness of construction endeavors. (Lafhaj et al., 2016),

stated that the application of sound Project Management practices provides construction project stakeholders with the means to meet their objectives which is described in terms of meeting the intended, purpose, the level of quality, time, and cost.

Construction industry is full of projects that are completed with significant time and cost overruns (Subramani et al., 2014). Due to the uncertain nature of the construction environment, it is rare for projects to be completed within the budget. Several factors contribute to this situation, including the complexity of construction projects, the involvement of multiple stakeholders such as project owners, end users, consultants, contractors, financiers, materials, and equipment providers, as well as the availability of project funding. Additionally, environmental conditions, political environment, and statutory regulations also play a role in influencing project outcomes. The presence of these various interest groups and external factors creates challenges and uncertainties that often lead to cost overruns in construction projects.

Attempts s in identifying the causes of delay have been undertaken by different scholars. For example, (Tebeje and Zewdu, 2016), identified factors that causes delays in road construction projects; of these cash flow problems during construction, mismanagement by the contractor (financial, supplier support, sub-contractor), improper planning, slow decision making, late deliveries of materials and equipment were ranked the top five factors. For example, according to Baruah(2007),concluded that time delay problem will be followed by many problems, such as causing difficulties in cost overrun, overutilization of resources, distrust, and conflicts among projects stakeholders.

1.2 Statement of Problem

Managing uncertainty is indeed a significant challenge for project managers at all levels, and construction projects are particularly susceptible to uncertainties. These projects are characterized by constraints such as limited time, physical resources, and budget, making them more vulnerable to uncertainties that can arise throughout the project lifecycle. One common consequence of these uncertain events in construction projects is project delays. Unforeseen circumstances, such as weather conditions, unforeseen site conditions, changes in scope, or issues with suppliers or contractors, can all contribute to delays in project completion. Effectively managing and mitigating these uncertainties is crucial for project managers to minimize the impact of delays and ensure successful project delivery.

According to (Chin and Hamid (2015),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 delays are prevalent in many countries, especially in developing nations. They occur in almost every construction project, and the extent of these delays can vary significantly from one project to another. Some projects may only experience minor delays of a few days or weeks, while others can be significantly behind schedule, with delays spanning over a year or even longer. The factors contributing to these delays can be diverse and complex, including issues related to funding, resource availability, and project management, changes in scope, regulatory challenges, unforeseen events, and external factors beyond the control of the project team. Addressing and mitigating project delays requires careful planning, effective project management practices, proactive risk management, and collaboration among stakeholders to minimize their impact and ensure successful project completion (Asadi et al., 2015)

In recent research conducted in Ethiopia regarding construction problems, it has been found that contractors are primarily held responsible, particularly in cases of delays that are deemed unjustifiable. Contractors face significant pressure, even if the delay is justified. According to the feedback received from contractors, the top five factors identified as contributing to project delays are cash flow problems during construction, mismanagement by the contractors, improper planning, slow decision-making processes, and late delivery of materials and equipment. These factors have been identified as key challenges in the construction industry in Ethiopia, and addressing them is crucial for improving project performance and reducing delays (Tebeje and Zewdu, 2016).

In the present day, project delays have emerged as a significant obstacle to the progress of developing countries like Ethiopia. The effects of these delays can have a substantial impact on the efficiency and effectiveness of projects. In particular, delays in road construction projects are frequent and can have significant implications for economic growth. Such delays pose a common problem that affects the competitiveness and long-term sustainability of construction companies in the global market. It is imperative for the construction industry in Ethiopia to address and mitigate these delays to enhance competitiveness, ensure sustainable growth, and foster economic development.(Sewell et al., 2019), Construction projects are delayed because of several reasons.

Despite advancements in technology and the widespread adoption of project management practices, the issue of project delays remains unresolved even in the present day. Despite the availability of advanced tools and techniques, construction projects continue to face challenges that lead to delays (Durney and Donnelly, 2015). Delays and cost overruns are widely recognized as the most common problems in the construction industry, affecting projects in both developed and developing countries (Shah, 2016). Delays occur in every construction project and the magnitude of these delays varies significantly from project to project and country to country (Vaardini, 2016). Cost and time over runs are the key problems of any construction projects.

These issues are causing the negative impact on the development of country economic growth and prosperity (Shah, 2016). Several studies have been conducted to investigate the causes of delay in construction projects. This particular study aims to analyze the primary cause of delay and its impact, while also introducing additional factors that contribute to delays specifically in road construction projects. The research provides valuable insights for company management by offering information on methods to minimize construction delays. By identifying the key causes of delay and providing strategies for mitigation, the study contributes to improving project management practices and enhancing the efficiency of road construction projects.

1.3 Research Questions

This research will try to answer the following questions:

- What are the main causes of delays in road construction projects of Addis Ababa city?
- What are the effects of delay in road construction projects?
- How can delays in road construction be mitigated?

1.4 Objectives of the Study

1.4.1 General objectives

This study aims to explore the cause and effects of delay with their minimizing methodologies in the road construction projects in Addis Ababa city. The primary objective is to identify the influential factors responsible for road construction project delay in Addis Ababa city under the Addis Ababa City Road Authority's. As a result, conclusions are drawn based on the findings that are meaningful and workable.

1.4.2 Specific objectives

- To identify the causes those are currently creating delays in Addis Ababa City's Road development projects.
- To analyze the most significant negative effects of delay in road construction project.
- To identify methods of minimizing delay and suggest the best practice, mitigate excessive delay in road construction projects.

1.5 Significance of The Study

The study plays a significant part in determining the reasons behind and consequences of timetable delays in road construction projects. When there is a delay, these problems typically arise because the people involved are uninformed or unaware of the reasons why the delay occurred. The study's findings also valuable since suggest methods and mitigation strategies for AACRA management to use in taking corrective action and choosing wisely in order to aid the project's effective execution by removing the primary causes of delay. The study is significant to add researcher's theoretical and practical understanding of how to do research. Additionally, it may be helpful to those researchers who need a foundation for additional research in this field. Additionally, this study offers measures to mitigate or eliminate the impact of construction project delays, providing valuable information for future researchers interested in exploring similar or related cases. The findings of this study serve as a guideline for the relevant parties involved in construction projects, enabling them to identify and prevent potential sources of delays. By adhering to the guidelines outlined in this study, stakeholders can effectively carry out construction works within the agreed-upon time, budget, and quality as stipulated in the contract. This contributes to improved project performance and successful project delivery.

1.6 Scope of The Study

1.6.1. Conceptual scope

The study aims to investigate the factors contributing to delays in the road development projects of the Addis Ababa City Road Authority. It is focus on examining the reasons and implications of timetable delays from several angles. Additionally, based on an analysis of the current situation, the research provides functional and procedural suggestions for changes to the project's implementation.

1.6.2. Geographic scope

The study conducted in Addis Ababa, Ethiopia focus on the road development projects implemented by the Addis Ababa City Road Authority.

1.6.3. Methodological scope

The study uses a mixed-methods approach that combines both qualitative and quantitative research methods. The qualitative method involves interviews with key stakeholders such as the client/owner, consultant, contractors, and personnel involved in the road construction projects. The quantitative method analyzing the data collected through a survey of stakeholders involved in the projects.

1.6.4. Time scope

The study focuses on road development projects implemented by the Addis Ababa City Road Authority between 2016 and 2023. It investigated the reasons for delays in these projects during this period and the implications of these delays on the projects' outcomes.

1.7. Operational Definition of Terms

Project Delay - A period by which the project is late or postponed.
http://www.taskmanagementguide.com/glossary/what-is-project-delay.php

Effects of delay - The consequence follows naturally or logically from its causal factors.
http://www.taskmanagementguide.com/glossary/what-is-project-delay.php

Mitigation measure - lessening the intensity, seriousness, or discomfort of a project delay
https://www.pmi.org/learning/library/delayed-projects-schedule-strategy-10148

Road construction - The process of adding structure to real property or construction of buildings
https://blog.masterofproject.com/project-schedule-delays/

Cause of Delay – the act of delaying, obstructing, or making sure the project is late or not finished by the deadline.
https://blog.masterofproject.com/project-schedule-delays/

1.8 Organization of The Study

The first chapter of this thesis provides background information on the study, a statement of the problem, the study's aims, its scope, and its limits, while the second chapter examines the

literature review in relation to the themes. The research techniques including methods for data collecting and analysis, study approach, and study design discussed in the third chapter. The research findings analyzed in the fourth chapter, and conclusions and suggestions made in the fifth chapter. All the reference sources consulted for the study is cited in the final chapter.

1.9 Limitation of The Study

The study has several limitations that should be acknowledged. Firstly, the sample size was relatively small, consisting of only 44 respondents representing clients, contractors, and consultants involved in road construction projects within the Addis Ababa City Road Authority. While efforts were made to ensure diversity within the sample, the findings may not be fully representative of the entire population. Additionally, the focus on road construction projects within Addis Ababa limits the generalize ability of the findings to other contexts or regions. Different factors and circumstances may influence delays in road construction projects in other areas. Secondly, the data collected through questionnaires and interviews relied on self-reporting by the respondents, introducing the possibility of response bias or inaccurate reporting. The subjective nature of the rankings using the Relative Importance Index (RII) also adds a level of subjectivity to the findings, as individual perspectives may differ. Furthermore, the study was conducted within a limited timeframe and with constrained resources. This may have impacted the depth and breadth of data collection, as well as the ability to explore additional variables or factors that could influence delays in road construction projects.

The study primarily focused on internal factors within the Addis Ababa City Road Authority and did not extensively consider external factors such as government regulations, socio-political factors, or environmental conditions that could contribute to project delays. The reliance on secondary data sources, such as project progress reports and documents, may introduce variations in the reliability and accuracy of the information obtained. Moreover, the study was conducted in the specific context of Addis Ababa, Ethiopia, which has its unique language and cultural characteristics. The findings may be influenced by these factors and may not fully align with other cultural contexts. Despite these limitations, the study provides valuable insights into the causes and effects of delays in road construction projects. It serves as a foundation for further research and highlights areas that require attention in order to mitigate delays and improve project performance.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1. Review of Theoretical Literature

2.1.1 Introduction

In this chapter, a comprehensive review of the literature is provided, encompassing theoretical, empirical, and conceptual frameworks related to the identification and analysis of causes and effects of delays in road construction projects. The focus is on the perspectives of contractors, owners, and consultants. The literature review includes an examination of methodologies used to identify and rank critical delay factors in the context of the Addis Ababa City Road Authority.

The causes of delays attributed to contractors, clients, and consultants are thoroughly discussed and presented in this section. By examining existing literature, the study recognizes the overall socio-economic significance of road construction projects, which serves as a primary motivation for undertaking this research. The review of current knowledge on the topic and the formulation of research problems are vital steps in establishing a strong foundation for the study. These steps ensure that the research addresses key gaps in the existing literature and contributes meaningfully to the understanding and resolution of delay issues in road construction projects.

