ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

DEPARTMENT OF PROJECT MANAGEMENT

ASSESSMENT OF TIME AND COST OVERRUN IN CONSTRUCTION INDUSTRY: THE CASE OF ADDIS-ABABA UNIVERSITY, COLLEGE OF COMMERCE

By: Amel Salem Omer

ID No.: GSE/7887/12

ADVISOR: BERHANU DENU (PhD)

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DEPARTMENT OF PROJECT MANAGEMENT (PM)

I, Amel Salem, Registration Number/I.D. Number: GSE/7887/12, declare that this project is my original work and has not been submitted in full or partially by any other person for an award of a degree in any other university/ institution All of the sources I utilized or quoted have been fully referenced and recognized.

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Addis Ababa University

The undersigned certify that they have read and at this moment, recommended to the Addis Ababa University to accept the thesis submitted by Amel Salem Omer, entitled "*Assessment of Time and Cost overrun: the Case of Addis Ababa University, College of commerce*", for the award of a Master's degree in Arts of Regional and Local development studies.

APPROVAL SHEET

Submitted by:

_____	_____	_____
PG candidate	Signature	Date

Approved by:

1.	_____	_____	_____
	Advisor	Signature	Date
2.	_____	_____	_____
	Internal Examiner	Signature	Date
3.	_____	_____	_____
	External Examiner	Signature	Date
4.	_____	_____	_____
	Director School of Graduate Studies	Signature	Date

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ABSTRACT

One of the important and essential industries for Ethiopia's economic growth and development is the construction sector. It is a well-known fact that most construction projects in Ethiopia run over budget and on schedule. A construction project's time overrun (delay) and cost overrun were the two primary groups into which earlier literature studies were separated (increasing of cost).

In particular, the College of Commerce building project at Addis Ababa University is the focus of this paper's study of the elements that contribute to time and cost overruns. A legitimate questionnaire was distributed online to the client, consultant, and contractors in order to accomplish the paper's objectives in both a qualitative and quantitative method. From the customer, consultant, and contractor involved in the project, 37 replies were obtained. Descriptive statistics and the importance of index were used to examine the data that were gathered for this study.

The results from the survey showed that the four factors causing time delay in construction projects from a perspective of stakeholders: (1) “slow decision making” (client-related), (2) “poor communication and coordination between parties” (contractor–related), (3) “Slow response time and inspection” (consultant-related) & (4) “the rise in the price of material” (External factor related). From the Project life cycle; (1) “underestimating time requirement” (in the planning phase), (2) “frequent design changes” (in the design phase) & (3) “currency exchange” (in the construction phase).

The client, contractor, and consultant were recommended on how to be more responsible for their work and how to avoid any delays or cost increases, which could be accomplished by quick response time and inspection, rewarding the workers to increase their productivity, practice good management, and enhance communication and coordination among them.

Keywords: *Addis Ababa University school of commerce, time overrun, cost overrun,* statistical Package for Social science

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Acronyms

AAU	Addis Ababa University
CR	Cost Ratio
EC	Ethiopian Calendar
ECDSW	Ethiopian Construction design and Supervision Works
KPIs	Key Performance Index
MIS	Mean Item Score
PM	Project Management
SPSS	Statistical Package for Social science

CHAPTER ONE

1. Introduction

1.1 Background of the Study

The construction sector is a vital part of economic growth for most emerging countries such as Ethiopia and it is a channel for a substantial portion of investment development for the country. The industry is also crucial to the country's infrastructure development, which is required for healthy economic growth.

Even though the construction industry is continuously expanding, it is struggling with the timely delivery of projects. Every project depends on meeting a deadline while staying within a specified budget. Due to various internal or external challenges, however, the construction industry in Ethiopia has been struggling to deliver projects on schedule and budget while retaining the intended quality.

According to current construction industry practice, most projects in Ethiopia are rarely finished on schedule, on budget, and with intended quality. Project nature, such as uniqueness, time and cost underestimation, and project risk, are only a few examples of internal variables contributing to project delays. Time value of money, inflation, and material price escalation are the other external factors for project delays. Aside from the difficulties outlined above, clients, consultants, and contractors contribute to construction project delays. The specific aspects for each stakeholder will be explained in the below paragraphs.

Consultant faults, such as necessary variations, design changes, payment approval delays, site conditions, and staffing issues, are common reasons for time and cost overruns. Clients are also responsible for project overruns due to late payments to contractors, a lack of emphasis on planning, client-initiated modifications (scope changes), creating unrealistic time schedules, an executive bureaucracy, and financial shortages.

The most prevalent cause of delays in building construction projects is the consultants' and clients' unbounded scope of the construction project, which is defined as the deliverables expected at the end of the project. The consultant is often at fault for poor scope definition at the start of the project, which can result in delay.

The original project scope is frequently used to compute all project plans, schedules, cost and quantity estimations, procurement, and quality mechanisms. Changes in project scope may occur

mid-way through the project execution because of a client request that leads to cost and time overrun. The figure below depicts the relationship between project scope and project duration, cost, and quality.

Figure 1-1: *Relationship between construction project scope, time, quality and cost* (M.E Abd El-Razek, 2008).

The delay induced by the contractor size is due to ineffective project planning and scheduling, lack of experience of the builders and subcontractors, frequent change of subcontractors, incorrect construction approach, and greediness (Anil Upadhyay, 2016).

Delay, in general, is defined as time overruns that occur after the contract's completion date or after the parties' agreed-upon project delivery date. Because of the aforementioned variables, cost and time overrun, stakeholder disputes and claims, and contract termination are becoming increasingly widespread, particularly on most construction projects. Determining the core causes of delays is also essential for reducing and eliminating delays and their repercussions in construction projects.

The effects of delay, time, and cost overrun are widespread phenomena and are almost associated with nearly all projects in the construction industry. This pattern is especially pronounced in underdeveloped nations, where project time and cost overruns might exceed 100% of the anticipated amount (M.E Abd El-Razek, 2008).

Therefore, as mentioned above, the cause and effect of project delays demand special attention. This study aims to identify the reason for time and cost delays of construction projects in the Addis Ababa University School of Commerce building and the level causes of the project.

1.2 Statement of the Problem

Time, money, and quality are the three constraints that must be addressed during any construction project, which needs proper planning. In Ethiopia, however, delay in construction is becoming more widespread, which may be the primary cause of most construction project failures. Here, the delay may be caused by the project owner (client), contractor, or consultant.

The client can cause a delay by poor finance arrangement, delay to a progress payment, slow decision making, unrealistic contract duration, scope change during construction (such as variation work), or poor coordination and communication.

Lack of trained and experienced employees, delays in delivering essential materials to the worksite, and the constructor's greed, are some of the causes of a delay from the contractor's side. From the consultant's perspective, lack of transparent and finished working drawings, unskilled employees, poor communication and coordination, poor management, mistakes and discrepancies in design documents, failure to consider recent technology in the market, and horrible consultant experience can be reasons for a project delay.

Many studies strongly emphasize determining the causes of cost and time overruns during the building stage while paying little attention to the design stage. According to the review of implications for design evaluation, design is responsible for 70% of the project's cost (J.A Barton, 2001). The study mentioned that most of the project's cost is at risk if its design has defects or omitted components or if it needs to be updated owing to scope changes or other unforeseen variables such as government legislation or technological change. Unnecessary design changes, design flaws, and consultant-related revisions are the most common problems in the construction industry.

This project work addresses the problem and fills the gap by identifying the leading cause of the time and cost overrun from the client, contractor, and consulting side in AAU College of commerce.

The following are some of the significant issues that need to be addressed as part of this project's work:

- What is the cause of the time and cost overrun in the AAU College of commerce?
- How could the time and cost overruns be minimized (avoided)?

1.3 Objectives of the Research

1.3.1 General Objective

The general objective of the project work is to assess the time and cost overrun for AAU College of commerce.

1.3.2 Specific Objectives

The specific objectives are,

- To study and identify the major causes of time and cost overrun in the project,
- To gather opinion on these causes from significant players in the construction industry, namely contractors, clients, and consultants.
- To determine the level of project delays using Mean item scale (MIS)
- To assess the cause & effect of time and cost overrun in AAU, College of Commerce,
- Finally, to forward recommendations about minimizing or avoiding cost and time overrun, provide suggestions to reduce cost overrun and time overrun.

1.4 Basic Research Questions

The research tried to answer the following questions to achieve a practical and credible conclusion,

- What are the major causes that influence project cost and time overrun in AAU, school of Commerce construction projects?
- What are the relative degree of importance of each factors in causing time and cost overrun?
- What should be recommended to reduce or eliminate cost and time overruns?

1.5 Significance of the Study

The success of a project can be measured by completing it on time and within budget, as specified in the contract document. This project work identifies whether the AAU College of Commerce project is completed on time, within budget, and with the desired quality.

The research investigated the consequences of construction delays, especially for AAU College of Commerce, by determining the project's time and cost delays. The study also considers strategies to prevent or eliminate building project time and cost overruns.

As a result, the importance of this study is to identify strategies, processes, and methods that may be utilized to reduce or eliminate construction project time and expense overruns.

1.6 Scope of the study

This thesis aims to perform a theoretical and practical investigation into a construction project, time, and cost overruns. Due to various factors affecting stakeholders, construction projects experience time and cost overruns.. These significant overruns demand time and cost management techniques such as prevention and resolution. Resource waste can be decreased if these overruns are controlled smoothly.

The study may assist the university in providing insight into the project's issues and being informed of future works. Furthermore, the study may serve as a resource for particular academics who wish to conduct additional research on a comparable topic. And geographic, the scope of this research will be confined to Addis Ababa University, college of commerce, Lideta Sub-city.

1.7 Limitation of the Study

During the project work, there were bottlenecks in the research limits. One of the challenges in completing this research was the lack of time. Because the time available for the research is limited, data collection via questionnaires and interviews is complex. Some respondents were not cooperative, especially from the client and contractor side.

The study's main limitation is that it concentrates on the causes and evaluation of cost and time overruns in the AAU School of Commerce: Facility Building,50M3 Septic Tank and site work project, which is a limitation. The last limitation of the study is the unwillingness of the three parties to submit comprehensive and accurate information.

