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THE CAUSES OF CONSTRUCTION DELAY OF REAL ESTATE PROJECT:- CASE OF AYATE REAL ESTATE CONSTRUCTION PROJECT

BY

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ABBREVIATION & ACRONYMS

APM:	Association of Project Managers
BCP:	Building Construction Project
CPM:	Critical Path Method
IPMA:	International Project Management Association
PMBOK:	Project Management Body of Knowledge

ABSTRACT

The construction industry is a vital driver for regional economic development, but it often grapples with significant delays that undermine project timelines, budgets, and overall success. This research paper investigates the causes of construction delays in the Ayat real estate construction project in Addis Ababa, Ethiopia. This investigation utilized quantitative research methods *of data collection and analysis, to identify and analyze the multifaceted factors contributing to the delays.*

The findings reveal that the key causes of delay can be attributed to contractor-related, client-related, and consultant-related factors. The study delves into the specific delay factors within each of these categories, providing a detailed understanding of the challenges faced by the construction industry in the region. The research also explores various methods for minimizing and mitigating construction delays, offering valuable insights for project managers, policymakers, and industry stakeholders.

The conclusion of the study highlights the critical importance of addressing the identified delays to ensure the successful completion of construction projects and foster sustainable economic development. The recommendations provided in the paper outline practical strategies for improving project management practices, enhancing stakeholder collaboration, and strengthening regulatory frameworks to overcome the challenges faced in the construction industry.

KEY WORDS :- Construction delay, Real estate construction project, Causes of construction delay, Effects of construction delay, Methods to minimize delays.

CHAPTER ONE

1. Introduction

1.1 Background of the study

The construction sector plays a crucial role in the economic development of a region, serving as a key component for growth. Despite its significance, numerous projects within this industry often encounter significant delays, surpassing the initially estimated time and cost projections (Tawana, 2015).

delays in construction projects have been a persistent issue that negatively impacts project timelines, budgets, and overall project success. Delays in construction projects not only lead to disruptions in labor and a decline in productivity but also result in late project completion, elevated time-related expenses, third-party claims, and potential contract abandonment or termination (Abdul-Rahman, 2006).

The ayat real state project around wesen in Addis Ababa has experienced significant delays, warranting an in-depth examination of the causes behind these delays. This research focus on identifying and analyzing the factor that contributing to the delay in the construction of this real state.

The literature contains numerous studies that investigate the causes and effects of delays in the construction sector. In developing countries, common causes of delay include financial problems, inflation, and late payments, among others. On the other hand, in developed countries, change orders by the client, planning and programming errors, and delays in decision-making by the client are among the common causes (Assaf and Al-Hejji, 2006; Pourrostam et al., 2011; Kumar, 2016). Time overrun and cost overrun are the primary delay effects observed in all countries regardless of their development level (Sarıkaya, 2010; Sunjka and Jacob, 2013; Kuşakçı et al., 2017).

However, delays in the construction sector can also be influenced by various internal and external factors at the local level. Therefore, it is essential to examine the causes and effects of delays in construction activities. In this context, the current study has selected the Ayat real estate project located in Addis Ababa as the case study to investigate and understand the specific causes of delays in that particular project.

The construction of real state plays a crucial role in enhancing the Construction that contributes greatly in the economic growth of a nation.(Abdul-Rahman, 2006). The

Construction Industry is an investment-led sector where government shows high interest. Government contracts with Construction Industry to develop infrastructure related to health, transport as well as education sector.

This study aims to identify and analyze the multifaceted factors contributing to the delays in ayat real projects in Addis Ababa. By exploring the various dimensions of project management, regulatory frameworks, funding mechanisms, and stakeholder collaborations, the research seeks to provide valuable insights into the challenges faced by the construction industry in the region.

The findings of this study will not only contribute to academic knowledge but also serve as a practical guide for policymakers, project managers, and stakeholders involved in real estate construction projects in Addis Ababa and beyond.

Ultimately, the goal is to facilitate the development of strategies and solutions that can mitigate delays and promote the successful and timely completion of projects, thereby maximizing the positive impact on the construction development and community development in Addis Ababa.

Several factors can significantly impact the performance of real estate construction projects, spanning various aspects from planning and design to execution and completion. Inadequate initial planning and incomplete or flawed design can lead to delays, budget overruns, and the need for design revisions. (Abdul-Rahman, 2006).

These issues can increase costs and affect project timelines. This research aims to address a significant gap in the existing literature, as several research outcomes have indicated that the effective application of project management concepts can significantly minimize issues related to delays in construction projects (Frame, 2002).

Furthermore, delays in obtaining necessary permits and changes in regulations or compliance issues can disrupt construction schedules. Financial challenges, such as budget constraints or unexpected cost escalations, can hinder project progress, while securing financing or funding approvals may take longer than anticipated(Frame, 2002).

Effective stakeholder management is crucial, as local opposition or community concerns can lead to legal challenges and project delays. Therefore, fostering effective communication and engagement with stakeholders is essential. Contractual issues, including disputes between contractors, subcontractors, and project owners, can also cause delays and legal complications.

Additionally, the capabilities and performance of chosen contractors play a significant role in determining project quality and timelines.

Environmental and geotechnical challenges, such as unforeseen soil conditions, environmental concerns, or adverse weather, can complicate construction efforts and impact project timelines. (Omran, 2012).

The incorporation of new technologies or complex designs may introduce a learning curve and potential delays, requiring specialized skills and resources. Global events, such as pandemics and economic instability, can disrupt supply chains, labor availability, and project timelines, further impacting performance. Ensuring safety and maintaining construction quality throughout the project are paramount to avoid work stoppages, investigations, rework, and delays. Logistical challenges, such as supply chain disruptions and transportation issues, can impede project progress and affect timelines.

To improve performance, proactive risk assessment, stakeholder engagement, and robust project management should be implemented.(Memon, Rahman, & Aziz, 2012).

1.2 statement of the problem

The construction industry involves various stakeholders, including clients, contractors, and consultants, which contributes to its inherent complexity. The success of a construction project is determined by its performance, which is evaluated based on several factors such as timely completion, adherence to budget constraints, compliance with quality standards, and overall customer satisfaction (Omran, 2012).

The research focused on the delay in ayat real estate construction project because the projects that are constructed by ayat real estate haven’t finished their construction beyond the given time. For this reason, I tried to identify the issues that caused and the effect of the delay on the company. I also tried to show the mechanism to minimize the delay.

The Ayat real estate project in Addis Ababa, Ethiopia, stands as a beacon of promise for the city's development; however, it grapples with significant delays jeopardizing its timely completion. Recognizing the urgency of this situation, our research aims to unravel the intricate web of factors causing these setbacks, with a vision to not only resurrect the project's momentum but also pave the way for enhanced project management practices in large-scale constructions (Abebe, 2023).

The completion of the Ayat real estate project is not merely a construction milestone but a pressing need to address the escalating demand for housing infrastructure in Addis Ababa. By deciphering the root causes of these delays, our research endeavors to breathe new life into the construction process, ensuring the timely delivery of this landmark construction facility (Zewdie & Fikre, 2022).

Delays inherently translate to cost overruns, jeopardizing the project's budgetary integrity. Through our investigation, we aspire to identify the factors contributing to these delays, allowing for the implementation of strategic measures that not only mitigate risks but also optimize resource allocation, thereby safeguarding the financial viability of the project (Memon, Rahman, & Aziz, 2012).

Delays inherently translate to cost overruns, jeopardizing the project's budgetary integrity (Smith & Johnson, 2020). Through our investigation, we aspire to identify the factors contributing to these delays, allowing for the implementation of strategic measures that not only mitigate risks but also optimize resource allocation, thereby safeguarding the financial viability of the project.

According to a study conducted by Werku and Jha (2016) on the causes of construction delays in Ethiopian construction industries, the groups responsible for delays were ranked in the following order of importance: (1) Contractors related factors, (2) Material related factors, (3) Labor related factors, (4) Designers related factors, (5) Consultants/supervisors related factors, (6) Client related factors, and (7) External related factors (Alade et al., 2016).

In another study by Alade et al. (2016), the effects of delays were identified as time overrun, which refers to the late completion or delivery beyond the agreed-upon time by all parties involved in the construction project, and cost overrun, which refers to increased costs associated with labor, workforce, materials, equipment, etc. Delays can also lead to disputes, which involve minor problems between different parties in the construction project. Furthermore, delays can result in litigation, arbitration, and even project abandonment.

Beyond the immediate challenges faced by the Ayate real estate project, our research carries broader significance (Chan, Scott, & Lam, 2002). It endeavors to extract valuable lessons that transcend this specific endeavor, providing insights and strategies that can shape the future landscape of construction projects in Addis Ababa and beyond. By navigating the complexities of delay causes, our research seeks not only to overcome present obstacles but to contribute to the evolution of best practices, ensuring the efficiency and success of future large-scale construction endeavors.

This research examined the factors that cause delays in the Ayat building construction project, aiming to determine the most influential critical delay causes and their impact on project performance (Chan, Scott, & Lam, 2002).By identifying these factors, the study provides stakeholders and engineers with valuable insights into their responsibilities regarding project delays, laying the foundation for strategies to avoid delays effectively. The research aims to mitigate delays in construction projects by identifying the main causes and suggesting ways to address them, thereby offering significant advantages for stakeholders and engineers in ensuring proper project management practices.(Zewdie, A., & Fikre, A. (2022).

By conducting this research helps to identify the causes of delay in the ayat real estate project in Addis Ababa is essential to ensure timely completion, effective cost management, stakeholder satisfaction, and the generation of valuable lessons for future projects.(Assaf, S. A., & Al-Hejji, S. (2006)). By addressing these challenges, we can pave the way for successful construction and contribute to the development of the housing infrastructure in Addis Ababa.

The causes of project delays can vary due to the unique characteristics of each construction project. However, common effects of these delays include time overrun, budget overrun, compromised quality, negative public relations, arbitration, litigation, disputes and claims, and even project abandonment.(Sambasivan, M., & Soon, Y. W. (2007)). Therefore, the objective of this research is to identify and understand the specific causes of delay in Ayat Real Estate construction. By conducting a comprehensive analysis, this study aims to uncover the underlying factors that contribute to project delays within the context of Ayat Real Estate construction. The findings of this research will provide valuable insights into the real causes and effects of delay in this specific construction setting.(Mezgebu, Y. (2019))

While there is existing literature on the causes of delays in construction projects, there is a lack of specific focus on the Ayat real estate project in Addis Ababa. The Ayat project has experienced significant delays, and it is crucial to investigate and understand the specific factors contributing to these delays(Abebe, T. (2023)).By conducting a comprehensive analysis of the causes of delay in this particular project, the research aims to fill the gap in the existing literature and provide valuable insights into the challenges faced by the construction industry in Addis Ababa.

Furthermore, the research aims to go beyond identifying the causes of delay and focus on analyzing their effects on the Ayat project. (Abebe, T. (2023).While time overrun and cost overrun are commonly observed delay effects in construction projects, there is a need to

understand the specific impacts of delays on the project's timeline, budget, and overall success. (Chan, D. W. M., & Kumaraswamy, M. M. (1997)).By examining the effects of delays in the Ayat project, the research will contribute to the understanding of the consequences of delays in construction projects and provide practical recommendations to mitigate these effects.

Overall, the research gap lies in the specific investigation of the causes and effects of delays in the Ayat real estate project in Addis Ababa, which will contribute to both academic knowledge and practical guidance for stakeholders involved in similar projects.(Sambasivan, M., & Soon, Y. W. (2007).)

1.3 Research questions

1. What are the root causes of project delays in the Ayat real estate project?

2. What are the top delays factors in the Ayate real estate project?

1.4 Objectives of the study

The primary objective of this research is to analyze the major root causes for delay in construction of ayate real estate project in Addis Ababa.

1.4.1 General Objective:

To analyze the root causes of the delays in the construction of the project in Addis Ababa, Ethiopia.

1.4.2 Specific Objectives:

1. This objective involves analyzing various delay factors caused by clint, contractor and consultant.

2. To identify the top delay factors caused by clint, consultant, contractor.

1.5 Significant of the study

The significance of the study lies in its potential to contribute valuable insights and solutions to a critical issue affecting real estate development in the wesen region. Understanding the root causes of delays in Ayat Real Estate projects in the Wesen area is crucial for multiple stakeholders, including developers, investors, regulatory bodies, and local communities. The study's findings can inform project management strategies, allowing for more efficient planning, resource allocation, and risk mitigation. By identifying and addressing specific factors leading to delays, the research has the potential to enhance overall project performance,

reduce financial losses, and improve the timely delivery of real estate developments. Moreover, the study's outcomes may serve as a foundation for policy recommendations and industry best practices, contributing to the sustainable growth and development of the real estate sector in the Wesen region. Ultimately, the significance of this research lies in its capacity to positively impact the efficiency and effectiveness of real estate projects, fostering economic development and meeting the needs of both developers and the local community.

1.6 scope of the study

The scope of the study focused on investigating and analyzing the factors contributing to project delays specifically within the Ayat Real Estate development in the Wesen region. The research delved into the various aspects influencing project timelines, including but not limited to construction practices, regulatory processes, economic conditions, and stakeholder dynamics. Geographically, the study was confined to the Ayat Real Estate projects in the Wesen area. The area of the project was 135 km*2. The temporal scope encompassed a specified timeframe to assess delays and their evolution over a defined period. Data collection involved examining project timelines, conducting questionnaires with key stakeholders such as developers, contractors, regulatory authorities, and consultants, as well as reviewing relevant documentation. The study aimed to provide a comprehensive understanding of the unique challenges leading to delays in Ayat Real Estate projects in the Wesen region, offering valuable insights for project management and addressing potential areas for improvement.