2.1.2 Project

According to the Project Management Body of Knowledge (PMBOK), a project is a temporary attempt to produce a particular product, service, or result. The temporary nature of the project indicates that the project has a beginning and an end. End is when the project is terminated because the project's goal is met or not met, or when the project requirements are no longer available. Projects can also have greater social, economic and environmental impacts than the project itself (PMBOK 5th edition). The International Project Management Association (IPMA) defines a project as a time and cost related activity to achieve a set of outputs that meet quality standards and needs. On the other hand, the Association of Project Managers (APM) defines a project as a discrete, short-term activity that is completed to achieve a desired result.

According to Ramesh et al., (2018), definition 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 (Maciej Serda et al., 2013)is a sequence of finite dependent activities whose successful completion results in the delivery of the expected business value that validated doing the project. (Atkinson et al., 2006)also defines a project as a temporary endeavor undertaken to achieve a particular aim. A project is actually the response to a need, the solution to a problem.

2.1.3 Project management

Project management is the application of knowledge, skills, tools and techniques to activities to meet requirements (Atkinson et al., 2006). Applying this knowledge requires good management of the project management process. Businesses often use project management to achieve specific results with limited resources in a critical time frame. Therefore, project management requires a specific management process necessary to plan, organize and manage projects with many challenges in an important area of responsibility (Harrison and Lock (2017).

In general, project management covers resources, cost, time, quality, etc. It is defined as the management of resources throughout the life of the project with various tools and methods to control and the deal is even broader when working in construction. It often includes general constraints that must be considered specifically for design, construction, and construction projects, and may relate to a variety of disciplines over the life of the project, such as architecture, engineering, and other disciplines. PMBOK also identifies 47 project management techniques, grouped in ten specific knowledge areas. These are:

1. Project Integration Management - Integrated management includes processes and activities to define, identify, coordinate, coordinate and coordinate the various processes in the process management team and project management. In the context of project management, integration includes aspects of coordination, coordination, communication, and joint operations that are critical to project management success, successful management of stakeholder expectations, and meeting requirements.

2. Project Scope Management - A project management plan is a document that describes how the project will be defined and analyzed and performance standards developed and verified. In the project management plan or part of the project management sub plan. The project scope includes the features and functions that define the product, service, or result, and includes the feature and function work and the tasks that must be done to deliver the product. To determine

the project is to determine the limits of the specifications of the works to be done and the products to be made.

3. Project Time Management - Time management includes the processes necessary to manage tasks to be completed on time (Atkinson et al., 2006)it includes both a planning and a control component. The planning process provides an estimate of the duration of the project (that is, how long it will take to complete) and the effort or time required to complete the project. Duration is used to estimate the total time required to complete a project. Working hours are used to estimate the total cost of the project. The Control component is part of the Monitoring and Control process, which includes comparing time estimates to real time and managing time and cost variances (Atkinson et al., 2006).

4. Project Cost Management - Effective cost management includes processes related to planning, forecasting, budgeting, budgeting, management and cost control so that projects can be done at approved resources. According to PMBOK guidelines, it includes cost management; default prices; budget decisions; and control costs. However, cost management is often associated with the cost of resources required to complete a project. It is also necessary to consider the impact of the decision on the cost of using the project products.

5. Project Quality Management - Effective project management includes the processes and activities of an effective organization that creates effective policies, goals and responsibilities to meet needs when implemented. Quality control can be one of the most common experiences for managers and teams. A good management system consists of the following three processes:

- Quality planning process
- Quality assurance process
- Quality control process

6. Project Human Resource Management - Project human resource management defines all the steps that must be taken to ensure the effective use of all people involved in the project. The human resource management process includes the process of organizing, managing and teamwork. Workgroups include planning people management, hiring workgroups, forming workgroups, and managing workgroups.

7. Project Communications Management - Communications management includes the procedures necessary to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and delivery of project information. The communication process is not always easy because project managers can find communication barriers such as a lack of clear communication throughout the team world and environmental issues. It is the administrator's responsibility to know what kind of message to send, to whom it will be sent, and to translate the message into a language everyone can understand.

8. Project Risk Management - Risk management includes processes related to risk management, identification, analysis, response, control and monitoring activities. Risk management is the formal process of identifying, measuring and disclosing potential risks. Risk management should be seen as planning ahead for possible events.

9. Project Procurement Management - Procurement Management includes the process required to purchase or obtain desired goods, services or benefits from outside groups. Organizations can be buyers or sellers of products, services or project results. According to the management organization, procurement management planning, procurement management, procurement management and procurement closure are the main processes of project management.

10. Project Stakeholder Management – Stakeholders are individuals, groups or organizations affected by the results of a business or project. Project stakeholder management includes stakeholder identification, planning, management and control. As the name suggests, project stakeholders are concerned with the success of the project and can be from inside or outside the organization that initiated the project. The seven contributors include: Sponsor, Client, Client, Business Process, Service Manager, Project Manager, and Business Analyst.

2.1.4 Construction project

A construction project is an activity related to the construction, modification, alteration, equipping, commissioning, renovation, repair and maintenance, renovation, demolition, decommissioning or demolition of a structure. Construction means any project paid by the Council for the construction, replacement or reconstruction of a public works, buildings, public works, roads, parking lots, bridges, garages and not fully or partially funded by federal or state

funds or parks, or any portion thereof, belonging to the city within its present or future present boundaries.

2.1.4.1. type of construction

The different types of construction projects can be categorized based on the type of facility being constructed. These categories include residential buildings (such as single and multi-family homes), commercial buildings (including offices or warehouses), industrial facilities (such as factories or large-scale production facilities), and infrastructure projects (such as roads, bridges, airports, or wastewater systems).

2.1.4.2. participants of construction project

In the construction industry, various participants play crucial roles in different types of projects. These participants are essential for the successful completion of construction projects. The common participants in the construction industry include:

1. **Client:** The client is the party responsible for funding the project. They may also supply materials and equipment and ultimately become the owner of the project upon completion.
2. **Contractor:** The contractor is responsible for executing the actual construction work. Depending on the contract type, the contractor may be responsible for providing materials, equipment, and labor necessary for project completion, or some of these resources.
3. **Consultant:** The consultant acts on behalf of the owner and provides control and support during project execution. They ensure that the contractor is meeting the predefined quality, time, and method requirements. Consultants also serve as mediators in case of disputes between the contractor and the client.
4. **Designer:** The designer is responsible for transforming the owner's ideas into a tangible project. They create the blueprint or design that encompasses the architectural, structural, sanitary, and electrical aspects of the project.

These participants collectively contribute to the successful implementation of construction projects, each playing a distinct role in different stages of the project lifecycle.

2.1.5 Construction project management

Project management involves managing and organizing every stage of the project lifecycle, from design to execution. It is a holistic approach with the goal of delivering projects on time and within budget. Project management is a complex discipline that requires addressing many

important issues, including cost control, scheduling, purchasing, and risk assessment. Project managers deal with all construction-related groups, from architects to owners and contractors.

Construction project management includes members ranging from financial planners and senior managers to contractors, engineers, field workers and more. But none is as important as the project management process. The project manager role can be filled by the contractor, the owner working on the building, or even the construction manager.

The goal of the project manager is to ensure that the entire construction process works as planned. They are responsible for maintaining tight deadlines, staying within budget, allocating resources, avoiding intrusions, and being efficient. They assess risks and inform stakeholders in a timely manner. By centralizing information and facilitating communication, project managers can achieve process efficiencies that would otherwise be impossible.

2.2. Empirical Review

2.2.1 Project delays

In construction, the word "delay'' refers to something happening at a later time than planned, expected, specified in a contract or beyond the date that the parties agreed upon for the delivery of a project (Pickavance, 2005). Lo, Fung and Tung (2006) define delay as the slowing down of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project. It is also a project slipping over its planned schedule and was considered as common problem in construction projects. For owners, delays mean loss of revenue due to lack of production facilities and rental space or reliance on existing facilities.

In some cases, delays for contractors mean more expenses due to longer hours, more materials due to inflation, and increased labor costs. Timely completion of work is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors from different sources. These resources include the effectiveness of the parties, the availability of capital, the environment, the cooperation of other parties, and the contract. It is rare for the project to be completed in the allotted time. The construction industry is large and unstable, requiring a large investment. Even with today's technology and managers' understanding of

project management processes, construction projects will experience delays and project deadlines will continue to be pushed back.

2.2.2 Cause of delay

The study by Fugar and Agyakwah-baah (2003) found that delays can be divided into two groups: internal and external causes. External causes of delay in construction projects arise from circumstances beyond the control of the contractual parties involved. On the other hand, internal causes are directly attributed to the actions or inactions of the contractor, client, and consultant. Examples of external causes include events considered as acts of God, such as natural disasters or extreme weather conditions. Governmental actions, such as changes in regulations or permits, can also contribute to project delays.

Additionally, delays may occur due to issues related to material providers, such as delays in the delivery of necessary construction materials. In contrast, internal causes encompass factors that can be attributed to the contractor, client, or consultant, such as poor project management, inadequate planning, or ineffective decision-making. The consideration of delays is widely recognized as crucial in ensuring the successful and efficient completion of construction projects in terms of timeliness, cost-effectiveness, and quality. To achieve these objectives, it is necessary to employ excellent ideas, best practices, and prudent decision-making throughout the project lifecycle.

Among the various challenges faced in road construction projects, delays are particularly prevalent and costly. Addressing and mitigating delays effectively is essential to minimize the negative impact they can have on project timelines and budgets. By proactively managing and addressing delays, construction projects can increase the likelihood of successful outcomes and the delivery of high-quality results. Construction delays have a substantial impact on the overall construction lifecycle of a project. Despite advancements in technology and the increased adoption of project management practices, construction projects still face challenges in meeting their completion deadlines.

Delays can arise due to various factors such as unforeseen circumstances, design changes, labor shortages, weather conditions, or logistical issues. These delays not only disrupt project schedules but also affect project costs, stakeholder satisfaction, and the overall success of the project. Despite efforts to minimize and manage delays, their occurrence remains a persistent

issue in the construction industry. This highlights the ongoing need for effective strategies and proactive measures to address and mitigate construction delays, ensuring smoother project execution and improved project outcomes Fashina et al. (2021). The main causes of delays include strikes, rework and lack of organization, equipment shortages, machine breakdowns and relocations.

Delays are costly for all parties in the construction industry and often result in litigation. The time and cost associated with building the application itself is enormous. The current practice of tracking timelines leaves room for improvement. Therefore, it will be important to introduce flexible and more accurate lag analysis methods. According to AlSehaimi et al. (2012), another cluster of problems leading to delays covers Labour shortage, problems in material supply, and financial difficulties, all related to the immaturity of the economy, financial institutions, and the labor market in a developing country. These are external factors that have to be taken as given in a project.