1.8 Organization of the Study

The research report was divided into five chapters as chapters and references. The first chapter presented above discusses the study's background, problem statement, objective, fundamental research questions, the significance of the investigation, scope of the study, and limitations. A review of relevant literature will be the subject of the second chapter. The third chapter will detail the research design and methodology used to conduct the study. The fourth chapter focuses on the study's results and discussion, as well as the study's primary findings and debate. The fifth chapter

concentrates on case studies on specific initiatives, and the final chapter provides conclusions and recommendations.

CHAPTER TWO

2. Literature Review

This chapter contains a related literature review that is separated into two parts. The first section covers the description and types of delays caused by cost and time overruns in construction projects. The main causes and effects of cost and time overruns in developing countries will be the second portion focus on previous studies and research in the area.

2.1 The Concept of Delay

As technology, budgets, and procedures processes grow more unpredictable, and the construction industry is becoming more dynamic. Moreover, government building projects have grown in complexity and difficulty, providing significant obstacles to the project team. One strategy for better understanding and enhancing the efficiency of construction projects is to look into the reasons for construction delays and their effects on project performance. One must first understand the concept of completed building projects to grasp the principle of delay.

The successful delivery of infrastructures in government construction projects depends on evaluating the performance of each activity throughout the project life cycle (I. Abdul Rahman, 2013). A successful construction project is completed on time, within the agreed-upon contract budget, and according to the specifications (S. Belay, 2021) . It's also worth emphasizing that successful construction project delivery requires complete cooperation and coordination from the project team throughout the project life cycle (M. M. Mukhtar, 2017).

In the construction industry, a delay is a time overrun that extends beyond the completion date indicated in a contract or beyond the date agreed upon by the parties for project delivery. (Parvaneh Shahsavand, 2018). To the client, a delay equals a loss of revenue due to a shortage of production and rentable space or reliance on existing facilities. Delays can result in more extraordinary overhead expenses for the contractor due to extended work periods, Inflation-driven increases in material and labor costs increases in some circumstances. Several factors cause construction delays.

2.1.1 Causes of Delay

There are two types of delays in construction projects:

- Internal and
- External causes

The contracting parties (contractor, client, and consultant) are responsible for internal causes. External causes, however, are uncontrollable events outside the parties' control. Natural disasters, government actions, and material suppliers are examples of these (Ahmed, 2003).

2.1.2 Types of Delay

In another publication, (Saleh Al Hadi Tumi, 2009) distinguishes delay non-excusable, excusable delays, and concurrent.

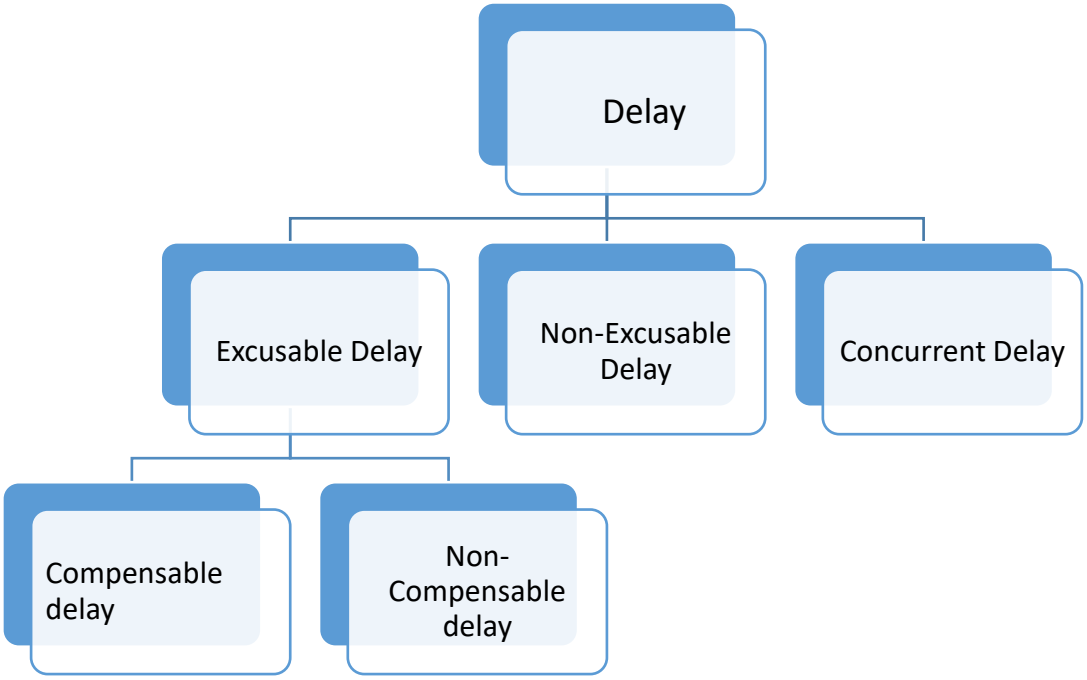

Figure 2-1: *Types of delay* **(N. Hamzaha, 2011)**

The contractor or its suppliers are to blame for a non-excusable delay, not the client. Most of the time, the contractor is not entitled to assistance and must either compensate the owner or speed to make up for the lost time. As a result, non-excusable delays typically result in no additional money or time awarded to the contractor.

An excusable delay occurs when a contractor or subcontractor is delayed owing to an unanticipated occurrence beyond their control. If the delay is deemed compensable, the contractor is entitled to additional monetary compensation and extended project time. When non-compensated excusable delays occur, the contractor is granted extra time but not money for the other work accomplished.

Excusable delays are referred to as "force majeure" and are usually referred to as "acts of God" because they are not the fault or responsibility of any one party. Most contracts allow for an extension of time, but not more money, in the event of unavoidable delays. (Wael Alaghbari, 2005).

There are two types of excused delays: compensable and non-compensable. Clients or consultants are also held accountable for compensable delays. Non-compensable delays are referred regarded as "acts of God" since they are not the fault or duty of any one party. They are caused by third parties or conditions beyond the control of the owner and the contractor (Wa'el Alaghbari, 2007).

Concurrent delays are the third kind of delay. When only one factor causes a construction project to be delayed, the time and cost incurred due to that single issue are usually reasonably straightforward to calculate. Concurrent delay is more complicated, which is typical in a construction project. This situation happens when more than one factor delays the project simultaneously or in overlapping periods (Wael Alaghbari, 2005).

Table 2-1: Construction Delay Theoretical Framework (N. Hamzaha, 2011)

Examples of Delay		
Excusable Delay (Compensable/caused by client or consultant)	**Non-Excusable Delay (Caused by Contractor)**	**Concurrent Delay (Non-comparable/caused by third parties, Act of God)**
• General labor strikes • Client-directed changes and extra works • Late possession of the site	• Late performance of the contractor ,suppliers and /or subcontractors • Faulty quality by the contractor or sub-contractors	• Fire • Flood • Wind damage • Snow • Suspension • Transportation delays

• Delayed payment • Government agencies' lack of action, such as building inspection • Between parties' slowness in the decision-making process • Conflicts between joint-ownership of the projects • Incentives for contractor stores to finish ahead of schedule aren't available. • Inflexibility of consultant • Consultant : slow in responding for review and approval of design documents • Conflicts between consultant and design engineer • Inadequate experience as a consultant • Financial problems (delayed payments) • Design & Contract modifications (Addition and omission of item; change in specifications)	• A project-specific labor stroke is caused by either the contractor's unwillingness to meet with a labor representative or by unfair labor practices • Poor site management and supervision • Poor communication and coordination by a contractor with other parties • Improper construction methods implemented by the contractor • Delays in sub-contractors' work • Frequent change of subcontractors because of their inefficient work • Poor qualification of the contractor's technical staff •Inadequate Planning and Scheduling	• Conflict modifications • Labor dispute and strike

• Lack of coordination with the contractor • Late Supervision and slow making decisions • Slow to give instructions		

2.2 Causes and Effects of Delays in Developing Countries

2.2.1 Causes in Developing Countries

Many construction projects across developing countries fail to meet the success criteria for various reasons, including poor cost and schedule performance. From the above sections, we have seen research conducted on the definition, causes, and delay types. Here, various studies will be covered in this area, recognizing the range of causes and consequences contributing to poor cost and time management in developing countries.

- The common causes of construction delays at various stages of the project life cycle and their influence on Ethiopian construction projects were investigated in a study (Tsegay Gebrehiwet, 2017). A questionnaire containing 52 causes and 5 effects of delay was used to collect data from 77 participants recruited through purposive sampling from contractors. And the crucial relative index (RII) and correlation coefficient were used as methodologies.
- Corruption, unavailability of utilities on site, inflation/price increases in materials, lack of quality materials, late design and design documents, slow delivery of materials, late in approving and receiving complete project work, poor site management and performance, late release budget, and ineffective project planning and scheduling are some influential causes of delay as Ethiopian construction projects. Research (Mulugeta, June,2018) looked into the impact of schedule and cost overrun elements in AAU building construction projects. The paper used a descriptive study method and issued 24 questionnaires with a 100% response rate. Furthermore, the actual project document revealed that the projects had a 46 percent average time overrun and a 25 percent average cost overrun. Based on the findings, the fundamental

causes of project time overruns were poor planning and scope specification, which necessitated significant design adjustments to complete the project.

- A study (Emmanuel Bentil, 2017) attempts to establish the scope of cost and time overruns in building construction projects in Ghana, their causes, and their influence on the industry, as well as give recommendations to reduce or eliminate them. Purposive, convenience, ad snowball sampling approaches were used in a questionnaire-based study, and 89 of the 120 surveys were returned. According to the data, cost and time overruns occurred in more than 40% of building construction projects in Ghana.
- In India, a study (P.ASMITHA, 2018) looked at the elements contributing to highway project overruns and their impact on project performance. Data was gathered via a questionnaire, and the Frequency Index was used to analyze the information. The most significant cost factors include increased material costs, inaccurate estimation, and underestimating project costs. In contrast, the most considerable time factors include unexpected site conditions, increased project scope, lack of timely payment, and inadequate planning.
- In Australia, Malaysia, and Ghana, a study undertaken by (Shah, 2016) attempted to identify the most compelling elements causing project delays and cost overruns, as well as feasible solutions to lessen the impact on construction projects. The primary goal of selecting three case studies is to compare delay factors. Various delay causes cause project delays and cost overruns in the construction sector in both industrialized and developing nations, according to three case studies. And numerous measures, depending on the nature of the delay factor, are required to reduce the impact of project delays and cost overruns.