This study examined the causes of project delays in the Ayat real estate construction works in Wesen, focusing on the perspectives of three key parties involved in construction projects: the owner, contractor, and consultants. Its aim was to identify the most common and frequently occurring causes of delays in building construction projects. Additionally, the study sought to identify and prioritize the factors that contributed to delays, using appropriate scales of measurement, and finally gave strategies to reduce delays.

1.7 Limitation of study

This research on ayat real estate construction is subject to several inherent limitations that should be acknowledged for a comprehensive understanding of its scope and applicability. Firstly, the geographical focus is constrained to a specific location , rendering the findings less universally applicable due to variations in construction practices, regulations, and market conditions across different locations. Additionally, time constraints may impact the study's ability to capture long-term trends and cyclical fluctuations in the real estate and construction industry. The accuracy and reliability of findings are contingent upon the availability and

quality of data, potentially leading to gaps or inconsistencies in data from industry reports, government agencies, or other sources. Unforeseen regulatory changes and economic factors, such as recessions, could affect the sector post-research, beyond the study's predictive capacity. External forces, such as economy and geopolitical events, may not be fully accounted for this research. Furthermore, rapid advancements in construction technology and insufficient exploration of human factors like organizational culture or leadership styles may restrict the research from fully capturing emerging trends in the field.

1.8 organization of the thesis

This research paper is organized into five chapters. The first chapter presents the introduction where the background of the study, statement of the problem, research questions, and research objectives both general and specific, significance of the study, scope and Limitation are clearly described. The second chapter deals with review of related literature on the delay of building construction projects. In this chapter, previously conducted studies are reviewed to explore basic concepts and main practical activities on the causes of project delay in building construction projects and in the second chapter there is conceptual framework which shows dependent variable and independent variable. The third chapter presents the research design and methodology that will be administered in the research where the intended research approach, study area, design, population, sampling technique, data source and analysis methods and ethical consideration are stated and the fourth chapter presents the overall finding of the study which prevails about the most important occurring causes of delay from the perspectives of the three main groups (clients/ owner, contractors and consultants). The last chapter, chapter five encompasses the conclusion and recommendation part of the study.

CHAPTER TWO

2. Review of Related literature

2.1 Theoretical Review

2.1.1 Definition of Delay

Construction of real estate delay refers to a situation where the completion of a construction project is delayed beyond the initial planned schedule. It means that the construction activities and progress are not proceeding according to the predetermined timeline. Delays in real estate construction can be caused by various factors, such as unforeseen site conditions, design changes, weather conditions, labor shortages, material shortages, funding issues, legal disputes, or poor project management(Abebe, T. (2023).

Proper monitoring, planning, and coordination among all parties involved in the construction process are crucial to minimize delays and ensure the timely completion of the real estate project.(Alaghbari et al. (2007))

According to Nadir , Delay refers to the situation where a construction project takes longer than planned or scheduled to complete. It is a significant issue that can lead to cost overruns and affect the overall progress of the project. The study identifies various factors contributing to delays in construction projects and emphasizes the importance of effective monitoring and management to minimize delays and ensure timely completion.

According to Ahmed (2018) ,Delay in the context of construction projects refers to the prolongation of the project's delivery time beyond the initially planned schedule. It is the deviation from the projected timeline due to various factors and circumstances that hinder or impede the progress and completion of the construction project.

Delay is defined as an occurrence or circumstance that prolongs the necessary time for performing or finishing the contractual work, resulting in additional work days (Zack, 2003). Majid (2006) describes delay as a time loss, where "time" refers to the duration required to complete the construction project. When there is a delay in the project timeframe, it implies that the project cannot be accomplished within the original schedule.

2.1.2 Causes of delay

The construction sector in Ethiopia involves a diverse range of participants, including clients or project owners, contractors, subcontractors, suppliers, as well as professionals like architects, engineers, and quantity surveyors who are responsible for project design and supervision. Owing to the involvement of these different parties, they frequently encounter challenging situations and various forms of pressure.

The research findings revealed that various factors significantly contribute to construction delays in public building projects in Addis Ababa. These top ten factors can be summarized as follows: difficulty in securing project financing, a poorly implemented project management system, delays in obtaining designs and working drawings, shortage of imported construction materials, design errors and complex designs, delays in progress payments for completed works, late project initiation and resource mobilization to the construction site, financing problems, inaccurate site investigation reports, and price inflation (Neway in 2018)

The research findings indicated that the most significant factors contributing to time overrun were identified as the following: right of way problems, financial difficulties, and inadequate planning. According to the survey results, the extent of time overrun in these projects varied significantly, ranging from 25% to as much as 264.38% of the original contract amount. This implies that delays in completion time were substantial and had a considerable impact on the overall project cost(Abubeker J. in (2015)

Over the course of several decades, numerous studies have been conducted to investigate the causes of delays in construction projects. Scholars and researchers in project management within the building industry have put forth various factors and groups of factors that contribute to these delays. In their studies, (Alaghbari et al. (2007)) explored multiple reasons and explanations for project delays.

They categorized these factors into client-based schedule factors, contractor-related schedule factors, consultant-related schedule factors, and other external-related schedule factors. By analyzing the results of their research, they aimed to gain a comprehensive understanding of the diverse influences on project delays in the construction industry(Alaghbari et al. (2007))

"Time and Cost Overrun in Construction Projects in Egypt," the researchers identified the top five factors influencing schedule delays (time overruns) in construction projects. These factors, ranked by importance, were as follows: (1) low productivity of labor, (2) poor communication and coordination between parties involved in the project, (3) bribery practices, (4) delays in

project financing, and (5) change orders during the course of work, along with the employment of unskilled labor(Shibani and Dr. Abdussalam in 2015),

Causes of construction delay by client, contractor , consultant related delaye (Daba and Pitroda in 2018)

2.1.2.1 Contractor related delay

In a recent critical literature review conducted by (Daba and Pitroda in 2018), focusing on the main factors causing delays in construction projects, contractor-related schedule delay factors were highlighted.

These factors include problems with funding or dishonesty by the contractor, ineffective site supervision, inadequate scheduling, revisions due to mistakes during work, delays caused by sub-contractors, lack of experience on the part of the contractor, delays in site arrangement, delays in the preparation of working drawings and material samples, delayed payment for executed work by the owner, slow decision-making, late approval of design documents, owner-initiated variations, delays in material procurement, mistakes in design documents, frequent changes of subcontractors, poor construction methods, unskilled project crew, inadequate technology, poor coordination and communication, ineffective contractor policies, unskilled subcontractors, weak economic control on-site, inadequate procurement of construction materials, improper equipment, frequent equipment breakdowns, equipment shortages, subcontractor turnover, labor shortages, slow mobilization of labor, ineffective equipment, delayed equipment delivery, material damage, and conflicts between labor and the client. (Daba and Pitroda in 2018)

Similarly, Enshassi et al. (2010) conducted a more recent study on cost overruns in construction projects in the Gaza Strip. They identified contractor-related schedule delay factors such as financial problems, delays in material delivery to the site, material shortages on-site, construction mistakes and defective work, insufficient skills and experience of labor, low labor productivity, coordination problems with others, lack of subcontractor skills, inadequate contractor staff on-site, poor site management, labor shortages on-site, and shortages of equipment and tools.

Aibinu and Odeyinka (2006) also identified several factors contributing to contractor-related schedule delays, which include planning and scheduling problems, financial shortages, equipment faults, shortages of equipment and materials, slow mobilization, equipment maintenance problems, and labor shortages.

These studies collectively highlight the range of contractor-related factors that can lead to schedule delays in construction projects, emphasizing the importance of effective management, coordination, and resource availability to mitigate these delays(Aibinu and Odeyinka (2006))

2.1.2.2 Client Related Delay Factors

In a recent critical literature review conducted by Daba and Pitroda (2018) regarding the main factors causing delays in construction projects, client/owner-related schedule delay factors were identified. These factors include corruption, intermittent termination of variations during ongoing projects, delayed or insufficient payments to developers, changes in specifications and material types during construction, delays in contract document verification, variations in project scope, poor coordination with other stakeholders, slow decision-making processes, inadequate information during project feasibility studies, delays in site delivery, lack of motivation for contractors to finish ahead of schedule, ineffective project representatives, lack of experience, interference during project work, disagreements among joint owners, improper feasibility studies, poor coordination and communication, work interruptions, delays in document approvals, nature of bidding and award processes, impractical contract durations, and unrealistic delay penalties.

Similarly, (Enshassiietal. (2010))identified client-related schedule delay factors, including contract modifications (such as replacements and additions of new work or changes in specifications), lack of working knowledge, lack of coordination with contractors, delayed decision-making, and financial problems such as delayed payments, financial difficulties, and economic problems.

(Assaf and Al-Hejji (2006)) conducted a study on the causes of delays in large construction projects, which also highlighted client-related schedule delay factors. These factors included lack of incentives for contractors to finish ahead of schedule, suspension of work by the owner, Delayed payment for the work, delays in site delivery to the contractor, changes and modifications in orders during work, delays in revising and approving design documents, poor communication and coordination between the client and other parties, slow decision-making processes, work suspensions, and conflicts among joint project owners.(Assaf and Al-Hejji (2006))

Aibinu and Odeyinka (2006) identified client-related schedule delay factors as well, which encompassed the owner's cash flow problems, variation orders, and delays and slowness in decision-making.

These studies collectively shed light on the various client/owner-related factors that contribute to schedule delays in construction projects, underscoring the significance of effective communication, coordination, decision-making, and financial management to mitigate these delays.(Aibinu and Odeyinka (2006))

2.2.1.3 Consultant Related Delay Factors

According to Gündüz et al. (2013), the most significant consultant-related schedule delay factors are performing inspections and testing, poor communication and coordination with other parties, and conflicts between the consultant and design engineer.

Al-Kharashi and Skitmore (2009) identified delays in approving major changes in the scope of work, inadequate experience of the consultant, and late review of design documents as critical factors.

Enshassi et al. (2010) found that factors such as the consultant's lack of expertise, absence of the consultant's site workers, lack of administrative and supervisory experience among the consultant's site staff, insufficient record keeping, prolonged and inefficient decision-making processes, and delayed orders contribute to delays.

Olawale and Sun (2010) identified inadequate evaluation of project duration, discrepancies in contract documentation, and disagreements in contract and specification interpretations as consultant-related causes of delay.

Daba and Pitroda (2018) also identified various consultant-related schedule delay factors, including lack of experience, disagreements with the design engineer, delays in approving project scope, delays in performing inspections and testing, poor site investigation, inadequate project management assistance, delays in approving and checking design documents, inadequate coordination and communication between project stakeholders and developers, recurrent changes of contractors and subcontractors, project award and bidding processes, owner-initiated variations during construction, unfavorable weather conditions during construction work, poor experience of consultants and contractors, delays in checking working drawings, design document errors and discrepancies, and insufficient specifications in drawings. These factors collectively highlight the importance of effective coordination,

communication, and expertise within the consultant team to minimize delays in construction projects.

Delays are a common occurrence in construction projects, and their impact can vary significantly from one project to another. Numerous researchers have conducted studies on the causes of project delays in the public construction industry. This research has involved reviewing the findings of these studies to gain insights into the factors contributing to project delays(Daba and Pitroda (2018)

2.2 Methods of Minimizing Delays

2.2.1 Rigorous Scope Management

Clearly define and document the project scope, deliverables, and requirements upfront: This involves creating a detailed project scope statement that outlines the objectives, boundaries, and key deliverables of the project. This helps establish a clear understanding of the project's goals and expectations among all stakeholders (Kerzner, 2017).

Implement a formal change control process to manage scope creep and changes: Establishing a robust change management process allows the project team to systematically review, approve, and document any changes to the project scope. This helps prevent uncontrolled scope creep, which is a common cause of project delays (Kerzner, 2017).

Regularly review the scope with stakeholders to ensure alignment: Periodic scope reviews with key stakeholders help identify any misalignments or evolving requirements, enabling proactive adjustments to the project plan and mitigating the risk of delays (Kerzner, 2017).

2.2.2 Resource Planning and Allocation

Conduct a thorough assessment of resource requirements and availability: Carefully analyzing the project's resource needs, including personnel, equipment, and materials, and comparing them to the available resources helps identify potential constraints or shortages (Kerzner, 2017).

Develop a resource management plan to optimize utilization and avoid constraints: Creating a detailed resource management plan that outlines the allocation and scheduling of resources can help ensure they are utilized effectively and efficiently, reducing the risk of delays due to resource unavailability (Kerzner, 2017).

Maintain a buffer of contingency resources to address unplanned needs: Reserving a pool of additional resources, such as skilled personnel or equipment, can provide the project team

with the flexibility to respond to unexpected resource demands or shortages, minimizing the impact on the project schedule (Kerzner, 2017).

2.2.3 Realistic Scheduling and Sequencing

Use historical data and expert judgment to develop accurate task duration estimates: Leveraging past project data and the expertise of the project team and subject matter experts can help improve the accuracy of task duration estimates, which is crucial for creating a realistic project schedule (Nicholas & Steyn, 2017).