Causes of Delay of Construction Projects in Ethiopia

Delay in construction is a common problem in Ethiopian construction projects and will occur at all types and stages of construction. The construction industry in Ethiopia is booming and the road network is being added from time to time across the country. However, project completion date records show that none were completed on time and within estimated cost. According to Gebrehiwet and Luo (2017), Construction delays are occurring in every phase of a construction project and are common problems in construction projects in Ethiopia, and this is the major causes of project failure. Many studies have been conducted on the main causes of delays in various construction projects. (Ababa and Mustefa, 2015)in his study “Factors affecting time and cost overrun in road construction projects in Addis Ababa’’ identified the most important causes of time overrun as: right of way problem, financial problems and improper planning and according to his survey result, project time overrun ranges from 25% to 264.38% of its original contract amount. Negesa (2022), In his study, which examined the factors causing delay in road construction in Addis Ababa, Ethiopia, he concluded that delay, inflation, delayed payment terms of owners, financial problems of contractors, wrong estimates and delays in starting work were the main causes. Reasons for delay in urban construction in Addis Ababa Ababa and Mustefa (2015), In their study titled "Investigating Causes of Construction Delay in Ethiopian

Construction Industries," the researchers examined the factors contributing to construction delays and ranked them in order of importance.

According to their findings, the most significant factors leading to delays were related to the contractor. Issues such as inadequate project management, poor coordination, and insufficient resources on the part of the contractor were identified as major contributors to project delays. Material-related factors were ranked second in importance, encompassing delays in the delivery of construction materials, shortages, or poor quality of materials. Labor-related factors, including labor shortages or inefficiencies, ranked third. The study also highlighted the role of designer-related factors, such as design errors or changes, as well as the impact of consultants/supervisors, client-related factors, and external factors.

However, these factors were ranked lower in terms of their overall importance in causing construction delays compared to the contractor, material, and labor-related factors. These findings provide valuable insights into the key areas that need attention and improvement to mitigate construction delays in the Ethiopian construction industry.(Bekele and Bekalu, 2018) In their study titled "Analysis of Delay Impact on Construction Project based on RII and Correlation Coefficient," the researchers found that delays in construction projects can be categorized into external, responsibility, resource, and contract-related factors. These factors were found to have varying levels of influence on project delays across different stages of the project. The study utilized the average relative importance index (RII) and correlation coefficient to analyze the impact of these factors. The findings provide valuable insights for project stakeholders in understanding the major causes of delay and improving project management to mitigate delays in construction projects.

2.2.3. Type of delay

In recent years, many researchers have investigated the causes of construction delays and identified some factors that are the main cause of delays. Many were interested in the effects of the delay, but few discussed the reasons for the delay. Below is some previous research on the causes and effects of procrastination. The study by (Hamzah et al. (2011)also classified delay as Excusable and Non-excusable. A non-excusable delay is a delay caused by contractor or suppliers, through no fault by the owner. Accordingly, the contractor is generally not entitled to relief and must either make up the lost time through acceleration or compensate the owner. As a result, the Contractor typically does not receive any further compensation or extension of time

due to non-excusable delays. Contrarily, excused delays are split into two categories: compensated and non-compensated delays. Compensable delays in a construction project are typically attributed to the owner or their representatives.

These delays are considered to be the responsibility of the owner, and they may result in compensation to the contractor. On the other hand, non-compensable delays are caused by factors or parties beyond the control of both the owner and the contractor. These delays are often referred to as "acts of God" because no one can be held accountable for them. In such cases, the parties involved are not held liable for the delay, as it is caused by unforeseeable and uncontrollable events. Concurrent delay arises when two or more delays occur simultaneously or partially overlap in a construction project. It occurs when both the owner and the contractor contribute to the project delay during an excusable but non-compensable event, such as adverse weather conditions. Concurrent delays happen when both parties share responsibility for the delay, resulting in an impact on the project timeline.

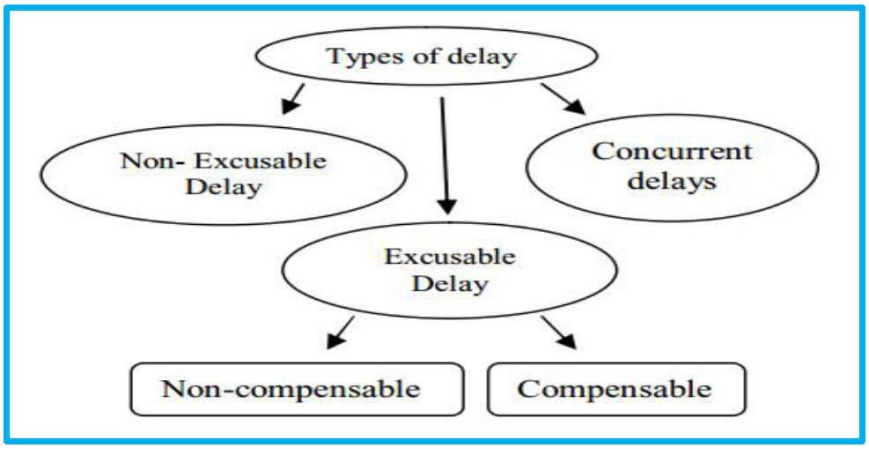

Figure: 2.1 Types of delays

2.2.4 Delay Factor

In the literature reviews conducted, the researcher has identified and selected 70 independent variables to be used as the basis of the questionnaire for the present study. These variables have been categorized into client, contractor, and consultant related factors. While there are other external variables that can also affect project completion time, such as government policies, environmental factors, politics, and social and economic factors, they have not been included in this study due to time limitations. However, it is acknowledged that these external factors can

have a direct or indirect impact on project performance and completion time. For the purpose of this study, the focus will be on the internal factors related to clients, contractors, and consultants.

Table 2.1: Causes of delays in road construction projects (Khair et al., 2016)

Causes of delays	
Contractor-Related Delay Factors	1. Insufficient planning and scheduling by the contractor. 2. The contractor has no discretion. 3. Contractor's slowness in site mobilization. 4. Contractor's slowness in preparation of documents 5. Contractor's poor site management & supervision. 6. Conflicts with sub-contractor. 7. Reworking of construction faced by contractor. 8. Contractor incompatibility with new technology? 9. Inexperience of contractor with new software. 10. Poor managerial skills of contractor. 11. Inadequate handling of project progress by contractor. 12. Lack of risk analysis & management by contractor. 13. Communication barriers faced by consultant.
Consultant-Related Delay Factors	1. Slowness in approving drawing by the consultant. 2. Inadequate authority given to consultant to take decision. 3. Mistakes in consultant's drawings. 4. Consultant's inexperience ability of leadership. 5. Financial difficulties affecting the consultant. 6. Lack of practical (working) knowledge by the consultant. 7. Lack of co-ordination of consultant with contractor. 8. Conflicts of consultant with design engineer changes in specification during construction by consultant. 9. Inadequate site information given to consultant. 10. Delay in handover of site to contractor. 11. Conflicts between consultant & contractor. 12. Complexity of project design faced by consultant.

	13. Communication barriers faced by consultant.
Owner/Client-Related Delay Factors	1. Late revising & approving of relevant documents by owner 2. Contract changes by owner during construction 3. Delays in payments for completed work by owner. 4. Lack of communication & co-ordination by owner. 5. Conflicts between owners in a joint ownership. 6. Suspension of work due to owner. 7. Misunderstandings in technical dealing with vendors and contractors.
Material-Related Delay Factors	1. Shortage of material and Changes in quality of material. 2. Unexpected modifications in specification of material during construction. 3. Slow process of material selection. 4. Poor material management and material damage in storage. 5. Escalation of material prices. 6. Lateness in finalizing finishing material due to availability of market. 7. Insufficient turnover & start-up resources makes project slow. 8. Materials not in right place when needed. 9. Untimely delivery of Labour
Labour & Equipment-Related Delay Factors	1. Poor Labour supply & Labour productivity. 2. Disputes in Labour & Labour strikes. 3. Unavailability of equipment and delay in equipment delivery. 4. Shortage of recent technology equipment. 5. Large or long lead-time equipment not received as requested. 6. No use of checklist. 7. Unavailability of equipment lists & related design data. 8. Shortage of operators. 9. Space limitations at site for temporary & permanent equipment. 10. Lack of safety effective inspection & expediting visits project
Project-Related	1. Traffic control at site. 2. Changes in site conditions & unforeseen ground conditions. 3. Insufficient data collections & survey.

Delay Factors	4. Changes in site topography after design. 5. Right of way issues. 6. Accidents on site & unavailability of utilities in site area. 7. Problems due to existing structures and rework due to construction error.
External-Related Delay Factors	1. Inclement weather effects. 2. Inaccurate cost estimates. 3. Restriction due to site location. 4. Changes in government regulation & laws

Source: *Result of a conducted survey by Researcher (2023)*

2.2.5. Delay mitigation methods

The timely completion of a project is crucial for both the employer and the contractor. As a result, it is essential for contracting parties to thoroughly analyze project delays in order to make informed decisions regarding potential time and cost compensation claims. However, despite the availability of various delay analysis techniques aimed at aiding this decision-making process, the occurrence of disputes related to project delays has remained high. Braimah (2013) suggests that although these existing techniques have been helpful to some extent, they have not been entirely successful in resolving the persistent issue of disputes arising from project delays. The delays in road construction projects, however, have other repercussions that some studies have found. For instance, Mary' and Abera, (2022) listed several consequences of delays, including cost and time overruns, compromised quality, arbitration, conflicts, litigation, low profit margin or financial loss, contract cancellation, and complete abandonment of the project. All of these delays severely harm both the client and the construction company.

Al-Khalil and Al-Ghafly (1999) looked at the connection between project circumstances, job scope, and timetable in the context of road construction. They noticed that any modifications to any of these three items could impact the amount of compensation and the turnaround time. It has been suggested that raising knowledge of the reasons behind project schedule delays, how frequently they occur, and how much they negatively impact project delivery is vital. According to Kaliba et al. (2009), construction project delays are a common occurrence, particularly in road construction projects, and their effects vary depending on the party involved. Nevertheless, it is widely recognized that delays in projects often lead to significant losses in terms of resources, including financial costs, time, and productivity. Numerous articles and studies have been

conducted to examine the effects of project delays on project delivery, both on a local and international scale. These studies have contributed valuable insights into understanding the impact and consequences of delays in project management.