2.2.2 Effects of Delays in Developing Countries

As previously said, all contracting parties share the aim to complete a project on time, within budget, and to the established quality standards (Client, Contractor, and Consultant). Delays almost always result in some type of loss for everyone. The consequences of construction delays in the project construction sector were investigated in a study (Murali Sambasivan & Yau Wen, 2007). The following are the six consequences of uncertainty that are discovered,

- Cost overrun
- Time overrun
- Dispute

- Arbitration
- Litigation
- Abandonment

In addition to the six impacts listed above, delays in building projects can result in low-quality completed projects and terrible public relations. Cost, time, and quality have been demonstrated above to be critical success elements in projects. Construction project delays are common and typically accompanied by cost overruns. Delays are detrimental to clients, contractors, and consultants regarding growth in various relationships, mistrust, litigation, arbitration, and cash-flow difficulties. Each consequence is discussed in detail in the section below.

2.2.2.1 Cost Overrun

Construction cost overruns differ between the actual project completion cost and the contract budget amount. They are calculated using the initial projected cost and the ultimate completion cost incurred throughout the project commissioning. The positive difference between a construction project's completion cost during commissioning and the contract amount agreed upon by the relevant parties during contract signing and project start-up is characterized as cost overrun in this context.

- The difference between the signed or agreed contract sum and the total project cost is calculated as follows:

$$Cost\ ratio(CR) = \frac{\text{Completion cost}}{Contract\ Amount} \qquad (2.1)$$

When the ideal C.R. exceeds the value of 1.0, it is referred to as "cost overrun."

- To convert the above value to a percentage, use the equation below (Equation 2.2).

$$Cost\ ratio(\%) = \frac{\text{Completion cost} - \text{Orginal Contract cost}}{Original\ Contract\ Amount} \qquad (2.2)$$

When the ideal C.R. surpasses the value of 1.0 in a construction project, it is referred to as "cost overrun". Cost overruns occur for various reasons, which are discussed in detail in the following paragraphs. Poor contract management, price fluctuation, material shortages, frequent design

changes, weather, financing, and late issuing of payments are stated as causes of cost overruns in building projects by Nigerian researchers (A. Omoregie, 2006).

Similarly, in a study conducted in Ghana, the client's financial difficulties, delays in payment of completed works, design variations, a lack of communication plans, poor feasibility and project analysis, poor financial management on site, and material price fluctuations were all factors affecting cost overruns (Samuel Famiyeh, 2015).

Generally, Cost overruns can be caused by various factors, including the consultant, contractor, and client, as shown in the table below.

Table 2-2: Common factors of cost overrun **(Samuel Famiyeh, 2015)**

Cause of Cost overrun		
Contractors	***Consultant***	***Client***
-Poor site management and supervision -Incomplete subcontractors - Schedule delay - Inaccurate time and cost estimation - Poor coordination and communication b/t contractor and other parties -Poor financial control mechanism - Often changing sub-contractors	- Lack of sufficient experience of consultants - Delay in reviewing the design documents - Project design complexity -Poor coordination/ communication between consultant and parties - Slowness in giving instruction - Conflicts amongst consultants with other parties - Delay in reporting the progress of works done	-Delay in progress payments -Delay in delivering the site to the contractor -Delay in delivering the site to the contractor -Unrealistic contract duration -Work suspension by client -Poor financial control mechanism

*2.2.2.2 **Time** Overrun*

When a construction project's completion date is pushed ahead, it is said to have experienced a time overrun. The term "time overrun" refers to a delay in completing or delivering a construction project beyond the time set or agreed upon by all parties involved (Haseeb, 2011).

Time overrun is influenced by the contractor and client-related issues such as insufficient contractor expertise and owner involvement. Financial problems, late payments for finished and ongoing work, modification orders, organizational changes, and other factors contribute to timetable delays (Sunjka, 2013).

The impact of construction delays on project delivery in the Nigerian construction industry was investigated, and one of the most significant repercussions of delay was time overrun. (Aibinu, 2002).

Financial issues, unrealistic contract durations enforced by the customer, inadequately described project scope, and client-initiated adjustments, according to a Ghanaian researcher (Samuel Famiyeh, 2015). Consultants' underestimation of project costs and insufficient inspection/supervision of projects were also significant reasons for construction time overruns. Other issues included contractors underestimating project complexity, poor site management, and contractors employing ineffective building technologies, as well as government agency delays in issuing permits.

In general, a poorly qualified workforce, intricate works, inappropriate project manager knowledge, erroneous project duration estimation, and a lack of sufficient talent and experience are the elements that lead construction projects to be delayed due to time overrun.

2.2.2.3 Disputes

Disputes result from fundamental causes of construction project delays, such as Client-related, Contractor-related, Consultant-related, and external-related issues that may emerge between project participants during construction. Misunderstandings, confrontations, and disputes may result from a lack of communication. As a result, project managers must have strong communication skills with the project partners involved in building projects, which is one of the essential talents (People skills).

According to (Murali, 2007) , factors such as a lack of communication between the parties, issues with neighbors, unforeseen site conditions, delays in payments for completed work, improper construction methods, delays caused by the sub-contractor (hired by the contractor), and discrepancies in signed contract documents will lead to disputes. In addition, arbitration or a lawsuit may be used if the conflicts cannot be resolved through negotiation.

2.2.2.4 Arbitration and Litigation

According to (Murali, 2007), delays caused by the client or contractor-related causes like modification orders, delayed progress payments, contractor non-performance, and a lack of communication between parties will be resolved through arbitration. In these circumstances, a competent third party who can resolve conflicts without resorting to court is required.

Also, in this case, Delays induced by client-related, contractor-related, labor-related, and external-related variables, such as delays in payment for finished works, site conditions, and labor shortages, eventually lead to disputes that must be handled through litigation, according to (Murali, 2007). Parties involved in construction projects use litigation as a last resort to resolve issues.

2.2.2.5 Total Abandonment

The most severe adverse effect of construction project delays is abandonment, which could be temporary or permanent depending on the severity of the delay. Client-related, consultant-related, contractor-related, and external-related issues may result in project abandonment, causing delays in building projects. The implications of construction delays on project delivery in the Nigerian construction industry were investigated by (Aibinu, 2002). They found absolute desertion was one of the most considerable repercussions of delay.

2.2.2.6 External Factors

External influences can cause construction projects to be delayed, and these elements might be difficult to control. One cause of delay in construction projects that the client should handle is the delay in acquiring permissions from the municipality. Other external causes of delay include

regulatory changes, weather effects on construction activities, a rise in material prices in the country, and a delay in providing amenities such as water and power.

Overall, six significant effects of construction project delays were identified based on the literature review: time overrun, cost overrun, dispute, arbitration, outright abandonment, and litigation. The fishbone diagram below depicts these primary consequences.

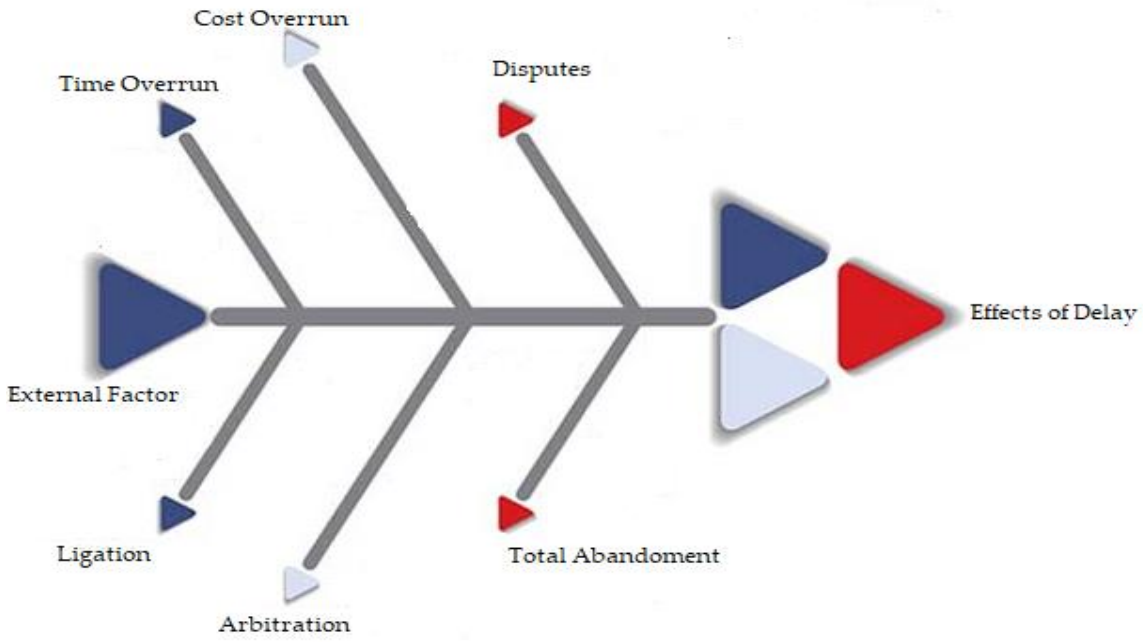

*Figure 2-2: Fishbone Diagram of Six effects of the construction del*ay **(Mohammad Abed, 2011)**

2.2.3 Project Success and Performance

According to the study (Al-Momani,A.H, 2000) , the success of any project is determined by two key factors: the quality of construction services provided by contractors and the project owner's expectations. Managing the building process such that all parties perceive an equal share of the advantages might be critical to the project's success. It has been shown that a total absence of attention paid to the pleasure of the owner’s correlates to bad performance. Poor performance is

also caused by declining market shares, low efficiency and productivity, and the substantial rise in construction costs.

(Nitithamyong, et.al, 2007) Stated in their article that the success of building projects depends on technology, process, personnel procurement, legal challenges, and knowledge management, all of which must be considered equally. With the project completed within an acceptable time, cost, and quality, and attaining the client's satisfaction, Pheng and Chuan (2006) defines project success. The project's success may be measured by how well the indicators perform.

The (M.Alvarado,et al., 2005)Alvarado et al., 2005) concerns scope, timeline, and budget. They also discovered seven KPIs for construction projects: construction cost, construction time, cost predictability, time predictability, defects, product satisfaction, and service satisfaction, as well as three company performance indicators. Safety, profitability, and productivity are the most important factors to consider.

2.2.4 Key Performance Indicators in Construction project

Working groups in the United Kingdom on Key Performance Indicators (KPIs) have identified ten factors for assessing projects in order to obtain good results. (Mike Murray, 1944-1998).