Identify and manage critical path activities and dependencies: Carefully analyzing the project's critical path, which identifies the sequence of activities that directly impact the overall project duration, allows the project manager to focus on managing these critical tasks and dependencies to avoid delays (Nicholas & Steyn, 2017).

Incorporate adequate schedule buffers to account for potential delays: Building in reasonable schedule buffers, or contingency time, between activities and at the project level can help absorb the impact of unforeseen delays, preventing them from cascading through the entire project schedule (Nicholas & Steyn, 2017).

2.2.4 Effective Communication and Stakeholder Management

Establish clear communication channels and protocols with all stakeholders: Implementing effective communication strategies, such as regular status meetings, progress reports, and clearly defined escalation procedures, can help ensure timely and accurate information sharing, which is essential for identifying and addressing potential delays (Kerzner, 2017).

Regularly review project status and performance with stakeholders: Conducting frequent reviews of the project's progress, milestones, and performance metrics with key stakeholders allows for early identification of issues or deviations from the plan, enabling proactive interventions to mitigate delays (Kerzner, 2017).

Promptly address any conflicts or misalignments between stakeholders: Actively managing stakeholder relationships and quickly resolving any conflicts or misalignments can help prevent these issues from escalating and causing delays to the project (Kerzner, 2017).

2.2.5 Proactive Risk Management

Identify, analyze, and document potential risks and their impacts: Implementing a comprehensive risk management process, which includes identifying, assessing, and

documenting potential risks, helps the project team understand the threats to the project schedule and plan appropriate mitigation strategies (Huemann & Pollack, 2019).

Develop and implement appropriate risk response strategies: Based on the risk analysis, the project team can develop and implement specific risk response strategies, such as risk avoidance, mitigation, transfer, or acceptance, to address potential delays and their impacts (Huemann & Pollack, 2019).

Monitor and review risks throughout the project lifecycle: Regularly monitoring and reviewing the project's risk landscape, and adjusting the risk management plan as needed, helps ensure that the project team is proactively managing risks and addressing any emerging threats to the project schedule (Huemann & Pollack, 2019).

2.3 Tools of project management

The tools of project management are the specific techniques, software, and processes used by project managers to plan, execute, monitor, and control projects.(PMBOK Guide)

2.3.1 The Critical Path Method (CPM):- involves breaking down the project into a logical sequence of tasks and determining the timeframe for each task. CPM enables effective time management, facilitates planning and communication, calculates the overall project duration, identifies critical activities that can impact the project timeline, and highlights float times for non-critical activities (PMI, 2013).

CPM is especially useful for large and complex projects as it communicates interdependencies and aids in efficient time management (Kallantzis et al., 2007). The Critical Chain Method (CCM) focuses on managing uncertainties and resource constraints by identifying the critical chain of tasks that determine the project duration. It involves buffering tasks to protect the project completion date and applying resource optimization techniques to improve scheduling accuracy (PMI, 2013).

The Precedence Diagram Method (PDM) visually represents the interdependencies between tasks using nodes and arrows, allowing for a clear understanding of task relationships and sequencing. PDM helps in identifying the critical path, determining task durations, and optimizing project schedules (PMI, 2013).

The Critical Path Method (CPM) is a project management technique used to identify the critical path of a project, which is the sequence of activities that determines the total duration of the project(Kelley, J. E., & Walker, M. R. (1959) .

The critical path is the longest path through the project network and represents the activities that must be completed on time for the project to finish as scheduled. CPM helps project managers identify the most important tasks, allocate resources effectively, and anticipate and mitigate potential delays. It is particularly useful for complex projects with interdependent activities and resource constraints, as it allows for detailed planning, scheduling, and optimization of the project timeline.(Kelley, J. E., & Walker, M. R. (1959)

2.3.2The Program Evaluation Review Technique (PERT) is a probabilistic approach that considers three estimates (optimistic, pessimistic, and most likely) for task durations to calculate the project's expected duration and identify critical tasks. PERT aids in managing uncertainties and risks associated with project scheduling (PMI, 2013). The Gantt Chart is a visual representation of project tasks plotted against time. It provides a clear overview of task durations, dependencies, and project milestones, facilitating effective project planning, scheduling, and monitoring (PMI, 2013).

The Program Evaluation and Review Technique (PERT) is a project management tool used to estimate the time required to complete a project. PERT uses a probabilistic approach to estimate the duration of each task, taking into account the most optimistic, most pessimistic, and most likely completion times(Malcolm, D. G., Roseboom, J. H., Clark, C. E., & Fazar, W. (1959).

This information is then used to calculate the expected duration of the overall project and identify the critical path. PERT is particularly useful for projects with a high degree of uncertainty, such as research and development projects, where the duration of tasks may be difficult to predict with certainty. By incorporating probability into the project planning process, PERT helps project managers manage risk and make more informed decisions.Roseboom, J. H., Clark, C. E., & Fazar, W. (1959).

2.3.3 work brakdown structure(WBS)

The Work Breakdown Structure (WBS) is a hierarchical decomposition of the work required to complete a project. It divides the project into smaller, more manageable components or work packages, which can be assigned to individual team members or subcontractors. Project Management Institute. (2017)

The WBS provides a comprehensive view of the project's scope and helps project managers plan, organize, and control the work to be done. By breaking down the project into smaller, more manageable tasks, the WBS ensures that all the necessary work is identified, assigned, and completed. It also helps project managers track progress, estimate resource requirements, and manage risks more effectively.A guide to the project management body of knowledge (PMBOK® guide)

2.3.4 Gant Chart

Gantt charts are a type of bar chart that illustrates a project schedule. They show the start and finish dates of the various elements of a project, typically displayed as horizontal bars along a timescale(Gantt, H. L. (1910))

Gantt charts are a widely used tool for planning and scheduling projects, as they provide a clear visualization of the project timeline, task dependencies, and resource allocation. They help project managers and teams understand the sequence of activities, monitor progress, and identify potential bottlenecks or delays. Gantt charts are particularly useful for simple, linear projects with well-defined tasks and dependencies.(Gantt, H. L. (1910)

2.4 Empirical literature

According to a study published in the Production Planning & Control journal, Murat Gunduz and Saleh R. Tehemar conducted an assessment of delay factors in the construction of sports facilities through multi-criteria decision making 1. The authors identified 37 delay attributes that were categorized into 8 groups and distributed through an online questionnaire portal to sport facility professionals. The analysis of the questionnaire responses concluded that “low level of consultant experience”, “low level of contractor experience”, “shortage of construction materials” and “difficulties in financing the project by contractor” were the most critical delay factors, while “delays related to contractor capabilities” was the most critical delay group

In a study conducted by Ramya et al. (2015) on the Malaysian construction industry, the researchers identified and ranked the ten most significant causes of delay out of a list of twenty-eight different causes. These ten causes, in order of importance, were as follows: (1) Improper planning by the contractor, (2) Poor site management by the contractor, (3) Incomplete designs, (4) Inadequate financial resources and delayed payments from the client for completed work, (5) Issues with subcontractors, (6) Material shortages, (7) Lack of available labor, (8) Equipment availability and failure, (9) Lack of communication between parties, and (10) Mistakes during the construction stage.

One of the limitations of the study is that the authors only considered the opinions of sport facility professionals, which may not be representative of all stakeholders involved in the construction of sports facilities. Additionally, the study only focused on the construction of sports facilities and did not consider other types of construction projects 1.

The Agyekum-Mensah, G., & Knight, A. D. (2017) conducted a critical literature review and a qualitative approach to identify 32 themes that were categorized into 15 categories of causes of delay in construction projects. The study found that knowledge and competence shortage, poor commercial decisions, unnecessary health and safety restrictions, poor risk management, and poor space and logistics management were some of the main themes that caused delays in construction projects.

One of the limitations ageyekum-menesah of the study is that the findings might not be considered as representative due to the qualitative nature of the research. Sholichan, A., & Husin observe M-PERT & BIM 5D-Based state Quantity Take Off method has the potential to minimize the risk of time delay and overrun in stadium project structure works 1.

The study by Agyekum-Mensah and Knight (2017) aimed to explore professional perspectives on the causes of delay in the construction industry. The study used a critical literature review and a qualitative approach to identify 32 themes, which were categorized into 15 categories of causes of delay in construction projects 1.However, the study has some limitations. Firstly, the study is qualitative in nature, and the findings may not be considered as representative 1. Secondly, the study was conducted in the UK, and the findings may not be generalizable to other countries or regions. Finally, the study did not consider the perspectives of other stakeholders such as clients, contractors, and suppliers.

Haritha and Murali's (2018) extensive research identified a total of 121 causes of delays in construction projects, which were methodically grouped into eight distinct categories. The primary causes within each category were then systematically ranked, providing a detailed insight into the major contributors to project delays. Owner-related challenges encompassed issues such as sluggish decision-making, work suspension, delays in revising and approving design documents, late site delivery to the contractor, financial and payment delays, change orders, and communication gaps between consultants and contractors.

Consultant-related delays were associated with insufficient consultant experience, delays in approving shop drawings and sample materials, tardiness in inspection and testing, and communication challenges between owners and contractors. The contractor-related category highlighted difficulties in project financing, deficient site management and supervision, ineffective project planning and scheduling, rework due to construction errors, delays in subcontractor work, insufficient contractor experience, and the use of inappropriate construction methods. Material-related delays included shortages in construction materials,

changes in material types and specifications during construction, and delays in material delivery.

Labor and equipment-related challenges involved labor shortages, equipment availability and failure, deficient experienced labor, low labor productivity, and personal conflicts among labor. Project-related delays were attributed to subsurface conditions, traffic control and restrictions, utility unavailability or delays in service provision, accidents during construction, and legal disputes among project participants. External factors contributing to delays encompassed weather effects, changes in government regulations and laws, slow permit processes by government/municipality, and fluctuations in costs or currency. Design-related challenges were linked to insufficient data collection and survey before design, errors and delays in producing design documents, and misunderstandings of owner requirements by design engineers.

In their study titled "Analysis of Delay Impact on Construction Project based on RII and Correlation Coefficient," Tsegay and Luo (2017) summarized their findings by employing the average Relative Importance Index (RII) and investigating causes of delay under the classifications of external, responsibility, resource, and contract-related factors. Within the category of responsibility-related causes, client-related issues included delays in finance and payments, interference in work execution, slow decision-making, late site delivery, improper project feasibility study, and poor communication.

Contractor-related causes encompassed problems with subcontractors, poor site management, ineffective project planning, inappropriate construction methods, communication issues, inadequate contractor experience, and rework. Consultant-related causes involved inadequate consultant experience, delays in approving and receiving complete work, poor supervision, late testing and inspection, and communication challenges. Designer-related causes included unclear details and specifications, late design and design documents, design mistakes, errors, and misunderstanding client requirements. Resource-related causes encompassed construction material issues like lack of quality materials, slow material delivery, changes in material types, damage to materials, and inflation. Finance-related causes included problems with financial claims processing, government funding delays, late budget release, and global financial crises.

Labor-related causes involved low productivity, lack of motivation, unqualified workers, discipline problems, and labor accidents. Equipment-related causes included insufficient equipment, low efficiency, equipment failures, allocation problems, and outdated equipment. Contract condition-related causes encompassed the absence of alternative dispute resolution,

mistakes in contract documents, unrealistic contract durations and costs, inadequate delay penalties, poor incentives, insufficient contract details, and a lack of clear understanding of contract documents (Tsegay and Luo (2017)

External causes included adverse weather conditions, force majeure, corruption, social and cultural factors, government policy, and the unavailability of utilities at the site.

Tadewos and Patel (2018) identified influential causes of delay, including corruption, unavailability of utilities at the site, inflation/price increases in materials, lack of quality materials, late design and design document submissions, slow delivery of materials, delays in approving and receiving complete project work, poor site management and performance, late release of budget/funds, and ineffective project planning and scheduling.

Toor, S. U. R., & Ogunlana, S. O. (2008) studies on major construction projects in Thailand" by Toor and Ogunlana 1 identifies several factors that contribute to construction delays in developing countries. The study conducted questionnaire surveys and interviews on a major construction project in Thailand to explore the most significant problems causing construction delays. The researchers found that factors related to designers, contractors, and consultants were rated among the top problems. Issues such as lack of resources, poor contractor management, shortage of labor, design delays, planning and scheduling deficiencies, changed orders, and contractors' financial difficulties were also highlighted during the interviews.

The study also revealed that several factors pertaining to local industry, socio-economic and cultural issues, and project characteristics contribute to construction delays. Delays are frequent and recurring in construction projects in developing countries. Although the principal reasons for construction delays are comparable across developing countries, several factors also contribute to construction delays(Toor, S. U. R., & Ogunlana, S. O. (2008)

The study has some limitations. The sample size is limited to one major construction project in Thailand, and the findings may not be generalizable to other countries or regions. Additionally, the study is based on self-reported data, which may be subject to bias. Despite these limitations, the study provides valuable insights into the factors that contribute to construction delays in developing countries(Nadir, H., & Ahmed, A. (2020).

Identifies 25 factors that cause cost and time overruns in construction projects. The study found that the factor of "Inconsistent Cash Flow" had the most significant impact on cost and time overruns, while "Weather Severity" had the least significant impact 1. The study also revealed that only 7 out of 65 projects were completed within budget, indicating that 90% of

projects are suffering from cost variation, including 74% of projects with overrunning costs and 15% of projects with under running costs due to scope reduction. Additionally, only 2 projects were completed on the planned schedule, indicating that 97% of projects were suffering from delays. The average cost overrun was 28.27%, with an average delay of 2.1 years per project (Nadir, H., & Ahmed, A. (2020).