A survey conducted by (Kuşakcı, Ayvaz, and Bejtagic, 2017) studied analysis of cause and effects of delay in a construction project in the Libyan Oil Industry and found that cost overrun, time overrun, disputes, total abandonment, and arbitration as the main effects of delays. Similarly (Charles Teye Amoatey, Yaa Asabea Ameyaw, 2015) Experts involved in state housing construction projects in Ghana have highlighted the significant effects of project delays, including cost overruns, time overruns, litigation, lack of continuity by the client, and arbitration related to delay claims resolutions. These effects underscore the importance of gaining a comprehensive understanding of the techniques and strategies associated with addressing delays in order to effectively tackle the underlying issues and identify areas for improvement. The study by (Alsehaimi, 2006) Argued that the utility of further traditional studies on delay is limited.

As a result, it is imperative for the construction industry to embrace innovative management approaches like lean construction to reduce waste, enhance productivity, foster team collaboration, and optimize the learning process. By doing so, the causes of delays can be minimized. Similarly, a study conducted by Shah (2016) affirms that delay factors and cost overruns vary across countries, and specific measures need to be implemented based on the nature of these factors to mitigate the impact on project delays and cost overruns within the construction industry.

2.3 Literature Overview and Research Gap

Road construction projects are essential for the development and connectivity of cities and countries. However, these projects often face significant challenges, such as time and cost overruns, which can lead to negative impacts on transportation networks, budgets, and overall project success. Understanding the factors that contribute to these delays and implementing effective mitigation measures is crucial for improving project outcomes.

Several studies have been conducted in different regions to examine the causes of delays in road construction projects and propose mitigation strategies. The studies conducted in Addis Ababa, Ethiopia, have identified inadequate planning, inaccurate cost estimation, poor project management, delays in material supply, and changes in project scope as major contributors to

time and cost overruns. To address these issues, researchers have recommended improving project planning and scheduling, enhancing project management practices, conducting accurate cost estimation, ensuring timely material supply, and establishing effective change management processes.

A study conducted in Sudan focused on road construction projects and identified several causes of delays, including inadequate planning and scheduling, delayed decision-making, poor coordination among stakeholders, inadequate project monitoring, and financial constraints. To address these issues, the researchers proposed several mitigation strategies. These included enhancing project planning and scheduling practices, expediting decision-making processes, improving coordination and communication among stakeholders, implementing effective project monitoring systems, and ensuring sufficient project financing. These measures aim to improve the efficiency and timeliness of road construction projects in Sudan (Khair et al., 2016).

Similarly, a study conducted in Pakistan highlighted inefficient planning and scheduling, inadequate project monitoring and control, delays in obtaining permits and approvals, poor contractor performance, and inadequate funding as significant causes of delays in road construction projects. The researchers recommended improving planning and scheduling practices, enhancing project monitoring and control mechanisms, expediting permit and approval processes, ensuring contractor accountability and performance evaluation, and securing sufficient project funding as potential mitigation measures.

Studies conducted in Nigeria and Ghana also identified common causes of delays in road construction projects, including poor project planning and management, delays in material procurement, inadequate contractor capabilities, land acquisition challenges, and funding constraints. The proposed mitigation measures included enhancing project planning and management practices, streamlining material procurement procedures, assessing and improving contractor capabilities, expediting land acquisition processes, and securing adequate project funding.

2.4 Conceptual Frame Work

In relation to the literature review, the conceptual framework has underlined a number of factors that determine the rate of project execution at which the projects are completed. It outlined

variables in road construction projects that is affected by the variable's interaction. The variable in this case is the delay of road construction projects implementation in the road construction sector and the subsequent outcomes of delays. These are

- **Independent variables:**
  - ✓ Contractor-Related Delay Factors
  - ✓ Consultant-Related Delay Factors
  - ✓ Owner/Client-Related Delay Factors
  - ✓ Material-Related Delay Factors
  - ✓ Labor & Equipment-Related Delay Factors
  - ✓ Project-Related Delay Factors
  - ✓ External-Related Delay Factors
- **Dependent variables:**
  - ✓ Time overruns
  - ✓ Cost overruns
  - ✓ Low quality
  - ✓ Claims. Or Client Dissatisfaction

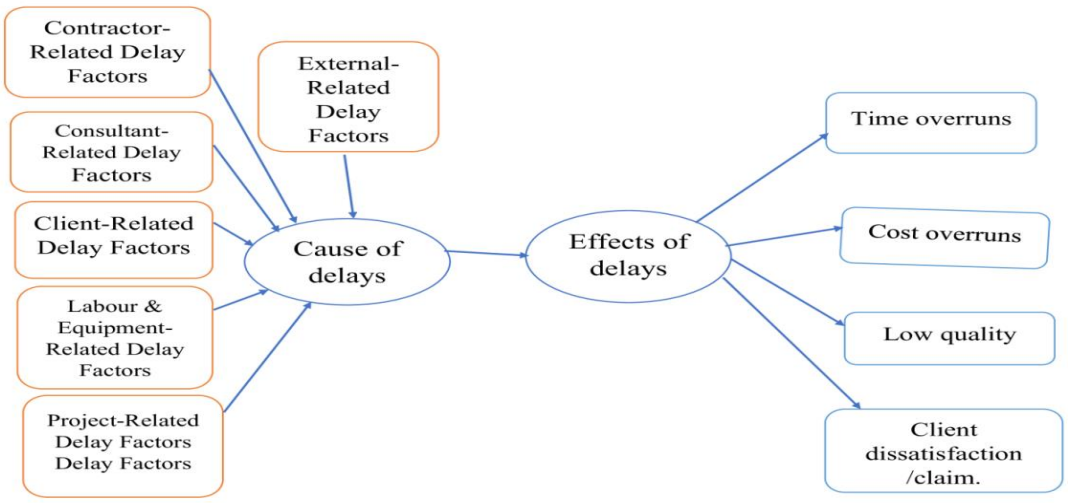

Figure: 2.2 Conceptual frame work of the study

Source: *Result of a conducted survey by Researcher (2023)*

CHAPTER THREE
RESEARCH METHODOLOGY

3.1. Introduction

This chapter focuses on the procedures and methodology used to choose the manner in which information and data from the research population are collected using field sources. The purpose of this study is to pinpoint the typical reasons behind delays in road construction projects from the viewpoints of the owner, contractor, and consultant. The purpose of the study, a description of the study population, the study sample, the methodology, the setting, and the statistical techniques utilized in the study are all covered in this chapter.

3.2. Research Method

A cross-sectional mixed method design was employed to answer the objectives of this study. The design converges or merges quantitative and qualitative data to provide a comprehensive analysis of the research problem (Creswel, 2014; Creswell J. and Creswell D., 2018). In this design, as found from the same sources, both the qualitative and quantitative data were collected concurrently and then the information integrates into the interpretation of the overall result. Moreover, the quantitative and qualitative data were collected concurrently through a community based cross-sectional survey and in-depth interview methods respectively. As Creswell & Clark, (2018) recommended that in using a mixed-method research design it's primarily essential to define the term by itself.

Therefore, mixed-method research is defined as a form of a research approach that entails collecting and integrating both quantitative and qualitative and using descriptive research design that utilizes quantitative measures of attitudes or opinions of participants has been chosen.The major premises behind adopting the design in this study is an understanding that mixing quantitative and qualitative components provides a more complete understanding of the gender-differentiated household food (*in*)security situation than that either of the components alone. In this study, the main purpose of adopting a mixed method design is to triangulate, develop, and complement qualitative and quantitative data components. Therefore, a quantitative survey data on road project delays in Addis Ababa were describe and validate the extent to which the factors

identified through a comprehensive literature analysis contribute to the delays in the road construction projects in Addis Ababa City Road Authority.

3.3. Types and Sources of Data

The study used primary and secondary data sources to paint a complete picture of road construction project delays in terms of the key contributing variables. Primary sources are obtained through survey questionnaires and interviews, while secondary sources are examined by looking at various project progress reports and other relevant papers. Both secondary and main data will be present in the data. Information from a literature analysis on construction project delays will be used as the secondary data in this study. The purpose of literature reviews was to improve comprehension of the theory behind the research problem. Books, articles, the internet, journals, documents, and other people's research papers are some examples of the sources for literature reviews. The researcher will able to collect qualitative (ordinal) data by administering the Five Point Likert's Scale questionnaire to several workers at a sample project. The information, which is pertinent, will be compared to primary data gathered to support the research as a benchmark. Additionally, an interview will be used to gather extra qualitative data.

3.4. Target Population

The primary participants(population) in this study will be the organizations involved in road construction projects in the city of Addis Ababa, including clients, contractors, and consultants (Addis Ababa City Road Authority).

3.5. Sampling Techniques and Sample Size

3.5.1 Sampling Techniques

Due to time and budget constraints, it is not possible to conduct a direct survey of the entire population (all contractors, consultants and clients) involved in urban development. Therefore, this work is limited to the contractors, consultants and clients involved in the Addis Ababa project only. Purposive sampling is used to select items from the population to be analyzed for this study. For this it is important to include all construction projects in the city of Addis Ababa.

According to the information provided by the contract administration office of the Addis Ababa City Road Authority (AACRA), there are a total of 64 road construction projects that have been awarded to contractors. However, in order to ensure a more concrete and realistic conclusion, it

has been decided to focus on projects that have made significant progress. Therefore, the sample will be limited to projects that have completed more than 50% of the total contract amount. Based on this criterion, the sample size for the study will be reduced to 22 projects. By including projects that have reached this level of completion, the study can provide more meaningful insights into the causes and effects of delays in road construction projects in Addis Ababa.

3.5.2 Sample size

The sample size plays a crucial role in ensuring the accuracy and reliability of a study's conclusions. In this particular study, the involvement of three different parties - the contractor, client, and consultant - in each project necessitates the selection of respondents from each party. To achieve this, a total of 44 samples have been chosen from all parties involved in the selected projects, with an allocation to each party as follows:

Table 3.1: Sample selections

Party Description	No of sample taken from each project	No of projects in consideration	No sample from each party
Contractor	6	4	28
Consultant	2	5	10
Client	1	6	6
The Total No of Samples			44

Source: *Result of a conducted survey by Researcher (2023)*

The targeted respondents for this study include counterparties and follow-up teams from the Addis Ababa City Road Authority, as well as project managers, site engineers, surveyors, material engineers, and resident engineers from both contractors and consultants. These individuals have been selected due to their technical expertise and analytical skills, which are necessary for effectively answering the questionnaire designed for this study.

3.6. Data Collection Tool

The primary data for this study were collected from the main parties involved in the road construction under AACRA project, namely clients, contractors, and consultants. This was done through the use of questionnaires, where participants provided their responses and insights.

Additionally, a document review approach was employed to gather secondary data from various sources such as project completion reports, books, journals, reports, and contract documents. This combination of primary and secondary data sources allowed for a comprehensive analysis of the causes and effects of delays in the road construction project.