The (M.Alvarado,et al., 2005)Alvarado et al., 2005) concerns scope, timeline, and budget. They also discovered seven KPIs for construction projects: construction cost, construction time, cost predictability, time predictability, defects, product satisfaction, and service satisfaction, as well as three company performance indicators. Safety, profitability, and productivity are the most important factors to consider. in this paper use cost and time of construction and client satisfaction as the Performance indicator of the project work.

2.3 Conceptual Framework

A conceptual framework is a collection of fundamental concepts and principles drawn from several disciplines of study and used to outline a future presentation (Reichel, M., & Ramey, M. A, 1987). In this study, the conceptual framework was utilized to illustrate many variables that impact the construction's performance. The conceptual framework of the study work is shown in the diagram below *(Figure 2-3*).

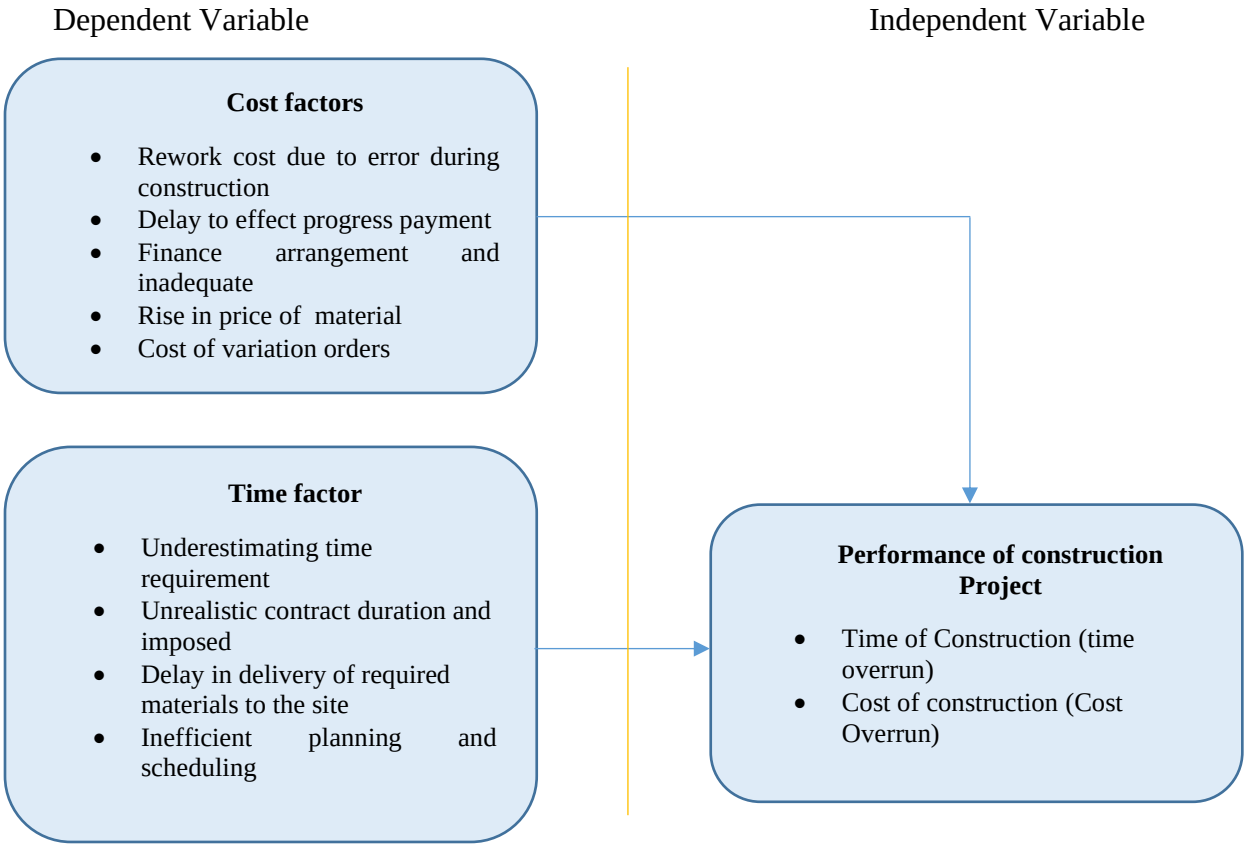

Figure 2-4 : Conceptual Frame Work (Edger, D., 2008)

CHAPTER THREE

3. Research Methodology

3.1 Introduction

This chapter will cover research methodologies, study design types, target populations, sample sizes, sampling procedures, sample collection procedures, research equipment, and data collection methods. It also stipulated how the information would be analyzed and presented.

3.2 Research Design

The study's history, research methodology, data source and type, targeted population, sample size and sampling tactics, data collection methods, and data analysis are all covered in this chapter. The primary elements that could lead to cost and time overruns in building projects were identified by the exhaustive literature research outlined in the preceding section. Data was gathered using those causes.

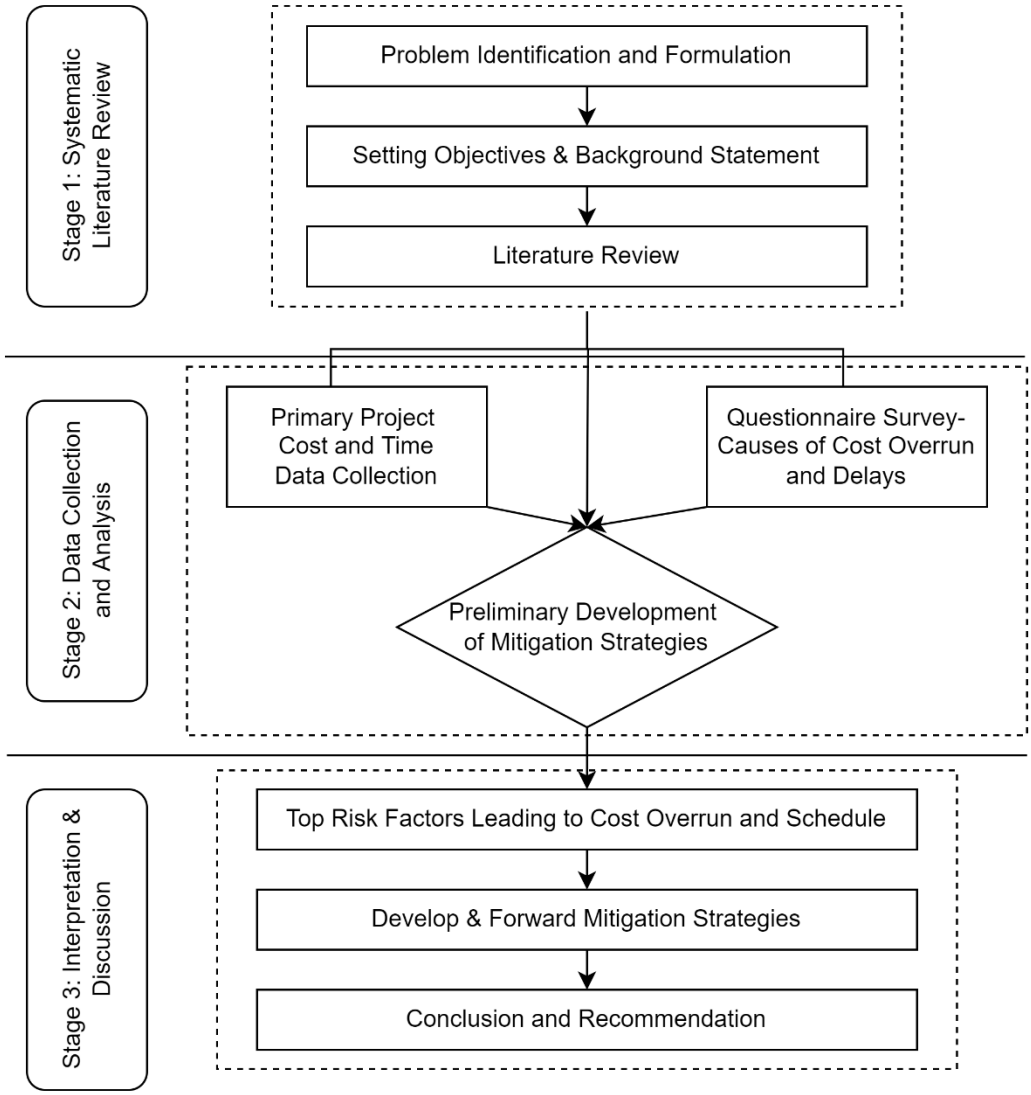

Figure 3-1: Methodologies followed in executing the Project work.

3.3 Data Collection Method

The data for this project collected from a variety of primary and secondary sources, which are detailed in the sections below.

3.3.1 Primary Data Collection Method

A questionnaire, interview and observation was used to collect the primary data. A structured questionnaire survey was used to collect primary data. This was delivered to 65 construction professionals, including architects, quantity surveyors, engineers (residential, civil, electrical,

sanitary, and mechanical), construction managers, lecturers, and project managers participating in AAU, college of commerce construction activities. This yardstick was deemed critical for the survey to provide an accurate picture of the effects of building project costs and time delays.

There are three key components to the questionnaire. The first section is related to respondents' general information, including their working positions and experience in the construction industry. The second part includes the list of the identified factors and their evaluation criteria. The survey population is restricted to professionals who worked on the campus construction projects from the different project parties. The third section elaborates on the delay causes related to the project life cycle: Planning, design, and construction.

In the project work, an interview was done with carefully selected candidates. The crucial interview involving three parties (contractor, client, and consultant) was conducted to determine the causes of project cost and time overruns. Additionally, an interview checklist was created to track and lead the interviews to the topic of discussion during the interview session.

Lastly, site observation was another method of data gathering strategy examined during the project work-study. It was chosen because it allows researchers to explore problems and opportunities in the actual world. As a result, observations were made while respondents were engaged in their daily tasks.

The reasons of construction project delays (time and expense overruns) were assessed using a five-point Likert scale based on the identified variables in the literature.

The adopted scales were as follows:

Table 3-1: Five points of the Likert scale to access the cause of construction delay

Extremely Unlikely	Unlikely	Neutral	Likely	Extremely Likely
1	2	3	4	5

The five-point scale was transformed to mean item score (MIS) for each of the factors of causes of cost overruns as assessed by the respondents. The indices were then used to determine the rank of each item. The ranking made it possible to cross-compare the relative importance of the things perceived by the respondents. This method was used to analyze the data collected from the questionnaire survey.