The study's limitation is that it only considered 65 projects executed by Frontier Works Organization (FWO), which is one of the biggest construction organizations in Pakistan . Therefore, the findings may not be generalizable to other construction organizations in Pakistan or other countries.

Wei, K. S. (2010) aims to identify the causes and effects of project delays in outskirt areas of Afghanistan and to identify methods to prevent construction projects from delay1. The study found that most construction projects are delayed due to poor coordination between parties, lack of experienced staff, poor financial ability of contractor, insufficient planning by contractors, poor supervision by governments, order changes by client, payment delay during project progress, late procurement of construction materials, project drawing change, changes in specification, and insufficient study of the site and tender form.

The effects of these causes are time overrun, cost overrun, dispute, arbitration, litigation, and total abandonment1. The study recommends that effective site management and supervision, strategic planning, and clear information and communication channels are the major measures of minimizing construction project delays2. However, the study also highlights that the causes of delays are different from project to project and country to country. The research paper does not explicitly mention any gaps in the research, but it would be interesting to investigate how the causes and effects of project delays vary across different countries and regions(Wei, K. S 2010)

Simushi, S., & Wium, J. (2020) aims to investigate the root cause of time and cost overruns on large projects in South Africa1. The study found that time and cost overruns on large projects originated from the external environment which in turn affected the organization and the project environments. The root cause was found to be a lack of project-specific experience by the project team, external and organizational decisions in the past, community resistance and pressure on the project team, and scope change drive from stakeholders.

The study recommends that an effective strategy to reduce time and cost overruns should involve not only the management of the project environment but also the organization and

external environments1. The research paper adds knowledge to the overrun causation theory and management of large projects Simushi, S., & Wium, J. (2020)

Ndekugri, Braimah, and Gameson 1 also investigates the current practice of delay claims analysis in the United Kingdom. The study is based on a questionnaire survey of key informants and aims to develop a framework for improving delay claims analysis.

The research findings indicate that the preparation of delay claims often requires input from commercial managers (quantity surveyors), schedulers, site managers, external claim consultants, and estimators. Commercial managers have the greatest involvement in the process. Claims analyzed using the As-Built vs. As-Planned and the Impacted As-Planned techniques are often successful, although there is considerable literature on the shortcomings of these techniques. The main obstacles to the use of the methods relate to deficiencies in project records and scheduling practice.(Ndekugri, Braimah, and Gameson)

The limitation of this study is it does not provide a comprehensive analysis of the shortcomings of the As-Built vs. As-Planned and the Impacted As-Planned techniques. Future research could focus on identifying the limitations of these techniques and developing new methods for delay claims analysis that address these limitations.

Okello (2015) conducted a study on the determinants of delay in public sector building construction projects in Kisumu city, Kenya. The study found that project management teams, contractors' capacities, client-related factors, and force majeure factors were the main causes of delays in public sector building construction projects in Kisumu city. The study also found that poor communication, inadequate planning, and poor project monitoring were the most significant factors contributing to project delays .

One research gap in the study is that it did not examine the impact of external factors such as political interference, economic conditions, and environmental factors on project delays. Future research could explore the impact of these factors on project delays and identify effective strategies for mitigating their impact. The research conducted by Salookolaei, D. D., & Nasab, M. M. (2020).

This aim to evaluate cost and time reduction strategies in construction projects using the fuzzy TOPSIS method1. The study used a questionnaire to obtain information from engineers, managers, and officials working on construction projects. The sample size consisted of 108 community members who were available to evaluate the importance and status of the

variables in the construction projects. In the second stage, 10 experts were selected from the 108 respondents to evaluate and rank the projects based on their experience and competency.

The results of the data analysis showed that Tajrish hospital had the highest weight of 0.3935, as the operating conditions were better than other projects and experts confirmed this. The identified factors have great effects on reducing the time and cost of construction projects. It is suggested to implement them in different organizations and projects in terms of type of activity in order to control the time and cost in any project.(Salookolaei, D. D., & Nasab, M. M. (2020).

The research findings suggest that the fuzzy TOPSIS method can be used to evaluate cost and time reduction strategies in construction projects. However, the study has not explored the limitations of the method and its applicability to other types of projects. Further research could investigate the effectiveness of the method in different contexts and identify the limitations of the method1.

Morkan, B. (2020). The paper highlights the importance of multi-stakeholder collaboration in responding to unexpected events and proposes a framework for the same. The paper also identifies the gaps in the existing literature and suggests future research directions.

2.5 Conceptual Framework

In this section, the objective is to provide a concise summary of the existing literature, highlighting its relevance to the study area and elucidating the contributions made by past researchers. The prevailing theme in the literature suggests a discernible connection between the causes and effects of delays in construction projects.

The conceptual framework is derived from the research of two distinct scholars, namely Abdella and Hussien (2002) and Sambasivam et al. (2007). Abdella and Hussien (2002) undertook the task of classifying delay-inducing factors into eight major groups. On the other hand, Sambasivam et al. (2007) identified six key effects resulting from delays. The amalgamation of these works forms the foundation for the conceptual framework, offering a comprehensive understanding of the intricate interplay between the causes and effects of delays in construction projects.

The causes of delays in construction projects have been systematically categorized into eight groups based on research by Abdella and Hussien (2002). These factors encompass various aspects of the project life cycle, involving stakeholders such as clients, contractors, consultants, and external elements. The breakdown of delay-causing factors is as follows:

2.5.1 Causes of delay

Causes of delay in projects refer to the various factors that can lead to a project taking longer to complete than originally planned or scheduled.(John M. Nicholas)

2.5.1.1 Client-Related Factors:- This includes financial considerations, payment issues for completed work, owner interference, sluggish decision-making, and unrealistic contract durations imposed by owners. These are factors that are related to the client or project owner. They can include changes in project scope, delays in decision-making or approvals, inadequate project requirements, and insufficient funding or financial issues on the client's side. Smith, J. (2020). Factors contributing to delays in construction projects. Journal of Construction Management.

2.5.1.2 Contractor-Related Factors:- Encompasses site management, inadequate planning, lack of contractor experience, errors during construction, improper methods, and delays attributed to subcontractors. Delays caused by subcontractors are attributed to contractors as they are held accountable for such delays. (Johnson, M. (2018).

These factors pertain to issues related to the contractor responsible for the construction project. They can include poor site management, inadequate planning and scheduling, lack of experience or expertise on the contractor's part, errors during construction, use of improper construction methods, and delays caused by subcontractors. Johnson, M. (2018).

2.5.1.3 Consultant-Related Factors:- Involves contract management, the preparation and approval of drawings, quality assurance/control, and prolonged waiting times for test and inspection approvals. These factors relate to issues associated with consultants or design professionals involved in the construction project. They can include delays in contract management, preparation and approval of drawings, quality assurance/control processes, and prolonged waiting times for test and inspection approvals Brown, A. (2019).

2.5.1.4 Material Factors:- Addresses issues related to material quality and shortages. These factors address issues related to materials used in the construction project. They can include challenges with material quality, delays or shortages in the supply chain, or difficulties in procuring specific materials. Lee, S. (2021). Material factors causing delays in construction projects.

2.5.1.5 Labor and Equipment Factors:- Encompasses challenges related to labor supply, labor productivity, equipment availability, and equipment failures. These factors encompass challenges related to labor availability and productivity, shortages of skilled workers, delays caused by labor strikes or disputes, equipment availability or breakdowns, and delays due to equipment failures. Chen, L. (2017).

2.5.1.6 Contract Factors:- Includes change orders, as well as mistakes and discrepancies in contract documents. These factors relate to issues arising from the contract itself. They can include changes in project scope through change orders, mistakes or discrepancies in contract documents, or delays caused by contract-related disputes. Wang, Q. (2016).

2.5.1.7 Contractual Relationships Factors:- Involves major disputes, negotiations during construction, inappropriate organizational structures connecting project stakeholders, and a lack of communication between parties. These factors involve issues arising from the relationships and interactions between project stakeholders. They can include major disputes or conflicts between parties, difficulties in negotiations during construction, inappropriate organizational structures that impede communication and decision-making, and a lack of effective communication between stakeholders. Gupta, R. (2020).

2.5.1.8 External Factors:- Encompasses external influences such as weather conditions, changes in regulations, societal issues, and site conditions. These factors refer to influences that are beyond the direct control of the project team. They can include adverse weather conditions, changes in regulations or permits, societal issues or protests that affect construction activities, and unexpected site conditions or geological issues. External factors in construction delays refer to influences that are beyond the direct control of the project team. These factors can significantly impact project timelines and include adverse weather conditions, changes in regulations or permits, societal issues or protests that affect construction activities, and unexpected site conditions or geological issues. External factors can introduce delays by disrupting work progress, requiring additional safety measures, or necessitating changes in construction methodologies Smith, J. (2022).

Fig 1 Framework for categorizing factors causing construction delays

Sambasivam et al. (2007) focused on the effects of construction delays within the industry. Their research identified six primary effects associated with delays:

2.5.2 Effect of delay

A study conducted by Aibinu and Jagboro (2002) discovered that the Nigerian construction industry experiences six detrimental effects due to project delays. These effects include time overrun, cost overrun, disputes, arbitration, total abandonment, and litigation. Similarly, Hamzah et al. (2011) found that the Malaysian construction industry also faces these same effects of delay. In another study conducted by Yahya et al. (2013) in the Pakistani construction industry, the effects of delays were identified as clashes, claims, total desertion, and hindered growth of the construction sector.

It is a shared objective among all contracting parties, including the owner, contractor, and consultant, to complete a project within the scheduled timeframe, allocated budget, and with the highest quality standards. However, delays typically result in losses for all parties involved, as highlighted by Murali, Sambasivan, and Yau (2007).

These consequences include contract disputes, decreased efficiency, increased construction costs, and added pressure on meeting the predetermined objectives of the project (Ahmed et al., 2002).

2.5.2.1 Cost Overrun:- Time overrun refers to a situation where the progress or actual completion of work is delayed compared to the baseline schedule or contract schedule. It is characterized by a slowdown in work without completely stopping it.(PMBOK, 2013)

Time overrun has a negative impact on a project as it extends the planned time for project completion. This, in turn, can lead to cost increases and affect the project's scope and quality. However, completing a project on time and within budget is advantageous as it delivers the agreed-upon scope, meets quality requirements, and creates value by addressing organizational market needs and achieving project outcomes (PMBOK, 2013).

The negative effects of time overrun include increased costs. The client may incur additional costs such as consultant fees, expenses for head office follow-up, loss of revenue, and compensation to the contractor if the time overrun is caused by the client. Similarly, the contractor may experience costs related to the operation and maintenance of temporary facilities, project and head office overhead costs, expenses associated with extending project performance, advance payment guarantees, and loss of revenue (Assaf & Al-Hejji, 2006).

The Schedule Performance Index (SPI), as defined by PMBOK (2013), is a tool used to measure the time efficiency of a schedule. It is calculated by dividing the earned value (EV) by the planned value (PV). If the SPI value is less than 1, it indicates that less work was

completed than planned. Conversely, if the SPI value is greater than 1, it indicates that more work was completed than planned. An SPI value equal to 1 signifies that the project is completed within the planned schedule (Roger, 2008).

Ashraf and Ghanim (2016) conducted a study on public construction projects in Jordan and identified critical factors that contribute to cost overruns, such as changes in the scope of work on-site, incomplete design at the tender stage, contractual claims (resulting in time extensions with associated costs), inadequate cost planning and monitoring of funds, and delays in costing variations and additional works. These factors are also linked to project delays.

According to PMBOK (2013), the Cost Performance Index (CPI) is a tool used to measure the cost efficiency of the budgeted resources for the work completed. It is calculated as the ratio of earned value (EV) to actual cost (AC). If the CPI value is less than 1, it indicates a cost overrun for the work completed. If the CPI value is greater than 1, it indicates a cost underrun in performance to date. A CPI value equal to 1 signifies that the project is completed within the approved budget.

Cost overruns have negative implications for a project, leading to project failure and impacting the project's scope and quality, as cost is a part of the project's iron triangle (PMBOK, 2013).

In Ethiopia, according to Worku and Jha (2016), cost overruns are primarily caused by contractor-related problems, material-related issues, and owners' financial constraints. Tsegay and Hanbin (2017) identified factors such as high inflation or increased material prices, design changes by the client, errors in design, delayed payments on contracts, and defective construction work as major contributors to cost overruns.

The effects of cost overruns on key stakeholders and the construction industry in general are well-documented (Robel, 2015). Clients experience additional costs and reduced income on their investments. End-users bear the burden of increased leasing or rent costs. Professionals may face reputational damage and loss of client trust. Contractors suffer profit losses and potential damage to their chances of securing future projects.

The industry as a whole can experience project abandonment, decreased building activities, a damaged reputation, and difficulties in securing project finance at higher costs due to increased risks (Keane & Caletka, 2015).

Owolabi et al. (2014) outline several major effects of cost overruns, including company liability leading to insolvency and bad debts, underutilization of manpower, resources, and equipment, increased project costs due to time extensions, and project abandonment.Cost overrun refers to a situation in which the actual cost of a construction project exceeds the initially estimated or budgeted cost. Delays in construction can contribute to cost overruns by prolonging the project duration, leading to increased labor, material, and overhead expenses.