Table 3.2: Primary and secondary data of the study

Study area	**Primary data**	**Secondary data**	**Location**	**Remark**
In Selected Project under AACRA involved Client, consultants and contractors	- Interviews - Questionnaires - Observation	Documents (including Contract document, Bill of Quantity, Drawings, Construction schedule, Number of projects.) Reports etc.	Addis Ababa	

Source: *Result of a conducted survey by Researcher (2023)*

The study involved the preparation and distribution of questionnaires to the selected samples of involved parties, including contractors, owners, and consultants. These questionnaires designed to gather information and insights on the factors that contribute to the delays in the completion of road construction projects. By collecting data directly from the parties involved, the study aims to gain a comprehensive understanding of the various factors that impact project delays.

A structured questionnaire was developed for the purpose of assessing the perceptions of clients, consultants, and contractors regarding the causes and effects of delays in road construction projects. The questionnaire included a combination of open-ended and close-ended questions to gather comprehensive information. In order to ensure inclusiveness, respondents were given the opportunity to include and rate variables that may have been overlooked by the researcher, specifically related to the Addis Ababa City Road Authority. The variables included in the questionnaire were derived from the studies mentioned in the literature review and were designed to align with the objectives of the study, aiming to identify the primary causes of road construction project delays and their associated effects.

The researcher conducted a pilot study with a group of contractors, clients, and consultants to assess the validity and reliability of the questionnaire. These individuals were part of the overall study sample to ensure that the results were not biased. The pilot sample included 8 respondents,

which represented 10% of the total study sample size, in line with the study's proportions. The participants were given sufficient time to review and provide feedback on the questionnaires. The feedback received from the pilot study was carefully noted and used to make necessary modifications and adjustments to the questionnaires.

- The questionnaires should contain general information about the respondents
- Some questions needed to be modified including more details
- Use simple words to ease understanding of the questions

The study focuses on 34 factors that are known to contribute to delays in road construction projects. These factors were selected based on their relative importance as identified in previous studies conducted in Ethiopia and other developing countries. To collect data on these factors, the respondents were asked to rank them using a five-point Likert scale. The scale ranged from "5=strongly agree" to "1=strongly disagree." The respondents were instructed to indicate the extent to which they believed each factor could contribute to delays in road construction projects. The questionnaires used in the study were divided into three sections. The first section gathered general background information about the respondents, such as their role in the construction project and their experience in the industry. The second section focused on identifying the causes of delay in road construction projects. Respondents were asked to provide their insights and opinions on the factors that contribute to project delays. The final section of the questionnaire concentrated on the effects of delay on construction projects. Respondents were asked to evaluate and share their perceptions of the impacts and consequences of delays in road construction projects.

A five-point Likert scale was employed to assess the effects of delays on construction projects. Respondents were asked to rate their level of agreement on the impacts and consequences of delays using the following scale: 5=strongly agree, 4=agree, 3=slightly agree, 2=disagree, and 1=strongly disagree. This allowed for a quantitative measurement of how past events and variables have influenced the projects and their effects. The mean scores were calculated to determine the Relative Importance Index (RII) and rank each delay attribute based on their level of importance. This analysis provided insights into the significance of different delay factors in the context of the study.

3.7 Data Processing and Analyzing

The data collected from the survey were analyzed using the Likert scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). The researcher utilized the Statistical Package for Social Sciences (SPSS 20) software to perform a comprehensive analysis of the data and evaluate the results. The findings of the questionnaires were presented through tables and descriptive statistics, including figures and means. Both SPSS 20 and Excel were employed for this analysis, ensuring a thorough examination of the collected data and providing clear representations of the results.

The data analysis involved the calculation of the Relative Importance Index (RII) and the subsequent ranking of factors within each category based on their RII values. Several researchers, such as (Aziz and Abdel-Hakam, 2016; Fugar and Agyakwah-Baah, n.d.; Milind Mehta et al., 2022), have argued that using the mean and standard deviation of individual attributes alone is not sufficient for assessing overall rankings. Instead, the Relative Importance Index (RII) is considered the most suitable measure as it considers the relationship between attributes and provides a comprehensive assessment of their importance in the study.

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

RII = Relative Importance Index,

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

A = highest weight (i.e., 5),

N = total number of respondents.

The causes of delay identified in the study were ranked using the Relative Importance Index (RII), and their rankings were categorized based on the RII classification table presented in Table 3.3. According to the RII classification table, the causes of delay were assigned a level of importance based on their RII values. Scale 1 represented causes that were classified as "Not Important at all" with RII values between 0.0 and 0.2. Scale 2 denoted causes that were considered "Slightly important" with RII values between 0.2 and 0.4. Scale 3 indicated causes classified as "Moderately Important" with RII values between 0.4 and 0.6. Scale 4 represented causes that were categorized as "Important" with RII values between 0.6 and 0.8. Lastly, Scale 5 denoted causes that were classified as "Highly Important" with RII values between 0.8 and 1.0. This ranking and classification system enabled the study to assess the relative importance of each

cause of delay. Further elaboration and discussion of specific causes and their rankings will be provided in the relevant sections of the thesis.

3.8. Validity and Reliability of The Instrument

3.8.1. Reliability test

Prior to analysing the results obtained from the Likert-type questionnaires, a Cronbach's analysis was conducted to assess the internal consistency and reliability of the questions. This analysis tests the reliability of the questions using the Likert scale and ensures the consistency of responses. Ethical considerations were applied in this study to maintain the confidentiality of organizational and respondent information. The collected data were solely used for the purpose of this study and were not shared with any other party or used for other purposes. Additionally, respondents were instructed not to provide any personal information such as their name or other identifying codes while completing the questionnaire.

3.8.2. Cronbach's Alpha Reliability Test

In this study, the reliability of the Likert scale used in the questionnaire was evaluated using Cronbach's alpha analysis, which is a commonly employed method for estimating reliability. Before analysing the data obtained from the questionnaire survey, a Cronbach's alpha analysis was conducted to assess the reliability of each question. This analysis measures the internal consistency of the questions based on the Likert scale responses.

To evaluate the reliability of each factor, the Cronbach's alpha coefficient was calculated for each group of factors to assess their internal consistency. The Cronbach's alpha coefficient ranges from 0 to 1, where higher values indicate greater internal consistency and lower values indicate lower internal consistency. To interpret the results of the analysis, the criteria proposed by Nunally and Bernstein (1994) were used.

The interpretation criteria are as follows:

- $C\alpha > 0.8$: Excellent
- $0.7 < C\alpha < 0.8$: Good
- $0.5 < C\alpha < 0.7$: Satisfactory
- $C\alpha < 0.5$: Poor

These criteria were applied to evaluate the reliability of the questionnaire and assess the internal consistency of the factors in the study.

Table 3.3： Result summary of Cronbach's Alpha Reliability test

PARTS		Cronbach's Alpha	Result of the analysis	Number of Questions
Parts I	Client	0.73	Good	7
	Contractor	0.71	Good	13
	Consultant	0.70	Satisfactory	14
	Material-Related Delay Factors	0.78	Good	11
	Labour & Equipment-Related Delay Factors	0.74	Good	11
	Project-Related Delay Factors	0.71	Good	10
	External-Related Delay Factors	0.76	Good	5
Part -II	Time as a factor	0.87	Excellent	5
	Cost as a factor	0.85	Excellent	5
	Quality as a factor	0.78	Good	5
	Client satisfaction	0.87	Excellent	5

Source: Result of a conducted survey by Researcher (2023)

The results of the Cronbach's alpha reliability test indicate that the items within each part are correlated and demonstrate internal consistency. The Cronbach's alpha coefficients for each group of questions were high and close to one, indicating a reliable result.

In **Part I** the client and contractor sections shows good internal consistency with Cronbach's alpha coefficients of 0.73 and 0.71 respectively. The Consultant section demonstrated satisfactory internal consistency with a Cronbach's alpha coefficient of 0.70. For the delay factors, Material-Related Delay Factors had a Cronbach's alpha of 0.78, Labour & Equipment-Related Delay Factors had a Cronbach's alpha of 0.74, Project-Related Delay Factors had a Cronbach's alpha of 0.71 and External Related Delay Factors had a Cronbach's alpha of 0.76.

In **Part II** all factors such as time, cost, quality, and client satisfaction exhibited excellent internal consistency with Cronbach's alpha coefficients ranging from 0.78 to 0.87. Overall, the high Cronbach's alpha coefficients suggest that the survey questions within each part were reliable and demonstrated internal consistency, indicating that the items functioned well as a group within their respective sections.

3.9. Ethical Consideration

The study ensured the privacy and confidentiality of the information provided by the respondents. The questionnaires and interview schedules did not require respondents to disclose their names. Participation in the study was voluntary, and no respondent was coerced or forced to take part. The researcher maintained honesty throughout the study by avoiding any distortions or manipulations of the data. Conclusions drawn from the study were solely based on the gathered data, and the analysis and interpretation were limited to the information provided by the data themselves.

CHAPTER FOUR

DATA PRESENTATION AND DISCUSSION

4.1 Characteristics and Profile of Respondents

The study examined the characteristics and profile of the respondents, including their age, gender, educational level, and response rates.

4.1.1 Age Distribution

The distribution of respondents' age was analysed, categorizing them into three groups: 25-35, 35-45, and 45 and above. Among the participants, a significant proportion (47%) fell within the age group of 35-45, which represented the highest percentage among the total of 36 participants.

4.1.2 Gender Distribution

The gender distribution of the respondents was assessed, revealing that a majority were male, accounting for 69% of the total participants. The remaining 31% of the respondents were female.

4.1.3 Educational Level Distribution

The educational background of the respondents was examined. The analysis showed that 53% of the participants held a degree qualification, indicating the highest proportion. Additionally, 28% of the respondents had a Master's degree or above, while a smaller percentage (19%) held a diploma.

4.1.4 Summary of Response Rates

The response rates from the participants were summarized to evaluate the level of engagement in the study. Among the clients, a majority (83.3%) returned the questionnaires out of the total distributed. Similarly, the response rate for contractors was 85.7%, indicating a significant level of participation. The consultants had a response rate of 70%. Overall, the combined response rate across all categories was 82%.

4.2. Discuses Analyzing of Study

The main findings of the study are based on the data collected through a questionnaire survey distributed among professionals in the road construction industry, including Clients, Contractors, and Consultants. The survey aimed to assess the factors that causes of delay in road construction projects and their impact on time, cost, and quality. The respondents included project managers,

project coordinators, site engineers, office engineers, designers, and supervisors with relevant experience and expertise in road construction projects.

The study analysed the responses and presented the findings using the relative importance index to rank the factors influencing road construction and their effects on time, cost, and quality. The results were separately presented for each party involved in the road construction projects (Clients, Contractors, and Consultants).