3.3.1.1 Mean Item Score (MIS)

The Likert scale was converted to a mean item score (MIS) for each component of cost and time overrun reasons as determined by the respondents. The indices were then used to compute each item's rank, allowing for a cross-comparison of the items' relative importance as assessed by the respondents. The data collected from the questionnaire survey were analyzed using this method. For each item, the mean item score (MIS) was computed as follows;

$$MIS = \frac{1n_1+2n_2+3n_3+4n_4+5n_5}{\sum N} \qquad (3.1)$$

Where,

n_1= Number of Respondents for extremely unlikely;

n_2= Number of Respondents for unlikely;

n_3= Number of Respondents for neutral;

n_4= Number of Respondents for likely;

n_5= Number of Respondents for extremely likely;

N= Total Number of Respondents

After mathematical computations in above equation (Equation 3.1), the factors were ranked in descending order of their mean item score (from the highest to the lowest).

3.3.2 Secondary Data collection method

Secondary data was acquired through a survey of literature and archive documents, such as books, journal articles, working papers, and other relevant works on the specified research subject, which were predominantly reviewed through internet sources. Additionally, throughout the study's analysis and interpretation, published and unpublished records and other related written reports on concerns of delay were employed.

3.4 Population

From 2011 to 2022 EC, the research focused on one construction project at Addis Ababa University, School of Commerce. As a result, the study's target group included all customers (owners), contractors, and consultants involved in building construction. The population is 65 as a whole (10 clients, 15 contractors, and 19 consultants, including intermittent engineers).

3.5 Unit of analysis

This study focuses mainly on building construction projects under AAU that were completed over the previous ten years in terms of the unit of analysis (from 2003–2007 EC).

3.6 Sampling and Sampling Procedure

We determined that to interpret our findings correctly, we needed to figure out how to choose a sample that was typical of the entire population. For this study, we adopted a non-random selection strategy based on criteria of probability and non-probability sampling methodologies. As an outcome, we were able to collect data right away.

A purposive selection method was used to select respondents from the overall population from among the several types of non-probability sampling approaches. Purposive sampling, also known as judgment sampling, entails a researcher using their knowledge to choose the most helpful sample for the study's purpose. Purposive sampling is utilized on the building site to select respondents for this project because professionals or experts directly involved with the issues are expected to have more knowledge data than others.

Representatives from the current professionals were chosen through systematic sampling to complete the survey questionnaire. The researcher's position, education level, and occupation influence the sample size. The researcher adopted the method because of their education, status, and professions, all linked to the knowledge and expertise they've gained on the causes of construction site delays over their lives. The enormous sample sizes attracted much attention and generated many reactions.

3.7 Instruments

To obtain data, all relevant and available documents were reviewed and processed. The project completion reports show whether the building was built according to the signed contract agreement.

Clients, contractors, and consultants were asked for their opinions on variables influencing construction project performance using closed-ended questionnaires in the form of a Likert scale.

3.8 Sample Size determination

As previously stated, the study utilized a purposive sample technique to select AAU School of commerce construction site participants from among the other Addis Ababa University construction sites. Throughout the project's life cycle, delays are assumed. In addition, the

researcher selects AAU, a college of commerce initiative, to collect data for the study. There was 65 personnel working at the research location at the time, according to the selected project.

The following Equation (equation 3.2) used (COCHRAN, 1977) and (Kothari, 2004) to determine sample size (n) with the required degree of precision for total project participants and the participant's variable (p) in this study:

$$n = \frac{Z^2 PQ\, N}{e^2(N-1)+Z^2 PQ} \qquad (3.2)$$

Where, **n** = sample size of the participants unit

P = proportion of success =80%

$\boldsymbol{Q} = 1 - p$= Proportion of fail=20%

$\boldsymbol{e}$= Standard error=5%

N = Total participant unit=65

Z = standard normal variable and value that corresponds to 95% confidence limit, which is equal to 1.96

d = Allowable error (0.05 or 5%)

According to statistics collected from AAU College of Commerce, the project had one site (resident) project manager, 14 intermittent engineers from the consultant side, 40 from the contractor, and ten engineers and managers from the client-side, for a total of around 65 participants in the project (N).

By inserting the variables in the above equation (Equation 3.2),

$$n = \frac{(1.96)^2 * .8 * 0.2 * 200}{0.05^2(65-1) + (1.96)^2 * 0.8 * 0.2}$$

n=42.7

n ~ 43

- Approximately, the sample size was calculated to be 43.

3.9 Data Analysis Method

The data analysis began as soon as the study site data was collected. Both quantitative and qualitative research methodologies were investigated for data arrangement and interpretation. The researcher used quantitative data analysis to examine numerical data from respected respondents by questionnaire.

The data gathered through surveys was analyzed statistically using graphs and tables in the Statistical Package for Social Sciences (SPSS), Excel, and Google Form. Graphs, tables, and charts are employed to summarize the data descriptively. The qualitative method was used to back up the quantitative data collected in the study.

Finally, conclusions and recommendations are offered based on the acquired data and analysis results.

3.10 Data Presentation

Data is displayed using tables, graphs, and charts and then explored in detail in paragraphs.

3.11 Consideration of Ethical Issues

A few key terms define the ethical framework modern social and medical research institutions have put in place to preserve study participants' rights. According to the idea of voluntary participation, people should not be coerced to participate in research. Informed consent is inextricably linked to the concept of voluntary participation.

The researcher obtains participants' permission to conduct a questionnaire survey. First and foremost, the researcher stated that the study was conducted for scholarly purposes. Personal information or background will be kept private and will not be shared with any third parties unless they have provided their explicit permission.

CHAPTER FOUR

4. Data Analysis and Interpretation

4.1 Introduction

Data from closed-ended questionnaires and interviews, as well as data analysis and discussion, are included in this chapter. In the project work, data was collected and carried out in the study area, with data collected from selected samples.

The study questions and questionnaire sections are organized into three groups. Gender, organization type, firm designation, construction industry experience, and construction project experience are all included in the first part. Potential delay factors were picked and divided into groups based on previous research. The questions in the second section of the results and discussion aim to identify the severity of Client, Contractor, Consultant, and externally associated delay-causing factors and rank them by mean. And thirdly, the respondents were asked to determine in which project life cycle the delay occurred.

As previously stated, these delay factors were rated using a Likert's scale on a five-point scale from 1 to 5 on a scale of Very high, high, medium, low, and very low, with the findings of the questions being presented and evaluated accordingly.

Before the acquired data was evaluated, data filling, cleaning, and processing were performed. These procedures allow for more reliable data analysis since some respondents completed the first component of the survey and left the remaining sections blank, resulting in data discrepancies throughout the study. The number of participants reduced from 37 to 35 as a consequence. Finally, the processed data was analyzed using Google format and SPSS (2022). Both tools are used to convey the outcome.

The survey results are shown below in three sections, each analyzed and presented separately.

4.2 Questionnaire Distribution and Statistical Response

4.2.1 Response rate

A total of 43 surveys were distributed via Google's format through mobile technology, with some being printed. The participants (clients who represent professionals, contractors, consultants, and sub-contractors) in AAU's College of Commerce projects calculate respondents' organizational type and response rate.

4.2.2 Statistically Response

From the above table, out of 34 questionnaires distributed, 31(91.17%) were returned. There were 3 (75%) questionnaires from the client and professionals from the client-side related to construction, 11 (84.6%) from contractors and their key staff, 2(100%) from sub-contractors, 15(100%) from the consultants' side and engineers. It shows that all the three parties were involved in responding to the questionnaire and put their comments based on their experience in the study of the cause of delay factors in Addis Ababa prisoner's building construction Projects.

Table 4-1: Statistically Responses for distributed Questionnaires (Own Source)

Questionaries' Distributed and Returned				
Respondent Organization type	**Questionnaire distributed (Q.D.)**	**Questionnaire Returned (Q.R.)**	**Difference between QD-QR**	**% of return Vs. distribution**
Contractor side	15	13	2	30.23
Consultant side	19	19	0	44.18
Client-side	9	5	4	11.62
Total	43	37	6	86.04

As shown in the table above, 37 (86.04%) of the 43 surveys were returned. There were 5 (55.5%) questionnaires from the client professionals, 13 (86.67%) from contractors and their core staff, and 19 (100%) from consultant engineers.

It illustrates that all three parties were involved in responding to the questionnaire and making recommendations based on their understanding of the factors that cause construction delays at Addis Ababa University College of Commerce. Even though 37 people answered the survey, two didn't fill it out completely; therefore, they were removed from the analysis.

4.2.3 Gender Respondents

According to the graph below, male professionals account for 71.4 percent of the respondents, while female professionals account for 25.7 percent and 2.9% of the respondent didn't fill the gender part. It reveals that the research into delay causes in the construction of the AAU College of Commerce building included male and female respondents. For anonymity, two people did not fill in their gender.

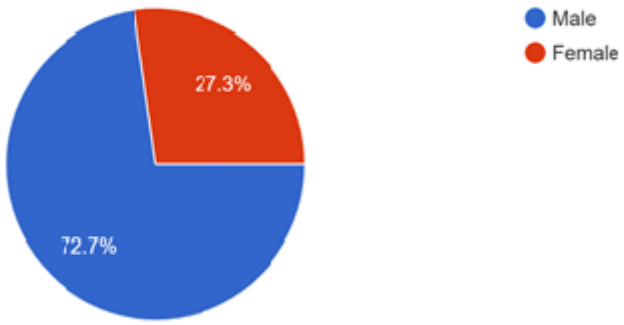

Figure 4-1: Gender Respondents extracted from Google format

- Table below shown the gender distribution in SPSS.

Table 4-2: Gender Respondent extracted from SPSS_2022

	Frequency	Percent
Unknown	1	2.9
Female	9	25.7
Male	25	71.4
Total	35	100

4.2.4 Age

The age of the respondents, as well as their percentage, is shown in the graph and table below (Table 4-3).