2.5.2.2 Time Overrun:- Time overrun occurs when a construction project takes longer to complete than initially planned. Delays in construction activities, such as unexpected issues, weather conditions, or changes in scope, can lead to time overruns. Time overruns can result in additional costs, disruption of project schedules, and potential penalties for not meeting contractual deadlines.(Assaf & Al-Hejji, 2006).

The project is adversely impacted by time overruns, leading to increased expenses. The additional costs borne by the client include consultant fees, head office monitoring expenses, revenue loss, and compensation to the contractor if the delay is caused by the client. On the other hand, the contractor incurs costs related to the operation and upkeep of temporary facilities, project and head office overhead expenses, extension of performance guarantees, advance payment guarantees, and revenue loss (Assaf & Al-Hejji, 2006).

2.5.2.3Dispute:- disputes are a significant consequence of delays in construction projects, arising from various factors related to the client, contractor, consultant, and external parties involved in the project. Lack of communication can be a major contributor to misunderstandings, conflicts, and disputes.(murali et al. (2007)

Therefore, project managers in construction projects need to possess effective communication skills as a crucial soft skill when engaging with the project parties. Several factors, such as lack of communication, issues with neighbors, unforeseen site conditions, delayed payments for completed work, improper construction methods, delays caused by subcontractors, and discrepancies in contract documents, can give rise to disputes among the different project parties. If these disputes cannot be easily resolved, they may escalate to arbitration or litigation (Murali et al., 2007).

Project managers spend a significant amount of their time communicating with team members and other project stakeholders, both internal and external to the organization. Effective communication plays a vital role in bridging the gap between stakeholders with diverse cultural and organizational backgrounds, varying levels of expertise, and different perspectives and interests that can impact project execution and outcomes (PMBOK, 2013, p. 313). According to Owolabi et al. (2014),

2.5.2.4 Arbitration:- This emphasize that delays in construction projects resulting from client or contractor related factors, such as change orders, delayed progress payments, contractor's non-performance, and lack of communication, can give rise to disputes that are typically resolved through the arbitration process.(Murali et al. (2007)

In such circumstances, it is important to engage a capable third party who can efficiently settle the disputes outside of court. By facilitating negotiations among all project stakeholders, the cost of conflict can be minimized, and a mutually acceptable resolution can be reached to achieve the project's stated objectives.(pmbok)

Arbitration is a method of alternative dispute resolution in which parties involved in a construction dispute agree to have an impartial third party, known as an arbitrator, review the case and make a binding decision. Arbitration is often chosen as a means to resolve construction disputes due to its perceived efficiency and confidentiality compared to traditional litigation. Time is a crucial factor in contractual activities, particularly in project delivery. (Murali et al. (2007)

Projects are typically assigned specific timeframes within which the deliverables must be completed. If the project exceeds the allotted time, it often results in increased costs, wastage, and underutilization of manpower and resources. Non-completion of the project may lead to the withholding of the client's capital, causing disputes, arbitration, and potential litigation between workers and management. Furthermore, delays can result in reduced profits for the contractor and even the abandonment of the building project by the client (Owolabi et al., 2014).

The effects of arbitration can be attributed to causes related to the client, contractor, consultant, and external factors. However, the responsibility for these effects is primarily placed on external causes such as utility companies, government agencies, subcontractors, suppliers, and labor unions. (Ashraf and Ghanim (2016)

2.5.2.5 Litigation:- litigation arises in construction projects when delays occur due to various factors related to the client, contract, labor, and external issues. These factors can include delays in payment for completed work, difficulties with site conditions, and a shortage of labor. As a result, disputes arise and are eventually resolved through the litigation process. (Murali et al. (2007),

Litigation is typically considered as a final resort by the parties involved in construction projects to settle these disputes. Litigation involves resolving a construction dispute through the court system. This process typically involves filing a lawsuit, presenting evidence, and having a judge or jury make a final decision. Litigation can be costly, time-consuming, and may negatively impact project timelines and relationships between parties. (Murali et al. (2007),

2.5.2.6 Total Abandonment:- delays in construction projects can have a severe impact, with the most critical adverse effect being project abandonment. This abandonment can occur temporarily or, in more severe cases, for a permanent duration. The causes of abandonment in construction projects can be attributed to various factors, including issues related to the client, consultant, contractor, and external factors. These causes contribute to delays in the construction process, ultimately leading to the abandonment of the project.(Abedi, Fathi, and Mohammad (2011)

Abandonment refers to the act of completely halting or discontinuing a construction project before its completion. Delays and associated complications, such as significant cost overruns or insurmountable challenges, can sometimes lead to a decision to abandon a project. Abandonment can result in financial losses, wasted resources, and legal implications depending on contractual agreements and obligations.(Mohammad (2011)

Project abandonment refers to the complete cessation of resources being allocated or provided to a project, resulting in it being starved and left unfinished. This situation leaves stakeholders involved in the construction project with an incomplete project on their hands. Starvation can occur due to various reasons, including the emergence of other projects that take priority, leading to a redirection of funding and resources away from the current project. Additionally, abandonment can result from circumstances such as a customer reducing or canceling their order, a decrease in the project budget, or the departure of a key resource. These factors contribute to the project being abandoned and stakeholders being left with an unfinished outcome.(Project Management Fundamentals, 2009).

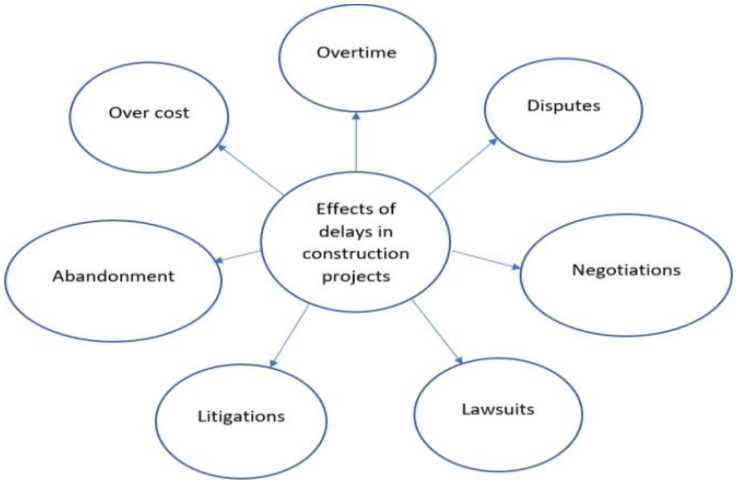

Fig2. Effects of delay

The research identifies several key factors contributing to construction delays and also the effects of this delay in the Ayat real estate project in Addis Ababa, Ethiopia. These factors can be categorized into three main groups:

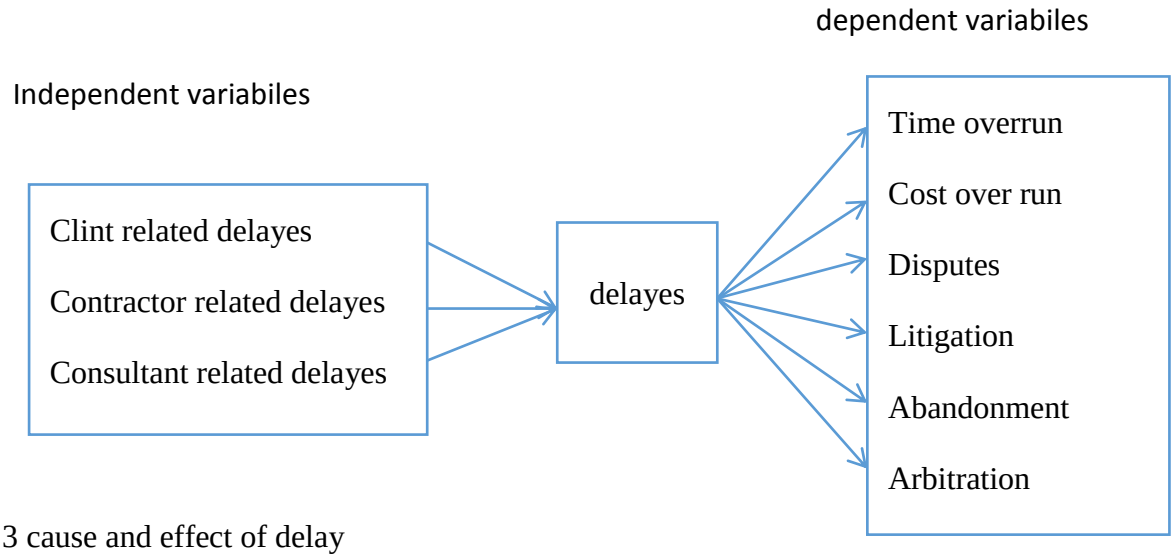

Figure 3 cause and effect of delay

CHAPTER THREE

1. Research Methodology

3.1 Research approaches

The research methodology outlines the means by which the study objectives can be achieved. This investigation utilized quantitative research methods, with a specific focus on the development of a questionnaire designed to evaluate the viewpoints of clients, contractors, and consultants regarding the causes and consequences of delays in the ayate real estate project. The collection of quantitative data was facilitated through the administration of the aforementioned questionnaire.

3.2 Data Type and Source

In terms of data type and source, a combination of primary and secondary data was employed in addressing the research topic. Primary data constitutes firsthand information acquired directly by the researcher. In this study, primary data was obtained through a survey, wherein questionnaires were distributed to respondents, collected in person after completion. Concurrently, secondary data, consisting of information gleaned from a comprehensive literature review on delays in construction projects, was utilized to augment the theoretical understanding of the research problem. The sources for the literature review encompassed various materials such as books, articles, magazines, internet resources, journals, documents, and other research papers. The pertinent information derived from the literature review served as a reference point against the primary data collected, contributing to the overall support of the research.

3.2.1 Target population

The target population for this study comprises the key stakeholders involved in the Ayat Real Estate construction project. These stakeholders include the client, contractor, and consultant associated with the Ayat Real Estate organization. The study aims to gather insights, perspectives, and experiences from these major stakeholders to gain a comprehensive understanding of the project's dynamics, challenges, and outcomes. By focusing on these key participants, the research seeks to provide valuable insights into the construction process, identify potential areas for improvement, and enhance the overall project management and delivery within Ayat Real Estate.

3.3.2 Sampling Techniques

Throughout the research process, participants were selected based on their expertise, experience, and involvement in construction. Random sampling, categorized as non-probability or deliberate sampling, was employed to select individuals within the owner, consultant, and contractor groups. The rationale for choosing this method stemmed from the widely dispersed geographical locations of project members and the relatively modest size of the study population within the client and consultant sectors. As advocated by William (2005), the use of purposive sampling is crucial, allowing the researcher to gather information from a sample of the population about which they have the most comprehensive knowledge.

3.3.3 Sample size

This study employed the simplified formula proposed by Yamane (1967) to determine the required sample size, considering a 95% confidence level and a degree of variability of 0.05. The research focused on the stakeholders directly involved in Ayat Real Estate construction, including the client, contractors, consultants, and staff members.

The total population under consideration consisted of 1 individual organ from the client's side. On the contractor side, there were a total of 6 contractors, comprising 1 local contractors (on force contractor) and 5 foreign contractors (AKO, Jesen, Yoakin, Huahong and Haushen), with an additional in-house contractor. The contractor side consisted of approximately 87 members.

For the consultant aspect, there were five consultancy firms involved: CMT, Aefa Gebeyawe, and Savior Consultancy, Internal and External consultancey . In terms of staff members, there were 41 individuals divided among different entities. The CMT team had 15 staff members, Savior Consultancy had 14 staff members, and Asefa Gebeyewe had 12 staff members.

Each consultant was assigned to supervise 25 blocks of construction, ensuring efficient management and quality control throughout the project.

By considering this comprehensive overview of the stakeholders involved in Ayat Real Estate construction, the study aims to provide a holistic and insightful analysis of the factors influencing project outcomes.

Totally the three consultant supervise 75 blockes

The formula used to determine the sample size is as follows:

n = N / (1 + N(e)^2)

In this formula: n= 129/(1+129(0.05)2

n=98

n represents the desired sample size.

N denotes the total population size (which is 98 in this case). represents the accepted error limit, which is 0.05 in decimal form.

Respondent	Numbers	Sample taken
Client	1	33
Contractor	6	29
Consultant	5	36

Sources:- own survey(2024)

Tabile 3.3.3 Sample size for Clint, Contractor,Consultant

3.3.4 Data collection

The data for this study was collected from the primary parties involved in the ayat real estate companey project, including the clients, contractors, and consultants. The data collection process involved the use of questionnaires and document reviews.

For the questionnaire-based data collection, close-ended questions were used. These questions were designed using a Likert scale, which allows respondents to express their opinions or level of agreement on a predefined scale.

In addition to the questionnaire, document review was carried out to collect secondary data from various sources. These secondary sources included project completion reports, books, journals, reports, and contract documents. The purpose of the document review was to gather relevant information and data to supplement the primary data collected through the questionnaires.

By employing both questionnaire-based data collection and document review, the study aimed to gather comprehensive and diverse data from different perspectives and sources related to the ayate real estate construction companey.

3.4 Research Methodology

The Research methodology employed in this study was carefully designed to address the research objectives, specifically focusing on the causes of construction delays in Ayat real estate projects. To ensure a comprehensive understanding, the survey incorporated a Likert scale, providing a systematic approach to gauge respondents' views and opinions.