The main findings of the study include the identification of the most significant factors of delay in road construction projects and their respective impacts on time, cost, and quality. These findings provide valuable insights into the key areas that need attention and improvement in order to enhance the overall delay of road construction projects. Overall, the study provides valuable information and insights into the factors of delay, as well as their effects on time, cost, and quality. The findings serve as a basis for understanding the challenges and opportunities in the road construction industry, and they can guide decision-making and strategic planning to optimize project outcomes.

The collected data was analysed using Microsoft Excel to determine the factors that influence the performance of road construction projects and their effects on cost, time, and quality. The factors were divided into three main categories: client-related factors, contractor-related factors, and consultant-related factors. Excel was utilized for data analysis and ranking purposes in order to gain insights into the relative importance of these factors in the context of the study.

To determine the ranking of the factors, the relative importance index (RII) was calculated based on the responses obtained from the questionnaire survey. The RII helps identify the most influential factors among the options provided in the survey. The factors affecting the performance of road construction projects and their effects on time, cost, and quality were analysed and ranked using the RII, revealing the relative importance of each factor. This analysis provides valuable insights into the factors that have the greatest impact on road project delay and can guide decision-making and resource allocation to improve overall project outcomes.

4.3. Ranking Factor that causes of delay in Road Construction project.

4.3.1. Client Perspectives

The researcher identified a total of 7 factors in the questionnaire that can impact the performance of road construction projects from the perspective of the client. The Relative Importance Index (RII) was calculated for each factor based on the responses gathered from the questionnaire survey, according to the perceptions of the respondents, the most highly significant client-related factors causing delays in road construction projects in Addis Ababa city are as follows: delays in payments for completed work by the owner, late revising and approving of relevant documents by the owner, contract changes by the owner during construction, lack of communication and coordination by the owner, and suspension of work due to the owner. On the other hand, conflicts between owners in a joint ownership were found to be the least significant factor causing time delays in road construction projects in the study area, followed by misunderstandings in technical dealings with vendors and contractors.

4.3.2. Consultant Perspectives

Based on the survey results, the consultant ranks slow in approving drawings is the major factor that causes delay in road construction projects. Followed by the consultant did not have adequate decision making authority as the second ranked factor which causes delay. The factors the consultant did not have adequate site information seem to be the third-ranked factors that cause delay in the road construction projects. Consequently, factors such as consultant lacked practical knowledge and the project design was complex were ranked fourth and fifth respectively.

4.3.3. Contractors' perspectives

Contractors inadequate planning and scheduling is the top delay factor. The contractors rank difficulties in financing the construction project by the contractor, Contractor's poor site management & supervision as second. Lack of experience of contractors in decision-making and Contractor's slowness in site mobilization as third and fourth important delay factors

4.3.4 Material-Related perspective

Shortage of material was ranked first in its effect on the time overrun of projects having the highest RII value from the material-related factors. The other factors like Changes in quality of material, frequent unexpected modifications in the specification of material during construction, slow process of material selection, Poor material management were ranked as the 2nd, 3rd, 4th

and 5th is the most significant factors. It was then noted from the table that insufficient turnover & start-up resources makes the project slow is the least significant factor identified.

4.3.5 Labor & equipment-related perspective

These factors have been identified through the questionnaire survey and have been ranked based on their RII values. Among them, disputes in labour and labour strikes, unavailability of equipment, and poor labour supply & labour productivity are considered the most significant factors which caused delays from the labour and equipment perspective.

4.3.6. Project-related perspective

These factors have been identified through the questionnaire survey and have been ranked based on their RII values. Among them, Right of way issues(the roads to be constructed like the ETC, AWSA and ELPA), traffic control at the site, and rework due to errors in construction are considered the most significant factors affecting the construction project performance from the project-related perspective

4.3.7. External related perspective

These factors have been ranked based on their RII values. Among them, inclement weather effects and inaccurate cost estimates are considered the most significant external-related factors in category. The other factors like Changes in government regulation & laws and restriction due to site location were ranked third and fourth respectively.

4.4. Analysis Causes of Delay in Road Construction

In the previous section of this chapter, the analysis of each individual factor within each category was conducted and presented. In this section, the focus is on identifying the most critical factor causing delays in road construction projects, as ranked by the Relative Importance Index (RII) technique. The RII was calculated for each cause of delay associated with the client, contractor, and consultants, allowing for the identification of the most significant factor impacting construction performance in Addis Ababa Road. By assigning rankings to each cause of delay across the three parties, the most critical factor affecting the construction performance was determined. The RII was calculated for each factor within the seven main categories, as presented in Table 4.1 below.

Table 4.1: Result of cumulative causes of delay

No.	Causes delay in Road construction	Mean	RII	Rank	Category
1	Late revising & approving of relevant documents by owner	4.44	0.89	7	Client-Related Delay Factors
2	Delays in payments for completed work by owner	4.5	0.9	3	
3	The consultant was slow in approving drawings.	4.56	0.91	1	Consultant-Related Delay Factors
4	The consultant did not have adequate decision-making authority.	4.44	0.91	2	
5	There was a lack of coordination between the consultant and contractor.	4.31	0.89	4	
6	There was a delay in handing over the site to the contractor.	3.47	0.89	4	
7	The consultant faced communication barriers.	4.39	0.88	6	
8	Contractor's inadequate planning & scheduling.	4.47	0.89	1	Contractor-Related Delay Factors
9	Lack of experience of contractor in decision-making.	4.42	0.88	5	
10	Contractor's slowness in site mobilization.	4.31	0.88	7	
11	Contractor's poor site management & supervision.	4.42	0.88	5	
12	Poor managerial skills of contractor.	4.39	0.88	6	
13	Shortage of material	4.44	0.89	3	Material-Related Delay Factors
14	Changes in quality of material	4.39	0.88	5	
15	Disputes in labour & labour strikes	4.36	0.87	7	Labour &

16	Unavailability of equipment	4.03	0.87	8	Equipment-Related Delay Factors
17	Traffic jam at site	4.44	0.89	3	Project-Related Delay Factors
18	Unforeseen ground conditions	4.31	0.86	6	
19	Right of way issues	4.47	0.89	1	
20	Inaccurate cost estimates.	4.31	0.86	1	External -Related Delay Factors

Source: *Results of Conducted Survey by Researcher (2023)*

The study utilized the RII method to rank the top 20 factors. These factors were categorized into Client-Related Delay Factors, Consultant-Related Delay Factors, Contractor-Related Delay Factors, Material-Related Delay Factors, Labour & Equipment-Related Delay Factors, and Project-Related Delay Factors.

Among the Client-Related Delay Factors, the late revising and approving of relevant documents by the owner ranked 7th. Delays in payments for completed work by the owner ranked 3rd. In the Consultant-Related Delay Factors category, the consultant's slowness in approving drawings ranked 2nd, while the consultant's lack of decision-making authority ranked 1st. Within the Contractor-Related Delay Factors, inadequate planning and scheduling by the contractor ranked 1st. Lack of experience in decision-making, slow site mobilization, poor site management and supervision, and poor managerial skills of the contractor were also identified as critical factors.

The Material-Related Delay Factors included a shortage of material ranking 3rd and changes in the quality of material ranking 5th with an RII 0.89 and 0.88 respectively. In the Labour & Equipment-Related Delay Factors, disputes in labour and labour strikes ranked 7th, while unavailability of equipment ranked 8th with an equal RII of 0.87. Among the Project-Related Delay Factors, traffic control at the site ranked 3rd, unforeseen ground conditions ranked six and right of way issues ranked 1st with an RII of and with an RII of 0.89,0.86 and 0.89respectivly. Inaccurate cost estimates also ranked 1st with an RII of 0.86 in the External-Related Delay Factors.

4.5. Analysis Effects of Delay With Respect To Time, Cost and Quality

The primary data that collected from all parties was analysed from the perspective of consultants, client and contractors. The ranking order of effects of delay by all party's perspectives is presented in the following table.

Table 4.2: Result of frequency of effects of delay

No.	Effect of Delay	RII	Rank
1.	Time overrun	0.85	1
2.	Cost overrun	0.84	2
3.	Quality loss	0.83	3

Source: -*Results of conducted survey by Researcher (2023)*

The analysis of data obtained from the questionnaire survey indicates that the three most significant effects of delays, according to the perspectives of all respondents, are time overrun (RII=0.85), cost overrun (RII=0.84), and quality loss (RII=0.83), as shown in Table 4-14. Interestingly, across all groups of respondents, it was found that the two most common effects of delay are time overrun and cost overrun. This suggests that these types of effects occur more frequently as a result of project delays. In particular, 100% of the contractors assigned equal and the highest importance to these factors. A previous study by (Assefa, n.d.) Also identified time overrun, cost overrun, loss of political and economic value towards the project, and arbitrations between contracting parties as the effects of delays encountered in Ethiopian construction projects.

4.6 Case Studies

4.6.1 Project I

Project Name: Kality – Tuludimtu

Client: AACRA

Consultant: Eng. Zewdie Eskinder PLC

Contractor: IFH Engineering

Table 4.3: Summary of project I case study.

Contract Sign Date	April 16,2016
Original Contract Amount	2,459,935,293.29
Project Commencement date	April 10,2017
Project Duration	1095 days
Number of Extension of time (EOT)	1177 days
➢ Reason of the extension	1. Loan credit fund 2. Right of way problem (ROW) 3. Utility relocation
Current Project status	63% (As of May,2023)

Source: *Result of a conducted survey by Researcher (2023)*

As summarized on above table 4-5, the project contract reveals that April 10, 2017 was the commencement date of the project with 11 km length from and the project duration was for three year which means the project was expected to be completed and closed out on April 10, 2020. However, the project was started almost at mid of 2017 with right of way problem (ROW), the problem of not timely diverting a water pipeline found on the road, late site delivery and lack of loan credit fund promised by China Exim Bank. Additionally traffic jam on the road, there is not alternative road and contractor poor performance and design problem experienced during the implementation, addition work order or Rework due to change of design or deviation order, late decision, addition work order or deviation order were a compensable delay as the cause of the delay were owners and external factors related to site clearance.

4.6.2 Project II

Project Name: Imperial Intersection Road Project

Client: AACRA

Consultant: STADIA Engineering Works Consultant PLC

Contractor: China First Highway Engineering Limited Company

Table 4.4: Summary of project II case study.