Table 4-3: Age of Respondent in extracted from SPSS-2022

Age Range	Frequency	Percent
26 – 46	24	68.6
47 – 50	5	14.3
Above 50	6	17.1
Total	35	100

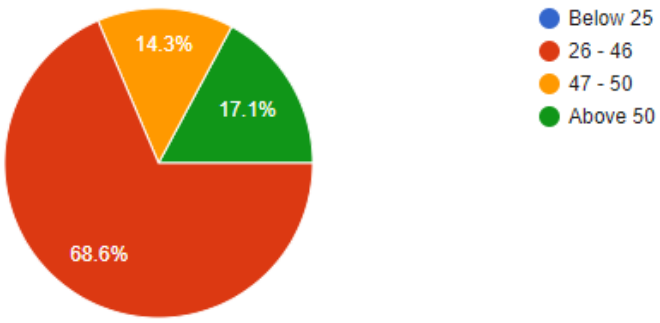

Figure 4-2: Age respondent extracted from Google Forms

4.2.5 Educational Background

The respondent's educational background is depicted in the graph below, along with their percentage.

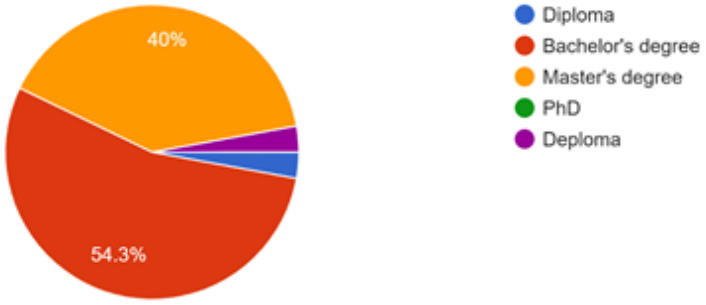

Figure 4-3: Educational Background extracted from Google Forms

The majority of respondents (54.3 percent) have a bachelor's degree, and 40% have a master's degree, as seen in the graph above (*Figure 4-4*).

4.2.6 Respondent Designation

From the table below, it can be observed that the number of participating professionals responding to the questionnaire is 35, with nine different positions. The designation of the respondents shows a wider variety of professionals relevant to the construction delay analysis.

Table 4-4: Respondent designation in the company from SPSS-2022

Designation Type	Frequency	Percentage
Unknown	11	31.4
DGM	1	2.9
Electrical Engineer	1	2.9
Office Engineer	8	22.9
Owner	1	2.9
Project Manager	7	20
Quantity	1	2.9
Resident Engineer	1	2.9
Site Engineer	1	2.9
Site Supervisor	3	8.6
Total	35	100

Most professionals who responded to the questionnaire were Office engineers, as shown in the table above. Because consultants oversee the majority of projects and share the client and consultant's responsibilities. As a result, those professionals' responses and comments were required to investigate the causes of cost and time overruns in AAU College of commerce building construction projects.

4.2.7 Work experience

The work experience of the respondent in a related field is shown in the figure below.

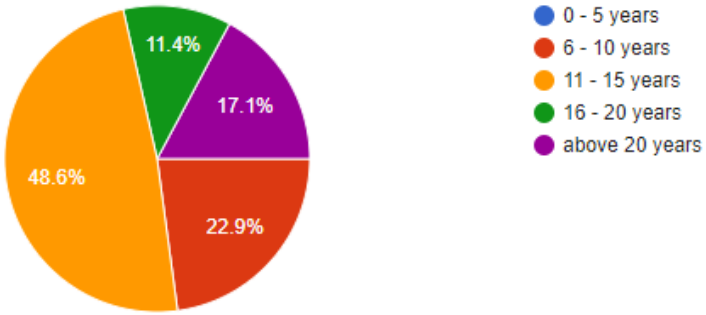

Figure 4-5: Work experience of the respondent in Google Forms

From the above figure (*Figure 4-6*), 48.6% of the respondents had 11-15 years of experience working in the construction industry. 22.9 percent of respondents have 6-10 years of experience, while 17.1 % and 11 %, respectively, have 6-10 and fewer than five years of work experience.

4.2.8 Organization Type

Finally, the responder filled in the sort of company they worked for throughout project execution from the first section.

Table 4-5: Organization type extracted from the repondant in SPSS-2022

Organization type	Frequency	Percentage
Client	5	14.3
Consultant	20	57.1
Contractor	8	22.9
Sub-contractor	2	5.7

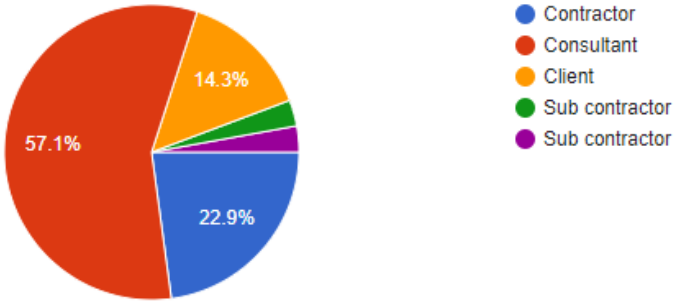

Figure 4-7: Organization type filled presented from Google Forms

We concluded that the percentage of respondents from all organizations are male and between the ages of 26 and 46. With 54.3 percent having a bachelor's degree and 40% having a master's degree. And the majority of the respondents had 11-15 years of work experience.

4.3 The Average and ranking of delays caused by respondents

In the second section, the response elaborated on the issues identified by the client, contractor, and consultant. Building delays are an inevitable problem and a common occurrence in building projects. Delays in construction projects can arise owing to a variety of factors. These factors are grouped into four groups in this project research.

- Client related
- Contractor related
- Consultant related ,and
- External factor related.

Respondents were asked to score the average delay reasons on a five-point scale (very high, high, medium, low, and very low) in this regard. The average and ranking of delay factors were determined using a questionnaire survey research approach and statistical SPSS software (SPSS-22).

4.3.1 Client related

Table 4-6: Mean and Ranking Response of Client related causes of delay

Cause of delay (Client related)	Scale	Frequency	Percent	Mean	Rank
Slow Decision making	Low	1	2.9	3.74	1
	Medium	14	40		
	High	13	37.1		
	Very High	7	20		
Underestimating time requirement	Low	2	5.7	3.6	2
	Medium	12	34.3		
	High	19	54.3		
	Very High	2	5.7		
Client interference	Low	1	2.9	3.54	3
	Medium	16	45.7		
	High	16	45.7		
	Very High	2	5.7		
Change the scope of the project during construction (Change/ variation order)	Low	3	8.6	3.51	4
	Medium	13	37.1		
	High	17	48.6		
	Very High	2	5.7		
Delay to effect progress payment	Low	5	14.3	3.49	5
	Medium	12	34.3		
	High	14	40		
	Very High	4	11.4		
	Low	3	8.6	3.49	5

Unrealistic contract duration and imposed	Medium	15	42.9		
	High	14	40		
	Very High	3	8.6		
Poor coordination and communication	Low	2	5.7	3.49	5
	Medium	16	45.7		
	High	15	42.9		
	Very High	2	5.7		
Rework due to error during construction	Low	2	5.7	3.4	8
	Medium	19	54.3		
	High	12	34.3		
	Very High	2	5.7		
Finance arrangement and inadequate fund	Low	4	11.4	3.29	9
	Medium	20	57.1		
	High	8	22.9		
	Very High	3	8.6		

According to the table above, the findings are that the project with the highest rank in the project that primarily causes cost and time overrun in AAU College of commerce projects has a 3.74 mean value, which reflects the amount of slow decision making from the client-side. The second source of delay raised from the client with a computed 3.6 value is underestimating the time needed for a specific task. The third most prevalent reason for project delays is unnecessary client intervention during project execution.

The fourth most common cause of delay in the AAU College of Commerce project with 3.51 mean values was a change in scope during construction. With a mean of 3.49, there was a delay in effecting progress payments, an unreasonable contract term enforced, and insufficient coordination and communication.

4.3.2 Contractor Related

Table 4-7: Mean and Ranking Response of contractor related causes of delay

Cause of delay (Contractor related)	Scale	Frequency	Percent	Mean	Rank
Poor coordination and communication	Low	1	2.9	3.83	1
	Medium	14	40		
	High	10	28.6		
	Very High	10	28.6		
delivery of required materials to the site delay	Low	1	2.9	3.8	2
	Medium	13	37.1		
	High	13	37.1		
	Very High	8	22.9		
Delay in sub contractor's work	Low	1	2.9	3.8	2
	Medium	11	31.4		
	High	17	48.6		
	Very High	6	17.1		
Inefficient planning and scheduling	Low	2	5.7	3.69	4
	Medium	13	37.1		
	High	14	40		
	Very High	6	17.1		
Lack of skilled and experienced labor	Low	3		3.63	5
	Medium	12			
	High	15			
	Very High	5			

Lack of training program	Very Low	1	2.9	3.63	5
	Low	2	5.7		
	Medium	11	31.4		
	High	16	45.7		
	Very High	5	14.3		
Poor project risk management	Unknown	1	2.9	3.57	7
	Low	1	2.9		
	Medium	14	40		
	High	14	40		
	Very High	5	14.3		
Inadequate experience of contractor	Unknown	1	2.9	3.51	8
	Low	5	14.3		
	Medium	9	25.7		
	High	14	40		
	Very High	6	17.1		
Poor project management	Unknown	1	2.9	3.46	9
	Low	2	5.7		
	Medium	16	45.7		
	High	11	31.4		
	Very High	5	14.3		
Inappropriate construction method	Unknown	2	5.7	3.4	10

According to the statistics in the table above, the most common cause of contractor delay is poor project coordination and communication, which has a mean value of 3.83. A delay in the provision of necessary supplies to the site and a delay in sub-contractor activities are the second and third causes of cost and time overrun in the project, respectively (3.8 mean value). A lack of adequate planning is the fourth factor. As per the statistics, a scarcity of competent, experienced people and training programs cause project delays, with a computed mean value of 3.63, the fifth level.