The questionnaire consisted of three sections, each serving a specific purpose:

3.5.1 Respondent Background: This section aimed to gather essential information about the participants, including their demographics and professional background. By capturing these details, the study ensured a diverse range of perspectives from individuals involved in the Ayat real estate project.

3.5.2 Causes of Delays: This section aimed to collect precise data on the various factors that contributed to project delays. Through a thoughtful selection of questions, the questionnaire sought to identify the primary causes of delays, such as financial challenges, regulatory issues, or planning errors. This section enabled a comprehensive analysis of factors influencing project timelines.

3.5.3 Effects of Delays:- This section focused on understanding and assessing the consequences of delays on the overall project. By utilizing the Likert scale, respondents were able to express their agreement or disagreement on the effects of delays, shedding light on aspects such as cost overruns, disputes, or potential project abandonment.

By incorporating the Likert scale, which consisted of five ordinal measures ranging from one (1) to five (5), the questionnaire provided a structured framework for participants to express their opinions. This approach allowed for a quantitative analysis of the data, facilitating a clear and concise understanding of the causes and effects of delays in the Ayat real estate project.

The questionnaire methodology employed in this study ensured a comprehensive exploration of the research objectives, capturing valuable insights from stakeholders involved in the project.

3.4 Data Analysis

The information collected through the questionnaire was analyzed and summarized using descriptive statistics. The aim was to assess the relative importance of different variables that contribute to construction delays.

To determine the contribution of each factor to the overall delays, the characteristics were ranked based on their perceived criticality by the respondents. This ranking was done using the Relative Importance Index (RII), which was calculated using the following equation:

$$RII = \Sigma (W / A) * (1 / N)$$

In this equation:

RII represents the Relative Importance Index, which falls within the range of 0 to 1.

W denotes the weighting given to each factor by the respondents, ranging from 1 to 5.

A represents the highest weight given to a factor, which is typically 5 in this case.

N indicates the total number of respondents.

By calculating the RII, the study determined the relative importance of each factor based on the respondents' perceptions and assigned weights. This allowed for the identification and prioritization of critical factors contributing to construction delays in the ayate real estate project.

The values of RII ranges from 0 to 1 (0 not inclusive); the higher the RII, the more important the cause of delay is. The RII value is ranked and the results are shown using tables and/or graphs. The RII is used to rank different causes. The RII then being classified based on the RII classification table as shown below in Table 3.1.

Scale Level of Importance RII

1) Not Important at all $0.0 < RII = 0.2$

2) Slightly Important $0.2 < RII = 0.4$

3) Moderately Important $0.4 < RII = 0.6$

4) Important $0.6 < RII = 0.8$

5) Highly Important $0.8 < RII = 1.0$

A five-point Likert scale ranging from very high to very low effect was used. The same classification is used as Jawal N. A. (2015) used in his study “Assessment of delay causes of construction projects in Palestine”. If the mean value ranging:

From 1 - 1.8 Considered to be Very low effect

1.81 - 2.6 Low effect

2.61 - 3.4 Medium effect

3.41 - 4.2 High effect

4.21 – 5.0 Very high effect

3.5 Validity and Reliability

Reliability and validity are crucial aspects of research that aim to enhance the accuracy of assessment and evaluation. Here is a paraphrased explanation of the concepts of reliability and validity in the context of your study:

Validity: Validity refers to the extent to which a measuring instrument accurately measures what it is intended to measure. It assesses the accuracy and appropriateness of the measurement. In this study, the validity of the questionnaire was evaluated by a group of referees who assessed its content, clarity, and alignment with the study objectives. Their feedback helped ensure that the questionnaire effectively measured the intended constructs.

Reliability: Reliability refers to the consistency, stability, and repeatability of results. In other words, it examines whether consistent results are obtained under similar conditions but different circumstances. In this study, the researcher conducted an initial survey involving clients, consultants, and contractors to assess the reliability of the questionnaire. The internal consistency of the questionnaire was evaluated using Cronbach's alpha. Cronbach's alpha is a statistical measure that indicates the degree of internal consistency within a questionnaire. The calculated Cronbach's alpha values for each field of the questionnaire ranged between 0.864 and 0.931, which is considered high. Higher values indicate greater internal consistency. These results demonstrate that the questionnaire is reliable in measuring the constructs under investigation.

Table 3.3.7 Reliability Statistics

Construct	No of Items	Cronbach alpha	Internal consistency
Owners related delay	9	.931	high
Consultants related delay	7	.864	good
Contractors related delay	15	.954	high

Source: Own Survey result, (2018)

3.6 Ethical consideration

In the preparations for data collection, researchers are dedicated to maintaining the utmost respect for participants and research sites. Ensuring the anonymity and confidentiality of all participants stands as a primary commitment. Addressing ethical concerns arising from the study's sensitive nature will be actively undertaken through careful design and structuring of the questionnaire. The questionnaire will be thoughtfully constructed to minimize potential discomfort for participants. To uphold confidentiality, no names or identifying numbers will be included in the questionnaire. A clear and thorough explanation of the study's purpose and significance will be provided, reinforcing participants' comprehension of the research's value. This approach not only aims to protect the confidentiality of information but also assures that individuals opting not to participate will not face any negative consequences.

CHAPTER FOUR

1. Data Presentation Analysis and Interpretation

4.1 INTRODUCTION

This chapter outlines the presentation of the data gathered from respondents through the questionnaire and document review process. An effort was made to collect relevant data from the targeted contractors, clients/owners, and consultants using a designed questionnaire. The thorough analysis of the questionnaire survey delves into the primary drivers of project delays, meticulously examining the frequency of variables contributing to time overruns, and the degree of consensus among the responding parties.

As meticulously outlined in the methodology section, the analytical procedures employed were specifically designed to ascertain the relative significance and importance of each factor impeding project progress in the studied region. By adopting this rigorous approach, the researchers have been able to uncover the root causes of delay, arming project stakeholders with the invaluable insights necessary to tackle these challenges head-on.

The survey respondents, comprising a diverse range of clients, contractors, and consultants, have provided a multifaceted perspective on the issues at hand. This breadth of input not only enhances the credibility of the findings but also ensures their applicability across the industry landscape.

Through the meticulous dissection of the questionnaire data, the study has meticulously mapped the frequency and prevalence of various time-related variables, shedding light on the most pervasive contributors to project delays. Complementing this analysis is a comprehensive assessment of the level of agreement among the responding parties, further solidifying the reliability and robustness of the identified factors.

By leveraging this holistic approach to data analysis, the researchers have succeeded in pinpointing the critical pressure points that must be addressed to optimize project performance and drive successful outcomes.

4.2 Data Characteristics

Respondent	Questionnaires Distributed	Invalid/No Filled Questionnaire	Complete/ Valid response	Response from Total (%)
client	33	3	30	31%
consultant	36	4	32	33%
contractor	29	3	26	27%
Total	98	7	88	88%

Sources:- own survey(2024)

Table 4.2 Data characteristics

Among the 98 responses seven of them were not filled. 27% of the responses were from the contractor group and the rest 31% of the responses were from clients and consultants 33% from each group.

4.2.1 Stakeholder participation

No. 1	stakeholder	Sample taken
1. Client	1	33
2. Consultant	5	36
3. Contractor	6	29
Total	12	98

Sources:- own survey(2024)

Table 4.2.1 stakeholder participation

The total population under consideration consisted of 1 individual from the client's side. On the contractor side, there were a total of 6 contractors, comprising 1 local contractors (on force contractor) and 5 foreign contractors (AKO, Jesen, Yoakin, Huahong and Haushen), with an additional in-house contractor. The contractor side consisted of approximately 100 members.

For the consultant aspect, there were five consultancy firms involved: CMT, Aefa Gebeyawe, and Savior Consultancy , Internal and External consultancy . CMT supervised the activities of Haushun, Nantong, YJ, and Yoakin contractors. Savior Consultancy was responsible for overseeing YJ, Akose, Huahong, and the in-house contractors. Asefa Gebeyewe Consultancy supervised YJ and the in-house contractors. In terms of staff members, there were 41 individuals divided among different entities. The CMT team had 15 staff members, Savior Consultancy had 14 staff members, and Asefa Gebeyewe had 12 staff members.

4.2.2 The organization structure

POSITION	NUMBER	EXPERIENCE IN CONSTRUCTION
Project Engineer	-	-
Project Coordinator	-	-
Office Engineer	10	5 yr
Site Supervisor	6	11 yr
Engineer Forman	50	15
Others (senior finance, human resource, senior purchaser and audit)	13	12
Total	79	

Sources:- own survey(2024)

Table 4.4 The organization structure

According to the table 4.4 the company has a total of 79 Members. The designations include Project Engineer, Project Coordinator, Office Engineer, Site Supervisor Engineer, Forman, and Others (senior finance, human resource, senior purchaser and audit).

The Office Engineer position has 10 members with 5 years of experience in construction. The Site Supervisor Engineer role has 6 members with 11 years of experience. The Forman position has the highest number of members at 50, with 15 years of experience. The "Others" category, which includes senior roles in finance, human resources, purchasing, and audit, has 13 members with 12 years of experience in construction.

4.2.3 AGE OF RESPONDENT

		Frequency	Percent
Valid	20-25	5	5.1
	26-30	10	10.2
	31-40	68	69.3
	above 40	12	12.2
	Total	98	100.0

Sources:- own survey(2024)

Table 4.2.3 AGE OF RESPONDENT

The table 4.2.3 lists the different age ranges of the respondents: 20-25, 26-30, 31-40, and above 40. The Frequency column shows the number of respondents in each age range. According to the data, there are 5 respondents aged 20-25, 10 respondents aged 26-30, 68 respondents aged 31-40, and 12 respondents above 40 years old.

The Percent column calculates the percentage of respondents in each age range. The 31-40 age group makes up the largest proportion, with 69.3% of the total respondents. The 26-30 and above 40 age groups each represent around 10% of the respondents, while the 20-25 age group accounts for only 5.1%.

4.2.4 Sex of the respondents

		Frequency	Percent
Valid	Male	65	66.32
	Female	33	33.67
	Total	98	100.0

Sources:- own survey(2024)

Table 4.2.4 Sex of the respondents

Table 4.6 shows that among the total of 98 respondents 65 respondents are male and 33 respondents were female and regarding the organization group 30 respondents are from client, 39 respondents are from contractor, and 31 respondents are from consultant. According to the findings as indicated in Figure 4.3 the higher number was taken by the male which is followed by a short gap of female respondents.

The table lists the two gender categories: Male and Female. The Frequency column shows the number of respondents in each gender category. According to the data, there are 65 male respondents and 33 female respondents. The Percent column calculates the percentage of respondents in each gender category. The male respondents make up 66.32% of the total, while the female respondents account for 33.67%.

Table: 4.2.5 EDUCATIONAL LEVEL OF RESPONDENT

		Frequency	Percent
Valid	Diploma	8	18.1
	Bachelor	56	57.1
	Master	32	32.6
	PHD	2	2.04
	Other	0	0
	Total	98	100.0

Sources:- own survey(2024)

Table 4.2.5 Education level of respondent

Table 4.2.5 shows that among the 98 respondents 8 of the respondent have diploma, 56 respondents have 1st degree, and 32 respondents have 2nd degree (Master's Degree) and 2 respondents have PHD. According to the data

- 8 respondents (18.1%) have a diploma-level education.

- 56 respondents (57.1%) have a bachelor's degree.

- 32 respondents (32.6%) have a master's degree.

- 2 respondents (2.04%) have a PhD.

The data shows that the majority of the respondents (57.1%) have a bachelor's degree, followed by those with a master's degree (32.6%). The remaining respondents have either a diploma (18.1%) or a PhD (2.04%). This indicates that the sample has a relatively high level of educational attainment, with most respondents holding at least a bachelor's degree.

4.3 Data analysis on human resource department

According to the information provided by the company, they are facing several significant challenges within their human resource department. According to the company respondent have identified several labor-related and material-related causes contributing to the organization's challenges.

4.3.1 Respondents' response to labor related causes

Respondents response	**Strongly Disagreed**	**Disagreed**	**Neutral**	**Agreed**	**Strongly Agreed**
Shortage of skilled personnel		●			
Low productivity				●	

Table 4.3.1 Respondents' response to labor related causes

Sources:- own survey(2024)

The company seems to have a mixed perspective on labor-related factors impacting the project. On the one hand, they disagree that there is a shortage of skilled personnel, indicating they believe they have adequate access to the necessary talent. However, they do agree that low productivity is an issue they are facing. This suggests that while the company may have the skilled workers, there are likely other factors causing lower-than-expected productivity on the project. This could be due to issues with training, equipment, management, or other process-related problems. Addressing the root causes of the low productivity, even if the skilled labor is available, will be crucial for the company to improve performance and avoid further delays or cost overruns. Aligning the team on the key labor-related challenges, whether it is access to talent or optimizing productivity, will be an important step for the company to take in order to get the project back on track.

4.3.2 Respondents' response to material related causes

Respondents response	Strongly disagreed	Disagreed	Neutral	Agreed	Strongly agreed
Lack of provision of quality material		●			
Scarcity in material				●	
Late procurement of materials			●		
Poor material management			●		
Fluctuation in price of building materials				●	
Delay in delivering material on site				●	

Sources:- own survey(2024)

Table 4.3.2 Respondents' response to material related causes

According to the table 4.82 The organization appears to have a mixed operational profile based on the available data. On the human capital side, HR reports indicate a low perceived shortage of skilled personnel, with most staff members disagreeing that there is a lack of qualified workers. Furthermore, labor productivity is low, and the majority of staff agree with this assessment. These factors suggest the organization have low productivity of work force but have high skilled person. However, the organization faces some challenges on the material resource front. While respondents do not express major concerns about the quality of materials, there is noted scarcity of materials within the organization.