Contract Sign Date	August,2020		
Original Contract Amount	714,865,946.80		
Project Commencement date	August ,2020		
Project Duration	19 months		
Number of Extension of time (EOT) (Reason of the extension)	(EOT) 1	Feb, 2022 - June, 2022	Right of way problem (ROW) Utility relocation
	(EOT) 2	June, 2022 - Dec, 2022	change of design or deviation order Unsolved Right of way problem
	(EOT) 3	Dec, 2022– April, 2023	Shortage of material(Cement) Rework due to change of design
Current Project status	77%Physicaly and 73%Financial (As of May,2023)		

Source: *Result of a conducted survey by Researcher (2023)*

As summarized on above table4.4, the project contract reveals that August, 2020 was the start month of the project with 1.5 km length and the project duration was for one year and seven month which mean the project was expected to be completed and closed out on February, 2022. However, with various delay factors, three times Extension of time were given for the contractor. These delay factors varies from contractors related factor to external related factor given the owner related factors particularly a right of way (ROW) problem (utility relocation) and shortage of Cement had been the base for the delay of the project. As summarized above, in addition of contractor poor performance and design problem experienced during the implementation, addition work order or Rework due to change of design or deviation order, traffic jam, late decision, addition work order and late approval were a compensable delay as the cause of the delay were owners and external factors related to inaccurate cost estimates.

4.6.3. Summary of key implications of case studies

The two project cases imply that there is significant schedule delay problem. The first project had time schedule overrun for more than 100% of planned project duration as seen from the table (4.3) summary while the second project had also approach to 100% of the planned project duration as seen from the table (4.4) summary. As a main reason for the time delay of the projects;- Right of way problem (ROW), traffic jam on the road, lack of loan credit fund , Addition work order or Rework due to change of design or deviation order, late decision, utility relocation, addition work order or deviation order and late approval were among the problems identified. Unresolved Right of way problem Delay due to adverse weather condition Extension of Time Late approval of Utility Unit Rate Utility relocation. Delays in contractor's progress payment by owner (late decision), Delay due to late site delivery, and the like as summarised by their Overall Relative Importance Index and ranked. In projects of the case studies, problem of delayed payment and Unresolved Right of way problem raised as issues for claiming additional project time. These two factors are also among the major delay factors identified by the research study even though their rank of importance is different in the research and in the case studies. In summary finding from the research study has implication of relevance when compared with the actual project case studies.

4.7 Methods of Minimizing Delay

Several factors contribute to delays in road construction projects, and minimizing their impact is crucial for efficient project execution. By analysing the data and considering the mean values and RII rankings, we can identify effective methods for mitigating the delays associated with each factor.

4.7.1 Client-related delay factors:

Late revising and approving of relevant documents by the owner, ranked seventh with an RII value of 0.89. It is essential to establish effective communication channels with the owner to minimize this delay factor, streamline the document revision process, and encourage timely approvals. Delays in payments for completed work by the owner, ranked third with an RII value of 0.9. Implementing measures such as clear payment terms, regular invoicing, and timely follow-ups can help minimize this delay factor.

4.7.2 Consultant-Related Delay Factors:

The consultant being slow in approving drawings, ranked second with an RII value of 0.91. To address this delay factor, it is crucial to establish efficient communication between the consultant and the project team, streamline the approval process, and set realistic timelines for drawing approvals. The consultant has not adequate decision making authority, ranked first with an RII value of 0.91. To minimize this delay factor, it is important to ensure that the consultant has the necessary authority to make timely decisions, collaborate closely with the consultant, and provide the required support for decision-making processes.

4.7.3 Contractor-Related Delay Factors:

Inadequate planning and scheduling by the contractor ranked first with an RII value of 0.89. Minimizing this delay factor requires the contractor to develop comprehensive project plans, establish realistic schedules, and ensure efficient resource allocation. The lack of experience of the contractor in decision-making ranked fifth with an RII value of 0.88. To address this delay factor, the contractor should invest in training and development programs to enhance decision-making skills and seek expert advice when needed.

4.7.4 Material-Related Delay Factors:

Shortage of material ranked third with an RII value of 0.89. Minimizing this delay factor requires effective inventory management, timely procurement processes, and establishing reliable supplier relationships to ensure the availability of materials when needed. Changes in the quality of material ranked fifth with an RII value of 0.88. It is important to implement strict quality control measures, perform regular inspections, and collaborate closely with suppliers to ensure consistent material quality to minimize this delay factor.

4.7.5 Labor & Equipment-Related Delay Factors:

Disputes in labour and labour strikes, ranked seventh with an RII value of 0.87. To address this delay factor, it is essential to maintain open lines of communication with labour unions, address labour-related concerns promptly, and establish fair and transparent labour practices. Unavailability of equipment, ranked eighth with an RII value of 0.87. Minimizing this delay factor requires proper equipment planning, regular maintenance, and establishing backup plans or alternative equipment sources to mitigate equipment-related delays.

4.7.6 Project-Related Delay Factors:

Traffic control at the site ranked third with an RII value of 0.89. To address this delay factor, effective traffic management plans should labour be implemented, including clear signage, alternative routes, and coordination with local authorities to minimize traffic-related disruptions. Unforeseen ground conditions, ranked sixth with an RII value of 0.86. To minimize this delay factor, conducting thorough site investigations, employing experienced geotechnical engineers, and implementing appropriate contingency plans are essential.

4.7.7 External-Related Delay Factors:

Right of way issues ranked first with an RII value of 0.89. Minimizing this delay factor requires proactive engagement with relevant stakeholders, including obtaining necessary permits and clearances in a timely manner, and addressing any right-of-way challenges promptly. Inaccurate cost estimates, ranked first with an RII value of 0.86. To address this delay factor, it is crucial to conduct comprehensive cost estimation exercises, account for potential contingencies, and regularly review and update the cost estimates throughout the project lifecycle. By implementing these methods, road construction projects can effectively minimize the factors that negatively impact construction performance, mitigate delays, and ensure smoother project execution.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Major Findings

The study examined various factors influencing road construction project performance, including time, cost, and quality. The analysis of the collected data and survey responses revealed significant findings. The factors identified as critical to project performance included collaborative working in construction, proper project planning and scheduling, use of appropriate construction methods, effective strategic planning, and use of modern construction equipment. The study also highlighted the negative impact of time overrun, cost overrun, and quality loss on project performance.

Road construction project delay in Addis Ababa City is explained through literature review and field survey. Through literature review 70 causes of delay were identified, the factors combined into three groups. Three major stakeholders, including 6 clients, 28 contractors and 10 consultants responded the questionnaire forms. The respondents perceived the following top ten causes of delay factors.

1. Slow in approving drawings by consultant (RII=0.91)
2. Delays in payments for completed work by owner (RII=0.9)
3. Late revising & approving of relevant documents by owner (RII=0.89)
4. Inadequate planning and scheduling of work by contractor (RII=0.89)
5. Right of way issues (RII=0.89)
6. Traffic Jam at site (RII=0.89)
7. Shortage of material (RII=0.89)
8. Poor site management and supervision by contractors (RII=0.88)
9. Unavailability of equipment (RII=0.87)
10. Disputes in labour & labour strikes (RII=0.87)

Clients and Cconsultant's agreed that weak in follow up the planned work schedule by the contractor is the most sever causes of delay by the contractors. Whereas, the contractor reported that late revising and approving of relevant documents and delays in payments imposed by the

client and Slow in approving drawings by consultant is the most significant causes of project delay.

Contractors indicate that client and consultants are the significant source of delays, while both client and consultant specified 'contractor' as sources of delay. The combined result of group causes shown that mostly the delay is caused by the Client, followed by contractor and, while consultants related cause is less important.

Regarding effects of delay, the analysis of survey result shows that the two most important effects of delays based on all respondent's perspective are time and cost overrun with the highest RII= 0.85 and 0.84 respectively. This finding agrees with the most of the findings revised in the literature reviews. The finding is in agreement with the finding of other scholars conducted studies on effects of road construction delay. Time and cost overrun is considered as the immediate effects of road construction delay.

5.2 Conclusions

In conclusion, this thesis examined various factors influencing road construction project performance, with a focus on time, cost, and quality. The study identified critical factors that contribute to project success or delays and highlighted the negative impact of time overrun, cost overrun, and quality loss on project performance. The analysis of data and survey responses revealed the top causes of delay, including issues related to document revisions and approvals, delays in payments, inadequate planning and scheduling, right-of-way problems, shortage of materials, and poor site management.

Clients, consultants, and contractors had different perspectives on the causes of delays, indicating the need for improved communication and collaboration among project stakeholders. The study also emphasized the importance of collaborative working, proper project planning, appropriate construction methods, strategic planning, and the use of modern construction equipment for successful project outcomes.

Based on these findings, several recommendations were proposed to mitigate delays and improve project performance. These recommendations include expediting decision-making processes, ensuring timely payments, establishing effective communication channels, enhancing

coordination between stakeholders, improving site management and supervision, addressing right-of-way challenges, and investing in training and capacity building.

By implementing these recommendations, road construction projects in Addis Ababa City can enhance efficiency, reduce delays, and deliver projects on time and within budget. Further research in areas such as the impact of new technologies, risk management strategies, and stakeholder engagement will contribute to the continuous improvement of road construction practices.

In summary, this thesis provides valuable insights into the causes of delays in road construction projects and offers practical recommendations for stakeholders to improve project performance. By addressing these factors and implementing the proposed strategies, the industry can overcome challenges, enhance project outcomes, and contribute to the development of high-quality infrastructure.

5.3 Recommendations

The results of the survey have identified the main causes of delay and the most frequent effect of delay on road construction projects in Addis Ababa. To minimize or avoid delays that made the completion time of the projects double and triple of the initial contract time and effects of delay, concerned parties in sector and professionals are expected to work hand in hand for a common goal. Based on the findings of the project, the following recommendations are forwarded to the main stakeholders of the industry and other parties, which have a connection to the successful completion of a project

- To address delays caused by late revisions and approvals of relevant documents by the owner, clients should expedite decision-making processes. This can be achieved by establishing effective communication channels with consultants and contractors. Implementing regular progress meetings, utilizing digital collaboration tools, and setting clear timelines for document review and approval will facilitate prompt decision-making and reduce delays in document processing.
- To mitigate delays in payments for completed work by the owner, clients must ensure effective project cost planning. They should determine adequate budget/funds and conduct comprehensive cost estimations. Review and adjust the budget as needed, and

establish a payment schedule aligned with project milestones. Timely payments will prevent disruptions in cash flow for contractors and suppliers, thereby minimizing project delays.

- To address delays caused by slow approval of drawings by the consultant, clients should establish efficient communication between the consultant and the project team. Streamlining the approval process for drawings is essential. This can be achieved by establishing clear communication channels, setting realistic timelines, and providing the necessary support for timely decision-making. Effective communication will expedite the approval process and minimize delays.
- To mitigate delays resulting from the consultant's lack of decision-making authority, clients should collaborate closely with consultants and empower them with the necessary decision-making authority. By providing the required support and fostering a collaborative environment, clients can enable consultants to make timely decisions and address project-related matters promptly.
- To address delays caused by a lack of coordination between the consultant and contractor, clients should foster effective communication and collaboration among all project stakeholders. Encouraging regular coordination meetings, establishing clear communication channels, and promoting a collaborative working environment will enhance coordination and prevent delays caused by miscommunication.
- To minimize delays resulting from a delay in handing over the site to the contractor, clients should ensure proper site preparations are completed on time. This includes conducting thorough site inspections, establishing a systematic handover process, and providing all necessary resources and access to the contractor as per the agreed timeline. Timely handover will enable contractors to commence work promptly, minimizing project delays.
- To mitigate delays caused by communication barriers faced by the consultant, clients should ensure effective communication channels are in place between the consultant and the project team. Addressing language barriers through translators or language support, utilizing modern communication tools and technologies, and establishing clear communication protocols will facilitate effective communication and reduce delays caused by misunderstandings or miscommunication.