4.3.3 Consultant related

Table 4-8: Mean and Ranking Response of External Factors related to causes of delay

Cause of delay (Consultant related)		Frequency	Percentage	Mean	Rank
Slow response and inspection	Low	1	2.9	3.91	1
	Medium	10	28.6		
	High	15	42.9		
	Very High	9	25.7		
Mistakes and discrepancies in design documents	Low	1	2.9	3.8	2
	Medium	11	31.4		
	High	17	48.6		
	Very High	6	17.1		
Poor contract management	Low	2	5.7	3.69	3
	Medium	13	37.1		
	High	14	40		
	Very High	6	17.1		
Unclear and inadequate details in drawings	Medium	14	40	3.66	4
	High	19	54.3		
	Very High	2	5.7		
Poor Communication and coordination	0	1	2.9	3.51	5
	Low	2	5.7		
	Medium	13	37.1		

	High	15	42.9		
	Very High	4	11.4		
Inadequate experience of Consultant	Low	4	11.4	3.43	6
	Medium	13	37.1		
	High	17	48.6		
	Very High	1	2.9		
Inaccurate site investigation	Very Low	1	2.9	3.31	7
	Low	3	8.6		
	Medium	18	51.4		
	High	10	28.6		
	Very High	3	8.6		

According to the above table, the primary reasons for the cost and time overrun related to the consultant's delayed response and inspection, with an average value of 3.91 based on the statistical (SPSS-2022) tool data analysis method. Because of the longer chain in the operational structure of the consulting company's organization, responding in a shorter amount of time is difficult. Furthermore, the consulting firm lacks technology capabilities to handle correspondence and clarification letters from other stakeholders. With a computed mean value of 3.8, mistakes and discrepancies in design papers are the second most common cause of delays in building construction.

Mistakes in design execution are most common when the disciplines in the design team do not collaborate to implement the design together. According to the data analysis, poor contract management is the third most common reason for delay caused by consultant delays. The fourth and fifth causes of cost and time overruns in the AAU College of commerce project include unclear and inadequate details in the drawings, poor communication, and collaboration with mean values of 3.69 and 3.66, respectively.

4.3.4 External factor-related

Table 4-9: Mean and Ranking Response of External Factors related to causes of delay

Cause of delay (External factors)	Scale	Frequency	Percentage	Mean	Rank
The rise in the price of materials	Medium	3	8.6	4.77	1
	High	2	5.7		
	Very High	30	85.7		
Utilities' failure to provide services on time (Such as water, electricity, and so)	Very Low	1	2.9	3.6	2
	Low	2	5.7		
	Medium	9	25.7		
	High	20	57.1		
	Very High	3	8.6		
Unforeseen site conditions	Low	3	8.6	3.6	2
	Medium	12	34.3		
	High	16	45.7		
	Very High	4	11.4		
Delay in obtaining the permit	Medium	22	62.9	3.49	4
	High	9	25.7		
	Very High	4	11.4		
Government policies	Very Low	1	2.9	3.17	5
	Low	5	14.3		
	Medium	19	54.3		
	High	7	20		
	Very High	3	8.6		
Weather Condition	Low	4	11.4	3.14	6
	Medium	22	62.9		
	High	9	25.7		
Natural Disasters	Very Low	3	8.6	2.89	7
	Low	7	20		
	Medium	17	48.6		

	High	7	20		
	Very High	1	2.9		

Source: Own computation

According to the above table, 87 percent of respondents believe the level of rising material prices that causes cost and time overruns in AAU College of Commerce is Very high. In contrast, in the project study, the remaining percentages, 8.6 percent, and 5.7 percent believe the level is high and medium. An increase in material prices has a significant impact on the cause of cost and time overruns in the AAU College of Commerce project.

Generally, the table above indicates that the first external cause of delay in the AAU College of Commerce project is mainly a rise in material prices, which accounts for 4.77 percent of the total. The second source of cost and time overrun in AAU College of commerce is a delay in supplying services from utilities like water and electricity and unexpected site circumstances. With a mean value of 3.49 and 3.17, respectively, the delay in acquiring government permission as the source of delay was rated fourth and fifth.

The information in the preceding tables was acquired from the respondent survey and processed using a statistical tool, with the results being displayed. From section two findings, we can conclude that the primary causes for delay in AAU college of the project are delayed decision making, poor coordination and communication, slow reaction and inspection, and an increase in the price of supplies raised from the client, contractor, consultant, and external factor respectively.

4.4 Delay causing factors on project life cycle

The final section of the outcome is separated into three sections based on the major project life cycle.

- Planning phase
- Design phase and
- Construction phase

Planning phase

The table below shows the mean and ranking of the cause of delay in the planning phase

Table 4-10: Mean and ranking of the cause of delay in the planning phase

Delay causing factors based on project life cycle - Planning Phase		
	Mean	Rank
Underestimating time requirement	3.97	1
Lowest bidding procurement policy	3.89	2
Poor project risk management	3.89	3
Poor planning	3.86	4
Lack of project cost management	3.77	5

Source: Own computation

According to the data, the highest degree of the cause for delay in the planning phase is underestimating the required time to execute the necessary activity, with a mean value of 3.97. The second and third causes of delays in planning processes are a low-bid procurement strategy and inadequate planning.

Design Phase

*Table 4-11***:** *Mean and ranking of the cause of delay in the design phase*

Delay causing factors based on project life cycle - Design Phase	
Factors	Mean
Frequent design change	4.17
Delay in designing work	4.00
Incomplete design at the time of tendering	3.91
Lack of designer experience and unclear specification	3.77
Poor project design	3.60

Source: Own computation

According to the table above, the most common reason for the delay in the project's design phase is frequent design changes, representing the 4.17 mean value of all delays. The second and third causes of design phase delays are delays in designing work and unfinished designs at the time of tendering.

Construction phase

Table 4-12: *Mean and ranking of the cause of delay in the construction phase*

Delay causing factors based on project life cycle - Construction Phase	
Factors	Mean
Currency exchange	4.57
A contractual claim such as the extension of time with cost claims	4.00
Poor financial control on site	3.97
Additional work at clients' request	3.97
Delay in progress payment	3.91
Change in scope/ scope creep	3.91
Delay in designing work	3.83
Damage of materials	3.83
Improvements to standard drawings during construction stage	3.71
Theft/ Corruption	3.46

Source: Own computation

The statistics from the above table show that currency exchange is the most common reason for construction delays, with a mean of 4.57. The second most common reason for cost and time overruns during the construction phase of the AAU College of Commerce project is structural claims, such as time extensions and cost claims. With a 3.97 average, poor financial control on-site and additional work at the client's request are the third causes of delay. The fourth reason for the delay factor is a delay in progress payment and a change in scope.

Table 4-13: Delay causing factors based on project life cycle

Delay driving factors based on project life cycle	Role			
	Client	Consultant	Contractor	Sub contra
	Mean	Mean	Mean	Mean
Poor planning	4.40	3.80	3.75	3.50
Poor project risk management	4.00	3.95	3.63	4.00
Lack of project cost management	4.00	3.80	3.75	3.00
Lowest bidding procurement policy	3.40	4.10	3.75	3.50
Underestimating time requirement	4.20	4.15	3.50	3.50
Poor project design	3.60	3.60	3.63	3.50
Frequent design change	4.20	4.10	4.50	3.50
Incomplete design at the time of tendering	4.60	3.95	3.63	3.00
Delay in designing work	4.60	3.85	4.38	2.50
Lack of designer experience and unclear specification	4.20	3.75	3.75	3.00
Improvements to standard drawings during the construction stage	4.40	3.65	3.63	3.00
Additional work at clients' request	4.40	3.90	4.00	3.50
Poor financial control on site	4.20	4.10	3.63	3.50
Delay in designing work	4.20	3.80	4.00	2.50
Currency exchange	4.80	4.50	4.88	3.50
Change in scope/ scope creep	4.00	4.10	3.75	2.50
Delay in progress payment	4.40	3.85	4.00	3.00
A contractual claim such as an extension of time with cost claims	4.60	4.00	3.88	3.00
Theft/ Corruption	3.40	3.60	3.13	3.50
Damage of materials	4.40	3.70	4.00	3.00

Source: Own computation

4.5 Project information from the Contract Document

The study is directly related to AAU College of commerce projects owned by AAU. The case studies focus on assessing the causes of cost and time overrun. Detail project description is shown in the table below.

Table 4-14: Detail information on the AAU College of Commerce project

Project name	Facility Building, 50m^3 Septic Tank and Site Work
Client (Owner)	Addis Ababa University
Consultant	Ethiopian Construction Design and Supervision Works
Contractor	Yotek Construction PLC.
Signature Date of Contract agreement	17/05/2014 Ethiopian Calendar (G.C.)
Initial Contract Amount	342,058,341.40 Ethiopian Birr
Project start Date	9/9/06 (EC)
Initail Contract Period	730 calander day
Supplementary work/Variation Order	39,315,250.11 Ethiopian Birr
Revised Contract Period	730 calander day
The total amount of work executed and material supplied till the end	368,186,150.44 Ethiopian Birr
Provisional acceptance Date	13/11/09(EC)/ July 13/2009 (GC)
Proposed date of final acceptance	13/11/10 (EC)/ July 20/2010 (GC)

The project name signed between the stakeholders is Facility Building, 50m^3 septic Tank and Site Work is located in the AAU College of commerce compound. The project comprises the new building B+G+M+9, constructed by a local contractor: Yotek Construction. The project commenced on 17/05/2014E.C and was supposed to be completed on 13/11/ 2010E.C. with a contract period of 720 days. The initial contract amount of the project was ETB 345,058,341.40 Ethiopian Birr but was raised to ETB 368,186,150.44 Ethiopian Birr because of supplementary works and variation with the amount of 39,315,250.11 Ethiopian Birr.

4.6 Summary of results

In conclusion, the data in the above tables came from a respondent survey, which was then processed with a statistical tool, and the findings are shown. In section one, we observed that males between the ages of 26 and 46 make up the majority of responders across all organizations. A bachelor's degree is held by 54.3 percent, while a master's degree is owned by 40% of the respondent. And the majority of those surveyed had 11 to 15 years of experience.

We also can conclude from section two's findings that the primary causes of project delay in AAU college are delayed decision making, poor coordination and communication, slow reaction and inspection, and an increase in supply price raised by the client, contractor, consultant, and external factor, respectively.

In section three, it is discovered that underestimating time requirements, frequent design changes, and currency exchange ar significant causes of delays in the project life cycle: planning, design, and construction phase, respectively.

4.6.1 The influence of cost factors

The investigated project suffered in cost performance in the execution. For the building construction projects, the actual contracted costs were overrun ranges from 12% to 60% (39,315,250.11) birr of the contract amount..

4.6.2 The influence of time factors

The building construction projects, the contract time performance was affected ranges from 50% to 170% (50-700days) of the actual contracted time

4.6.3 Client satisfaction

Despite the fact that the building made a significant contribution to the university's educational infrastructure, some of the project's client end users are dissatisfied. Since they found the design flaws, a few of the building's components have stopped operating. Solar panels not operating at the intended load, battery life draining, and a variety of other causes are common in electrical work.