Additionally, the organization experiences high fluctuations in building material prices, introducing financial and supply chain volatility. Yet, despite these material availability and pricing issues, the organization maintains strong material management practices. In addition to this the organization faces challenge by material delivery. This problem can be maintained by using multiple sources. This mixed operational profile, with strengths in human capital but

challenges in material resources, likely requires the organization to carefully balance its strategies across these key business inputs to optimize overall performance.

4.4 Client related delay respondent frequency to related factor

NO	Client related delay	Strongly disagree	Disagree	Moderate	Agree	Strongly agree	Total respondent
1	**Delays in revising and approving design document**	1	4	12	9	4	30
2	**Change orders by owner during construction.**	0	4	11	13	2	30
3	**Delays in approving shop drawing and sample materials.**	0	7	9	10	4	30
4	**Slowness decision-making process.**	0	9	8	12	1	30
5	**Poor communication and coordination.**	3	13	7	5	2	30
6	**Conflict between joint-ownership of the project**	3	11	10	3	3	30
7	**Delay to furnish and deliver the site.**	1	2	7	17	3	30
8	**Delay in progress payment.**	2	2	8	9	9	30
9	**Suspension of work by owner.**	5	12	8	1	4	30

Sources:- own survey(2024)

Tabile 4.4 frequency for client related delay

According to Table 4.4 the survey results, the most significant owner-related delays stem from several factors. First factor client related delays in revising and approving the design document were strongly agreed upon by 4 respondents, agreed by 9, and seen as neutral by 12, while 4 disagreed and 1 strongly disagreed. Second factor change orders by the owner during

construction were strongly agreed to by 2 respondents, agreed by 13, and seen as neutral by 11, with 4 disagreeing and none strongly disagreeing.

The third factor, delays in approving shop drawings and sample materials, was strongly agreed to by 4 respondents, agreed by 10, seen as neutral by 9, and disagreed by 7, with no strong disagreement. Fourthly, slowness in the decision-making process was strongly agreed to by 1 respondent, agreed by 12, seen as neutral by 8, and disagreed by 9, with no strong disagreement.

The fifth factor, poor communication and coordination, was strongly agreed to by 2 respondents, agreed by 5, seen as neutral by 7, disagreed by 13, and strongly disagreed by 3. The sixth factor, conflicts between joint ownership of the project, was strongly agreed to by 3 respondents, agreed by 3, seen as neutral by 10, disagreed by 11, and strongly disagreed by 3.

The seventh factor, delays in furnishing and delivering the site, was strongly agreed to by 3 respondents, agreed by 17, seen as neutral by 7, disagreed by 2, and strongly disagreed by 1. The eighth factor, delays in progress payments, was strongly agreed to by 9 respondents, agreed by 9, seen as neutral by 8, disagreed by 2, and strongly disagreed by 2.

Finally, the ninth factor, suspension of work by the owner, was strongly agreed to by 4 respondents, agreed by 1, seen as neutral by 8, disagreed by 12, and strongly disagreed by 5.

The survey results highlight several critical owner-related factors that contribute to construction delays, with the most significant being delays in revising and approving design documents, change orders during construction, and delays in approving shop drawings and samples. Slowness in the decision-making process and poor communication/coordination were also identified as important issues. Additionally, delays in furnishing the site, delivering progress payments, and suspending work were other notable owner-related delays reported. These findings suggest that owners need to improve their project management practices, enhance communication with contractors, and streamline their decision-making processes to mitigate construction delays and ensure more efficient project delivery.

4.4.1 Ranking Client related delay

NO	Client related delay	mean	Rll	rank
1	**Delays in revising and approving design document**	3.36	0.67	4
2	**Change orders by owner during construction.**	3.43	0.68	3
3	**Delays in approving shop drawing and sample materials.**	3.36	0.67	4
4	**Slowness decision-making process.**	3.16	0.63	5
5	**Poor communication and coordination.**	2.66	0.53	7
6	**Conflict between joint- ownership of the project**	2.73	0.54	6
7	**Delay to furnish and deliver the site.**	3.63	0.72	2
8	**Delay in progress payment.**	3.7	0.74	1
9	**Suspension of work by owner.**	2.56	0.51	8
	Grand Mean	3.17	0.63	

Sources:- own survey(2024)

Table 4.4.1 Ranking client related delay

The study results indicate that there are 9 primary causes of delays related to the project owner in building construction projects. The most significant factor identified is "Delays in revising and approving design documents(1)", which had the highest mean value of 3.7 and a relative importance index (RII) of 0.74, ranking it as the top contributor to delays.

The second most important factor is "Delay to furnish and deliver the site(2)", with an RII of 0.72, ranking it as the second highest cause of delays. This is followed by "Change orders by the owner during construction", which had an RII of 0.68, placing it as the third most impact factor.

Two factors tied for the fourth rank - "Delays in revising and approving design documents(4)’’and "Delays in approving shop drawings and sample materials(5)", both with an RII of 0.67. Finally, the fifth contributing factor is "Slowness in the decision-making process (5)", with an RII of 0.53.

The analysis suggests that owner-related factors, particularly those involving design approval, site delivery, change orders, and decision-making, are the primary drivers of delays in these building construction projects. Addressing these owner-eccentric issues could be a critical step in improving the timeliness and efficiency of the construction process.

4.4.2 Scale and level of important for client

No	Client related delay	Rll value	Not Important	Slightly Important	Moderately Important	Important	Highly important
1	**Delays in revising and approving design document**	0.67				●	
2	**Change orders by owner during construction.**	0.68				●	
3	**Delays in approving shop drawing and sample materials**	0.67				●	
4	**Slowness decision-making process.**	0.63				●	
5	**Poor communication and coordination.**	0.53			●		
6	**Conflict between joint-ownership of the project**	0.54			●		
7	**Delay to furnish and deliver the site.**	0.72				●	
8	**Delay in progress payment.**	0.74				●	
9	**Suspension of work by owner.**	0.51			●		

Sources:- own survey(2024)

Table 4.4.2 Scale and level of important for client

The design and construction process involves several critical factors that must be carefully considered. Revising and approving the design document, handling change orders from the owner during construction, and the overall decision-making process are highly important

factors. Delivering the site, furnishing the project, and the progress payment process are also essential elements. Additionally, the approval of shop drawings and sample materials plays a crucial role. On the other hand, communication and coordination, conflicts between joint ownership, and suspension of work by the owner are moderately important factors that can impact project management. Understanding and addressing these various factors is key to ensuring the successful completion of a construction project.

4.4.3 Scale level of effects for client

NO	Client related delay	mean	Low effect	Medium effect	High effect	Very high effect
1	**Delays in revising and approving design document**	3.36		●		
2	**Change orders by owner during construction.**	3.43			●	
3	**Delays in approving shop drawing and sample materials.**	3.36		●		
4	**Slowness decision-making process.**	3.16		●		
5	**Poor communication and coordination.**	2.66		●		
6	**Conflict between joint- ownership of the project**	2.73		●		
7	**Delay to furnish and deliver the site.**	3.63			●	
8	**Delay in progress payment.**	3.7			●	
9	**Suspension of work by owner.**	2.56	●			

Sources:- own survey(2024)

Table 4.4.3 Scale level of effects for client

According to the table 4.9.3 key factors that can contribute to project delays can be summarized as follows:

4.4.3.1 The medium-effect

The factors include delays in revising and approving design documents, delays in approving shop drawings and sample materials, slowness in the decision-making process, poor communication and coordination, and conflicts due to joint ownership of the project. These factors can have a noticeable impact on the project timeline, but may not be the primary drivers of significant delays.

4.4.3.2 The high-effect

The factors include change orders by the owner during construction, delays in furnishing and delivering the site, and delays in progress payments. These factors have a more substantial influence on project delays and can significantly disrupt the planned schedule. Additionally, the low-effect factor of suspension of work by the owner can also contribute to project delays, though to a lesser degree compared to the medium and high-effect factors.

4.5 contractor related delay respondent frequency to each factor

No	Causes of Delays	Strongly disagree	Disagree	Moderate	Agree	Strongly agree	Total respondent
1	**Poor communication and Coordination**	2	7	7	6	4	26
2	**Delay in sub - contractor work**	0	3	3	15	5	26
3	**Inadequate contractors experience.**	0	6	11	5	4	26
4	**Deficiency in planning and scheduling of project**	0	6	11	5	4	26
5	**Poor safety conditions on site**	0	4	6	12	4	26
6	**Delays due to material delivery**	0	1	4	9	12	26

7	**Shortage of equipment**	0	0	6	7	13	26
8	**Rework due to errors during construction**	0	3	15	7	1	‘ 26
9	**Conflicts between contractor and other parties.**	0	11	10	3	2	26
10	**Difficulties in financing project**	3	8	8	3	4	26
11	**Under estimation of cost of the project by contractor**	4	12	3	4	3	26
12	**Poor qualification of contractor’s technical staff**	6	6	8	6	0	26
13	**Low productivity of labor**	0	1	9	13	3	26
14	**Shortage of labors**	0	12	5	7	2	26
15	**Poor site management and supervision**	1	5	12	6	2	26

Sources:- own survey(2024)

Table 4.5 frequency of respondent to contractor related delay

Contractor-Related Delay Factors

According to the Table 4.5 The study examined various factors that contribute to delays in construction projects related to contractors. The first factor, poor communication and coordination, had mixed responses, with 2 persons strongly disagreeing, 2 persons disagreeing, 7 persons neutral, 6 persons agreeing, and 4 persons strongly agreeing. The second factor, delay in subcontractor work, had a more positive response, with 5 persons strongly agreeing, 15 persons agreeing, 3 persons neutral, and 3 persons disagreeing, but no one strongly disagreeing.

The third factor, inadequate contractor experience, also had a generally positive response, with 4 persons strongly agreeing, 5 persons agreeing, 11 persons neutral, and 6 persons disagreeing, but again, no one strongly disagreeing. The fourth factor, deficiency in planning and scheduling of the project, had a similar response, with 4 persons strongly agreeing, 5 persons agreeing, 11 persons neutral, and 6 persons disagreeing, but no one strongly disagreeing.

The fifth factor, poor safety conditions on-site, had a predominantly positive response, with 4 persons strongly agreeing, 12 persons agreeing, 6 persons neutral, and 4 persons disagreeing, but no one strongly disagreeing. The sixth factor, delays due to material delivery, had an even more positive response, with 12 persons strongly agreeing, 9 persons agreeing, 4 persons neutral, and only 1 person disagreeing, but no one strongly disagreeing.

The seventh factor, shortage of equipment, had a very positive response, with 13 persons strongly agreeing and 7 persons agreeing, and 6 persons neutral, but no one disagreeing or strongly disagreeing. The eighth factor, rework due to errors during construction, had a more mixed response, with 1 person strongly agreeing, 7 persons agreeing, 15 persons neutral, and 3 persons disagreeing, but no one strongly disagreeing.

The ninth factor, conflict between the contractor and other parties, had a predominantly negative response, with 2 persons strongly agreeing, 3 persons agreeing, 10 persons neutral, and 11 persons disagreeing, but no one strongly disagreeing. The tenth factor, difficulties in financing the project, had a more varied response, with 4 persons strongly agreeing, 3 persons agreeing, 8 persons neutral, 8 persons disagreeing, and 3 persons strongly disagreeing.

The survey findings suggest that delays due to contractors stem from a range of issues, with the most significant being delays in subcontractor work, inadequate contractor experience, deficiencies in planning and scheduling, poor safety conditions, and delays in material delivery and shortage of equipment. Poor communication and coordination, as well as rework due to construction errors, were also identified as contributing factors, though to a lesser degree. Interestingly, conflicts between contractors and other parties, as well as difficulties in project financing, were not seen as major sources of delays by the respondents. Overall, the results highlight the need for contractors to strengthen their project management capabilities, enhance coordination with subcontractors, improve material and equipment planning, and prioritize safety to mitigate construction delays more effectively.

4.5.1 Contractors Related Delays ranking

No	Causes of Delays	MEAN	RII	RANK
1	**Poor communication and Coordination**	3.11	0.62	9
2	**Delay in sub - contractor work**	3.84	0.76	3
3	**Inadequate contractors experience.**	3.26	0.65	6
4	**Deficiency in planning and scheduling of project**	3.26	0.65	6
5	**Poor safety conditions on site**	3.61	0.72	5
6	**Delays due to material delivery**	4.23	0.84	2
7	**Shortage of equipment**	4.26	0.85	1
8	**Rework due to errors during construction**	3.23	0.64	8
9	**Conflicts between contractor and other parties.**	2.84	0.56	13
10	**Difficulties in financing project**	2.88	0.57	12
11	**Under estimation of cost of the project by contractor**	2.61	0.52	14
12	**Poor qualification of contractor's technical staff**	2.53	0.50	15
13	**Low productivity of labor**	3.69	0.73	4
14	**Shortage of labors**	2.96	0.59	11
15	**Poor site management and supervision**	3.11	0.62	9
	GRAND MEAN	3.29	0.65	

Sources:- own survey(2024)

Table 4.5.1 Contractors Related Delays rank

According to the table 4.5.1 The primary contributor to project delays is the shortage of equipment, which is ranked as the most significant factor. This shortage of necessary equipment can disrupt the smooth progress of construction activities and hinder timely completion.