- To address delays caused by inadequate planning and scheduling by the contractor, clients should emphasize the importance of comprehensive project planning and scheduling. Encourage contractors to develop detailed work plans, establish realistic timelines, allocate appropriate resources, and regularly monitor and update the project schedule. Effective planning and scheduling will minimize delays and ensure project milestones are met.
- To mitigate delays caused by the contractor's lack of experience in decision-making, clients should encourage contractors to invest in training and development programs. This will enhance their decision-making skills and provide them with the necessary expertise to address project-related issues promptly. Clients can also provide access to expert advice and mentorship when needed.
- To minimize delays resulting from the contractor's slow mobilization to the project site, clients should establish clear expectations and deadlines for site mobilization in the contract. Encourage contractors to develop detailed mobilization plans, address logistical challenges in advance, and closely monitor progress. Timely mobilization will ensure that project activities start on schedule, minimizing delays.

By implementing these recommendations, clients can effectively address the specific delay-causing factors identified in Table 4.5. These strategies aim to enhance communication, streamline approval processes, foster collaboration, and promote timely decision-making

5.4. Direction for Further Studies:

Further research in the field of road construction projects can explore areas such as the impact of new materials and technologies, performance evaluation of road maintenance practices, risk management strategies, stakeholder engagement and community impact, integration of sustainability practices, and development of performance measurement metrics. These areas of research will contribute to a deeper understanding of road construction project performance and provide valuable insights for future project planning and execution.

In conclusion, this study sheds light on the factors affecting road construction project performance and provides recommendations for enhancing project outcomes. By addressing these factors and implementing the recommended strategies, stakeholders in the road

construction industry can improve project efficiency, reduce costs, and deliver high-quality infrastructure. Continued research in this field will further contribute to the advancement of road construction practices and ensure sustainable and successful project delivery in the future.

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Annex 1. Survey questionnaire

SAINT MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
MASTER OF BUSINESS ADMINISTRATION
QUESTIONNAIRE TO BE FILLED BY CONTRACTOR, CONSULTANT AND CLIENT IN ADDIS ABABA, ETHIOPIA.

Prepared by: Nanati Ermiyas

Email: nanatiermias84@gmail.com

Thank you for your committed cooperation, time, and consideration!!!

Dear Respondents: - I would like to express my sincere appreciation for your generous time and honest and prompt responses.

Objective of the Questionnaire:

I am a student researcher at Saint Mary's University currently pursuing my MA in Business Administration. As part of my research study on the "Delay in road construction project in Addis Ababa City Road Authority" I am designing a questionnaire to collect relevant information. The collected information will be used as primary data in my research study, which is being conducted as a partial requirement for the completion of my degree.

I would like to request your permission to distribute the questionnaire to your organization's employees who have experience with road construction projects in Addis Ababa City. The questionnaire responses will be kept confidential, and any personal information collected will be used solely for academic purposes. Upon completion of my research study, I will be willing to share a copy of my final report with your organization. Your prompt response and cooperation in granting permission to distribute the questionnaire would be greatly appreciated.

Thank you for your time and consideration.

Sincerely,

Nanati Ermiyas

General Instructions:

- ✓ There is no need of writing your name, and Participation in this survey is voluntary.
- ✓ In all cases where answer options are available, please tick (√) in the appropriate box.
- ✓ Please return the completed questionnaire as much as possible
- ✓ If you need further explanation, you can contact me through the address mentioned above.

Part I: **Preliminary Information**

Respondent Profile

1. Gender:
   - ☐ Male
   - ☐ Female
2. Which of the following age categories describes you?

   Between 25-35 ☐ 35-45 ☐ above 45 ☐
3. Marital status

   Single ☐ married ☐ divorced ☐

4. Education level:
   - ☐ Diploma
   - ☐ First Degree
   - ☐ Masters and Above
5. In terms of your current occupation, how would you characterize yourself?
   - ☐ Project Manager.
   - ☐ Site Engineer
   - ☐ Office Engineer
   - ☐ Quality manager
   - ☐ Material Engineer
6. Years of service in the company
   - ☐ Below 2 years
   - ☐ 3- 5 years
   - ☐ 6-10 years

- ☐ 11-15 years
- ☐ Above 15 years

7. Your organization side

- ☐ Contractor
- ☐ Consultant
- ☐ Client
- ☐ Community

Part II: Questions related to Factor affecting performance.

7. Select and circle (more than one is possible) among the following in which your company interpret good performance? It is in terms of...

A. Cost Performance
B. good quality
C. fast delivery time
D. high profit
E. customer satisfaction
F. Specify if any.....

❖ In the following box, there are the lists of expected "Cause and Effects of delay factors in road construction in Addis Ababa City" Please show the factors by selecting and putting a tick mark in the box of your choice.

5= Strongly Agree 4= Agree 3= Neutral 2= Disagree 1= Strongly Disagree

For each statement, respondents can choose one of five options ranging from "Strongly disagree" to "Strongly agree".

Contractor-Related Delay Factors Questionnaire	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
	5	**4**	**3**	**2**	**1**
1. Contractor's inadequate planning & scheduling.					
2. Lack of experience of contractor in decision-making.					

3. Contractor's slowness in site mobilization.					
4. Contractor's slowness in preparation of documents.					
5. Contractor's poor site management & supervision.					
6. Conflicts with sub-contractor.					
7. Reworking of construction faced by contractor.					
8. Contractor incompatibility with new technology?					
9. Inexperience of contractor with new software.					
10. Poor managerial skills of contractor.					
11. Inadequate handling of project progress by contractor.					
12. Lack of risk analysis & management by contractor.					
13. Communication barriers faced by consultant.					

Note: Respondents can indicate their level of agreement or disagreement with each statement by ticking the appropriate box under the respective column headers.

Consultant-Related Delay Factors:	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
	5	**4**	**3**	**2**	**1**
1. The consultant was slow in approving drawings.					
2. The consultant did not have					

adequate decision-making authority.					
3. There were mistakes in the consultant's drawings.					
4. The consultant lacked experience.					
5. Financial difficulties affected the consultant's performance.					
6. The consultant lacked practical knowledge.					
7. There was a lack of coordination between the consultant and contractor.					
8. The consultant demonstrated strong leadership skills.					
9. There were conflicts between the consultant and contractor due to changes in specifications during construction.					
10. The consultant did not have adequate site information.					
11. There was a delay in handing over the site to the contractor.					
12. There were conflicts between the consultant and contractor.					
13. The project design was complex, causing delays for the consultant.					
14. The consultant faced communication barriers.					

No.	Owner/Client-Related questionnaire	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		5	4	3	2	1
1.	Late revising & approving of relevant documents by owner					
2.	Contract changes by owner during construction					
3.	Delays in payments for completed work by owner					
4.	Lack of communication & co-ordination by owner					
5.	Conflicts between owners in a joint ownership					
6.	Suspension of work due to owner					
7.	Misunderstandings in technical dealing with vendors and contractors					

Material-Related Delay Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	5	4	3	2	1
1. Shortage of material					
2. Changes in quality of material					

3. Frequent unexpected modifications in specification of material during construction						
4. Slow process of material selection						
5. Poor material management						
6. Material damage in storage						
7. Escalation of material prices						
8. Lateness in finalizing finishing material due to availability of certainties in market						
9. Insufficient turnover & start-up resources makes project slow						
10. Materials not in right place when needed						
11. Untimely delivery of Labour						

No.	**Labour & Equipment-Related Delay Factors**	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
		5	**4**	**3**	**2**	**1**
1.	Poor Labour supply & Labour productivity					
2.	Disputes in Labour & Labour strikes					
3.	Unavailability of equipment					
4.	Delay in equipment delivery					
5.	Shortage of recent technology equipment					
6.	Large or long lead-time equipment not received as requested					

7.	No use of checklist					
8.	Unavailability of equipment lists & related design data					
9.	Shortage of operators					
10.	Space limitations at site for temporary & permanent equipment					
11.	Lack of safety effective inspection & expediting visits project					

Project-Related Delay Factors	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
	5	**4**	**3**	**2**	**1**
1. Traffic control at site					
2. Changes in site conditions					
3. Unforeseen ground conditions					
4. Insufficient data collections & survey					
5. Changes in site topography after design					
6. Right of way issues					
7. Accidents on site					
8. Problems due to existing structures					
9. Unavailability of utilities in site area					

10. Rework due to error in construction					

External-Related Delay Factors	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
	5	**4**	**3**	**2**	**1**
1. Inclement weather effects.					
2. Inaccurate cost estimates.					
3. Restriction due to site location.					
4.Changes in government regulation & laws					

Appendices B: -Survey questionnaires

Effect of performance of construction related to Time, Cost and Quality

Please tick and fill the blanks if any others. Each scale represents the following rating.

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

S.No	Description of Project Performance	Rating/ Significance Level				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		5	4	3	2	1
1	Time					
1.1	Site preparation time					
1.2	Planned time for construction					
1.3	Average delay in claim approval					
1.4	Average delay in regular payments					
1.5	Average delay in payment from owner to contractor					
2.	Cost					
2.1	Material and equipment cost					
2.2	Project labor cost					
2.3	Cost of variation orders					
2.4	Project overtime cost					
2.5	Cost of rework					
3	Quality					
3.1	Quality of equipment and raw materials in project					
3.2	Unavailability of					

	competent staff					
3.3	Conformance to specification					
3.4	Participation of managerial levels in decision making					
3.5	Quality training/meeting					
4	Client Satisfaction					
4.1	Information coordination between owner and project parties					
4.2	Leadership skills of project manager					
4.3	Speed and reliability of service to owner					
4.4	Number of disputes between owner and project parties					
4.5	Number of reworks					

Annex 2. Reliability test result

Contractor related factor

Reliability Statistics

Cronbach's Alpha	N of Items
.728	13

Client related factor

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.726	.716	7

Consultant related factor

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.715	.698	7

Material related factors

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.784	.789	11

Labor & Equipment related factor

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.744	.743	11

Project related factor

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.714	.730	10

External related factors

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.462	.473	4

Cost related

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.848	.848	5

Time related

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.848	.848	5

Quality related

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.781	5

Client Satisfaction related

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.781	5