CHAPTER FIVE

5. Conclusion and Recommendation

This chapter contains conclusions and recommendations that will aid in the solution of the construction delay and its consequences at AAU, College of Commerce.

The study's initial purpose was to investigate and explain the causes of project delays in the case of AAU College of Commerce. Second, the sources of project delays are identified. The third and final purpose was to analyze the building construction project delays and their potential causes from diverse stakeholder perspectives, including design change as one element group of delay, and make recommendations to avoid or minimize delays and their subsequent effects.

5.1 Conclusion

The study's overall purpose was to identify the cause, assess and analyze the extent and hazards that lead to cost and time overruns (delays) in AAU College of Commerce construction projects. Furthermore, the research included benchmarking crucial steps for stakeholders to manage the critical risks imposed by project cost and time overruns, and hopefully in association with the delays across diverse infrastructures in the Ethiopian construction sector.

As a result of the case study, project performance indicators and tools in construction building projects must include cost and time management. The investigation also shows the extent of the cost and time excess (delay). Furthermore, to ensure the success of future building construction projects, it is necessary to decrease and enhance cost and time overruns (delays).

In addition, the study provided critical practical consequences and recommendations for stakeholders in the future to enhance the cost and time performance of comparable projects. The research findings are expected to have a significant favorable influence on a variety of stakeholders.

5.2 Recommendations

Cost overruns and schedule delays are wreaking havoc on the building of AAU projects, and a solution is recommended to prevent more delays. The method to avoid and counter delays is to prevent and mitigate the causes of delays and, as a consequence, the effects of delays on related construction projects, especially universities.

It is proposed that the reasons be addressed and a solution found so that these causes do not occur or occur infrequently.

The survey results indicated that the delay factors are relevant to the Client, Contractors and Consultant. Therefore, the following corrective measures are expected from all the organizations.

5.2.1 Recommendations to Contractors

The following suggestions were made for the contractor based on the study's findings.

- The contractor are recommended to work on the communication and coordination while the project's design and execution process during the project life cycle.
- Contractors are advised to keep track of the time it takes for essential goods to arrive on site. They should correctly collect necessary building supplies in advance (per the planned schedule), especially those limited in local markets, and ensure adequate on-site storage.
- Contractors should control how they deal with their subcontractors and have a set of requirements, standards, and timelines in hand, as well as follow the terms in the agreement to avoid time and cost overruns.
- Contractors are advised to use effective project planning and scheduling methodologies and adjust as needed to prevent time and cost overruns throughout the project's life cycle.
- Contractors should assign the right professional to the appropriate role and employ a competent and experienced workforce.
- Contractors should have a tight grip on the task to prevent rework and acquire bulk supplies at the outset of the project to avoid price inflation.

5.2.2 Recommendations to Consultants

All adjustments should be made before the start of construction, and the client's requirement should be well defined to prevent construction delays caused by change orders and design revisions,

- Consultants should respond and check more quickly when scenarios emerge that demand their intervention to prevent delays. To prevent delays, consultants should respond as promptly as feasible to contractor and client inquiries and requests for clarification.
- The consultant should reduce the number of mistakes and discrepancies in the design document and specification. This may be accomplished by employing appropriate people,

establishing a well-organized structure, educating specialists in new technologies, and ensuring the design and specification quality to decrease delays.

- Consultants should produce a clear, conclusive, and adequately detailed design and working drawings as early as possible (before tender preparation).
- Designers should pay more attention while preparing design to reduce design error and omissions; therefore, getting coordinated design working as a team is recommended to solve time and cost overrun.

5.2.3 Recommendations to Client

- The client should create a faster decision-making process to minimize the cost and time overruns.
- Client interference should be managed. Assigned and skilled technical professionals and managers should incorporate the project's issues.
- The client should minimize the scope change of the project during construction underway to prevent variation orders.
- A client should make progress payments to the other stakeholders regularly.
- To avoid time and cost overruns client should clearly define its demand before the design is completed (before tender preparation).
- Client must have a robust economic ability and financial arrangement for the project, affecting timely progress payments.

5.3 Suggestions for Future Work

- A study should find out the cause of effect of the other KPIs to identify the reason of delay other AAU projects,
- Similar projects should be evaluated in order to determine how well other AAU Construction projects are progressing.

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7. Appendix A

Questionnaire on Assessment of Time and Cost overrun: The case of Addis Ababa University, College of Commerce

Greetings,

My name is Amel Salem, a Post graduate student of Addis Ababa University. I am conducting research for the fulfillment of my Masters of Arts in Project Management titled "Assessment of time and cost overrun: The case of Addis Ababa University, college of commerce". The main objective of this research is to assess the time & cost overrun in AAU College of Commerce and to provide recommendation based on the findings.

The questionnaire has two parts. Part one is about the general background of the respondent and part two is about the factors contributing to the project time & cost overrun by their frequency of occurrence and degree of severity. At the end, there is space provided to write additional factors if you have any.

I kindly invite you to be a part of this research and request you to assist me in completing this brief questionnaire.

The information provided will only be used for research on an academic purpose and your kind assistance in this regard is highly appreciated. Thank You for your time and cooperation. I look forward to hearing from you.

General Directions

1. It is not necessary to write your name.
2. Please try to answer all questions based on the instructions provided.
3. For multiple questions please give your appropriate answer by putting "X" in the space provided.
4. Please give your short, brief and honest answer for questions that require opinions.
5. Please also be informed that the information you give will be kept secret and hence try to express your ideas freely.

Part One: Respondent and Company Profile

Please kindly respond to the following questions by marking the appropriate box

1. Gender *Mark only one oval.*

- Male
- Female

2. Age of the respondent *Mark only one oval.*

- Below 25
- 26 - 46
- 47 - 50
- Above 50

3. Educational background *Mark only one oval.*

- Diploma
- Bachelor's degree
- Master's degree
- PhD

4. Name of your organization

5. 5. Your organization type while AAU, College of Commerce was executed *Mark only one oval.*

- [ ] Contractor
- [ ] Consultant
- [ ] Client
- [ ] Other: _____

6. If your organization is contractor/ consultant, state the grade.

_____

7. Your current designation in the company *Mark only one oval.*

- [ ] Site Engineer
- [ ] Owner
- [ ] Site Supervisor
- [ ] Resident Engineer
- [ ] Project Manager
- [ ] Office Engineer
- [ ] Other: _____

8. Your experience in the construction Industry

Mark only one oval.

- 0 - 5 years
- 6 - 10 years
- 11 – 15 years
- 16 - 20 years
- above 20 years

9. Years of work experience (building construction projects)

Mark only one oval.

- 0 - 5 years
- 6 - 10 years
- 11 - 15 years
- 16 - 20 years
- above 20 years

Part Two

2.1. Client related delay causing factors

10. 2.1.1. Based on your experience, what is the level of contribution of the given factor to client related delays?

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Finance arrangement and inadequate fund	⬭	⬭	⬭	⬭	⬭
Delay to effect progress payment	⬭	⬭	⬭	⬭	⬭
Slow Decision making	⬭	⬭	⬭	⬭	⬭
Unrealistic contract duration and imposed	⬭	⬭	⬭	⬭	⬭
Change the scope of the project during construction (Change/ variation order)	⬭	⬭	⬭	⬭	⬭
Poor coordination and communication	⬭	⬭	⬭	⬭	⬭
Rework due to error during construction	⬭	⬭	⬭	⬭	⬭
Underestimating time requirement	⬭	⬭	⬭	⬭	⬭
Client interference	⬭	⬭	⬭	⬭	⬭

11. 2.1.2. What do you think should be done to avoid or to minimize client related delays?

2.2. Contractor related delay causing factors

12. 2.2.1. Based on your experience what is the level of contribution of the given factor to contractor related delays?

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Inefficient planning and scheduling					
Inadequate experience of contractor					
Poor coordination and communication					
Lack of skilled and experienced labor					
Delay in delivery of required materials to the site					
Delay in sub contractor's work					
Poor project management					
Inappropriate construction method					
Poor project risk management					
Lack of training program					

13. 2.2.2. What do you think should be done to avoid or to minimize contractor related delays?

2.3. Consultant related delay causing factors

14. 2.3.1. Based on your experience what is the level of contribution of the given factor to Consultant related delays

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Unclear and inadequate details in drawings	◯	◯	◯	◯	◯
Slow response and inspection	◯	◯	◯	◯	◯
Poor contract management	◯	◯	◯	◯	◯
Poor Communication and coordination	◯	◯	◯	◯	◯
Mistakes and discrepancies in design documents	◯	◯	◯	◯	◯
Inadequate experience of Consultant	◯	◯	◯	◯	◯
Inaccurate site investigation	◯	◯	◯	◯	◯

15. 2.3.2. What do you think should be done to avoid or to minimize Consultant related delays?

2.4. External delay causing factors

16. 2.4.1. Based on your experience what is the level of contribution of the given factor to external factor to delays

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Delay in obtaining permit					
Rise in price of materials					
Weather Condition					
Unforeseen site conditions					
Delay in providing services from utilities (Such as water, electricity, etc.)					
Natural Disasters					
Government policies					

17. 2.4.2. What do you think should be done to avoid or to minimize External related delays?

18. 2.5. If you have any comments regarding causes of delays in general, please specify here:

2.6. Delay causing factors based on project life cycle

19. 2.6.1. Planning phase

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Poor planning	◯	◯	◯	◯	◯
Poor project risk management	◯	◯	◯	◯	◯
Lack of project cost management	◯	◯	◯	◯	◯
Lowest bidding procurement policy	◯	◯	◯	◯	◯
Underestimating time requirement	◯	◯	◯	◯	◯

20. 2.6.2. Design phase

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Poor project design	◯	◯	◯	◯	◯
Frequent design change	◯	◯	◯	◯	◯
Incomplete design at the time of tendering	◯	◯	◯	◯	◯
Delay in designing work	◯	◯	◯	◯	◯
Lack of designer experience & unclear specification	◯	◯	◯	◯	◯

21. 2.6.3. Construction phase

Mark only one oval per row.

	Very High	High	Medium	Low	Very Low
Improvements to standard drawings during construction stage					
Additional work at clients' request					
Poor financial control on site					
Delay in designing work					
Currency exchange					
Change in scope/ scope creep					
Delay in progress payment					
Contractual claim such as, extension of time with cost claims					
Theft/ Corruption					
Damage of materials					