The second most impactful factor is delays in material delivery. Delays in the supply of essential materials can directly impact the construction schedule and lead to delays in the overall project.

The third-ranked factor is delays due to subcontractor work. Issues with the performance or coordination of subcontractors can have a cascading effect on the project's progress.

Low labor productivity is the fourth-ranked factor, which can slow down the execution of work and contribute to delays. The fifth-ranked factor is poor safety conditions on the construction site. Unsafe working environments can disrupt the workflow and lead to project delays. The sixth-ranked factors are deficiencies in project planning and scheduling, as well as inadequate contractor experience. Both of these factors can undermine the efficiency and effectiveness of the construction process. Rework due to errors during construction is the eighth-ranked factor, which can consume additional time and resources, thereby delaying the project. The ninth-ranked factors are poor site management and supervision, as well as poor communication and coordination. These managerial and organizational issues can hinder the smooth execution of the project. In contrast, factors such as shortage of labor, difficulties in project financing, conflicts between the contractor and other parties, underestimation of project costs, and poor qualifications of technical staff are not considered significant contributors to project delays, as indicated by their lower rankings and the majority of respondents disagreeing on their impact.

4.5.2 Scale and level of important for contractor

No	**Causes of Delays**	RII	Not Important	Slightly Important	Moderately Important	Important	Highly important
1	**Poor communication and Coordination**	0.62				●	
2	**Delay in sub - contractor work**	0.76				●	
3	**Inadequate contractors experience.**	0.65				●	
4	**Deficiency in planning and scheduling of project**	0.65				●	
5	**Poor safety conditions on site**	0.72				●	

6	**Delays due to material delivery**	0.84					●
7	**Shortage of equipment**	0.85					●
8	**Rework due to errors during construction**	0.64				●	
9	**Conflicts between contractor and other parties.**	0.56			●		
10	**Difficulties in financing project**	0.57			●		
11	**Under estimation of cost of the project by contractor**	0.52			●		
12	**Poor qualification of contractor's technical staff**	0.50			●		
13	**Low productivity of labor**	0.73				●	
14	**Shortage of labors**	0.59			●		
15	**Poor site management and supervision**	0.62				●	

Sources:- own survey(2024)

Table 4.5.2 scale and level of important for contractor

According to table 4.10.2 of the key factors influencing construction project outcomes, organized by their level of importance:

4.5.2.1 Highly Important Factors:

Delays caused by material delivery issues and equipment shortages are identified as highly impactful, significantly hampering project progress and timelines. These supply chain and resource constraints are critical challenges that must be proactively addressed.

4.5.2.2 Important Factors:

The information also highlights several important factors that have a substantial effect on construction projects. These include poor communication and coordination, delays in subcontractor work, inadequate contractor experience, deficiencies in planning and scheduling, poor site safety conditions, rework from construction errors, low labor productivity, and

inadequate site management and supervision. Recognizing and mitigating these interrelated management and operational hurdles is essential for project success.

4.5.2.3 Moderately Important Factors:

Additionally, the data identifies some moderately important factors that, while not as severe as the highly or generally important issues, still present meaningful risks. These include conflicts between contractors and other parties, difficulties in project financing, contractor underestimation of costs, poor qualifications of technical staff, and labor shortages. Though secondary to the primary challenges, these factors warrant consideration and appropriate risk management.

4.10.3 Scale level of effects for contractor

No	Causes of Delays	MEAN	Low effect	Medium effect	High effect	Very high effect
1	**Poor communication and Coordination**	3.11		●		
2	**Delay in sub - contractor work**	3.84			●	
3	**Inadequate contractors experience.**	3.26		●		
4	**Deficiency in planning and scheduling of project**	3.26		●		
5	**Poor safety conditions on site**	3.61			●	
6	**Delays due to material delivery**	4.23				●
7	**Shortage of equipment**	4.26				●
8	**Rework due to errors during construction**	3.23		●		
9	**Conflicts between contractor and other parties.**	2.84		●		
10	**Difficulties in financing project**	2.88		●		

11	**Under estimation of cost of the project by contractor**	2.61		●		
12	**Poor qualification of contractor's technical staff**	2.53	●			
13	**Low productivity of labor**	3.69			●	
14	**Shortage of labors**	2.96		●		
15	**Poor site management and supervision**	3.11		●		

Sources:- own survey(2024)

Table 4.5.3 scale level of effect for contractor related delay

According to the table 4.10.3 categorizing the relative impacts of these diverse issues, construction teams can better prioritize and allocate resources to address the most critical drivers of project success or failure.

4.5.3.1 Very High Effect

Delays due to material delivery issues and equipment shortages are identified as having a very high impact on project outcomes. These supply chain and resource challenges can significantly delay project completion timelines.

4.5.3.2 High Effect

Factors with a high level of impact include delays in subcontractor work, poor site safety conditions, and low labor productivity. Addressing these core operational and workforce issues is critical for improving project performance.

4.5.3.3 Medium Effect

The information also notes several factors with medium-level effects, such as poor communication and coordination, inadequate contractor experience, deficiencies in planning and scheduling, rework from construction errors, conflicts between contractors and other parties, difficulties in project financing, and contractor underestimation of project costs. While not as severe as the high-impact factors, these management and execution challenges still present meaningful risks.

4.5.3.4 Low Effect

Finally, the qualifications of contractors' technical staff are cited as having a relatively low effect on project outcomes compared to the other factors identified. Though not insignificant, this aspect appears to be less impactful than the more pressing project management and resource-related challenges.

4.6 Respondent frequency for consultant related delays

No	Consultant Related Delays	Strongly disagree	Disagree	Moderate	Agree	Strongly agree	Total respondent
1	**Delays in approving major changes in the scope of work**	1	1	3	22	5	32
2	**Unclear and inadequate details in drawings**	2	11	8	6	5	32
3	**Delay in producing design document**	4	7	12	7	2	32
4	**Insufficient data collection and survey before design.**	2	11	12	4	3	32
5	**Delay in approval of submittals, design drawings, and sample materials, etc.**	2	9	8	10	3	32
6	**Delay in performing inspection and testing**	2	8	12	7	3	32
7	**In adequate experience of consultants.**	7	8	11	5	1	32

Sources:- own survey(2024)

Table 4.6 frequency of respondent to contractor related delay

In a survey regarding factors related to delays in consultant work, several key findings emerged. The first factor, "delays in approving major changes in the scope of work," was strongly agreed upon by 5 respondents, agreed by 22 respondents, with 3 neutral, 1 disagreeing, and 1 strongly disagreeing. The second factor, "unclear and inadequate details in

drawings," had 5 respondents strongly agree, 6 agree, 8 neutral, 11 disagree, and 2 strongly disagree. The third factor, "delays in producing design documents," saw 2 respondents strongly agree, 7 agree, 12 neutral, 7 disagree, and 4 strongly disagree. Regarding "insufficient data collection and survey before design," 3 respondents strongly agreed, 4 agreed, 12 were neutral, 11 disagreed, and 2 strongly disagreed. For "delay in approval of submittals, design drawings, and sample materials," 3 strongly agreed, 10 agreed, 8 were neutral, 9 disagreed, and 2 strongly disagreed.

The sixth factor, "delay in performing inspection and testing," had 3 respondents strongly agree, 7 agree, 12 neutral, 8 disagree, and 2 strongly disagree.

Finally, "inadequate experience of consultants" was strongly agreed upon by 1 respondent, agreed by 5, with 11 neutral, 8 disagreeing, and 7 strongly disagreeing.

The strongest agreement was around the factor of "delays in approving major changes in the scope of work," suggesting this is a critical issue that needs to be addressed to improve project efficiency. The other factors, such as unclear drawings, delays in design documents, inadequate data collection, and delays in approvals and inspections, also received significant agreement, indicating these are other key contributors to consultant work delays that should be examined and improved. The relatively low level of agreement around "inadequate experience of consultants" implies this may not be as significant a factor compared to the process and communication-related issues identified. Overall, the survey highlights several areas where project management processes and coordination between stakeholders can be enhanced to mitigate delays in consultant work.

4.6.1 Consultant related delay ranking

No	Consultant Related Delays	MEAN	RII	RANK
1	**Delays in approving major changes in the scope of work**	3.90	0.78	1
2	**Unclear and inadequate details in drawings**	3.03	0.60	3
3	**Delay in producing design document**	2.87	0.57	5
4	**Insufficient data collection and survey before design.**	2.84	0.56	6
5	**Delay in approval of submittals, design drawings, and sample materials, etc.**	3.09	0.62	2
6	**Delay in performing inspection and testing**	3.06	0.61	3
7	**In adequate experience of consultants.**	2.53	0.50	7
	GRAND MEAN	3.04	0.60	

Sources:- own survey(2024)

Table 4.6.1 Consultant related delay ranking

According to the table 4.11.1 ranked consultant related delays Delays in approving major changes to the project scope of work are identified as the most significant consultant-related issue. Slow approval of scope changes can substantially disrupt project timelines and progress. Placed the first factor and The second most impactful factor is delays in approving submittals, design drawings, and material samples. Timely review and approval of these critical project inputs is essential for maintaining momentum. And the ranked are third are two closely related factors: delays in performing inspections and testing, as well as providing unclear or inadequate details in the design drawings. These inspection and documentation challenges can compound execution problems. And then Delays in producing the design documents represent the fifth most impactful consultant-related issue after that Interestingly, both insufficient data collection and survey work prior to design are ranked sis factor and also identified as these factors having no direct contribution to project delays, Similarly, inadequate consultant experience is also listed as not being a contributing factor to delays to project and ranking seventh.

4.6.2 Scale and level of important consultant related delays

No	Consultant Related Delays	RANK	Not Important	Slightly Important	Moderately Important	Important	Highly important
1	**Delays in approving major changes in the scope of work**	0.78				●	
2	**Unclear and inadequate details in drawings**	0.60			●		
3	**Delay in producing design document**	0.57			●		
4	**Insufficient data collection and survey before design.**	0.56			●		
5	**Delay in approval of submittals, design drawings, and sample materials, etc.**	0.62				●	
6	**Delay in performing inspection and testing**	0.61				●	
7	**In adequate experience of consultants.**	0.50			●		

Sources:- own survey(2024)

Table 4.6.2 scale and level of important for consultant

According to Table 4.11.2 in the consultant-related factors classified based on level of importance, the following factors are considered important in a project:

4.6.2.1 Important factors

- Approving major changes in the scope of work: This factor involves the consultant's ability to effectively manage and approve any significant changes to the project's scope, ensuring that the work remains aligned with the initial plans and requirements.
- Approval of submitting, design drawings, and sample materials: The consultant's role in reviewing and approving submitting, design drawings, and sample materials is crucial. This ensures that the work adheres to the specified standards and specifications, enabling the smooth execution of the project.
- Performing inspection and testing: The consultant's responsibility to conduct thorough inspections and testing is an essential factor in project success. This helps to identify and address any issues or deficiencies early on, minimizing the risk of delays or rework.

4.6.2.2 Moderately important

- Unclear and inadequate details in drawings: This factor highlights the importance of the consultant providing clear and comprehensive design documents, as any ambiguity or lack of detail can lead to confusion and potential issues during the construction phase.
- Producing design documents: The consultant's ability to produce high-quality design documents, including plans, specifications, and other relevant materials, is a moderately important factor. These documents serve as the foundation for the project's execution.
- Sufficient data collection and survey before design: Ensuring that the consultant has conducted adequate data collection and surveys before the design phase is a moderately important factor. This helps to ensure that the design is informed by accurate and up-to-date information, reducing the risk of unforeseen challenges.
- Adequate experience of the consultant: The consultant's level of experience is a moderately important factor, as it directly influences their ability to provide sound advice, make informed decisions, and effectively manage the project.

4.6.3 Scale for effect for consultant related delayed

NO	Consultant Related Delays	MEAN	Low effect	Medium effect	High effect	Very high effect
1	**Delays in approving major changes in the scope of work**	3.90			●	
2	**Unclear and inadequate details in drawings**	3.03		●		
3	**Delay in producing design document**	2.87		●		
4	**Insufficient data collection and survey before design.**	2.84		●		
5	**Delay in approval of submittals, design drawings, and sample materials, etc.**	3.09		●		
6	**Delay in performing inspection and testing**	3.06		●		
7	**In adequate experience of consultants.**	2.53	●			
	GRAND MEAN	3.04				

Sources:- own survey(2024)

Table 4.6.3 describe the level of effect for consultant related delay

According to Table 4.6.3 the level of effect that various consultant-related factors have on a project can be categorized as high, medium, or low.

4.6.3.1 high level of effect on a project is:

Delay in approving major changes in the scope of work: This factor has a high level of impact on the project, as any delays in approving significant changes to the scope can lead to significant disruptions, additional costs, and potential delays in the overall project timeline.

4.6.3.2 medium level of effect on a project are:

Unclear and inadequate details in drawings: When the consultant fails to provide clear and comprehensive design documents, it can lead to confusion, rework, and delays during the construction phase, resulting in a medium-level impact on the project. Delay in producing design documents: Delays in the consultant's ability to produce the necessary design documents can have a cascading effect, hampering the progress of the project and causing a medium-level impact. Insufficient data collection and survey before design: Inadequate data collection and surveys prior to the design phase can lead to design flaws or the need for rework, resulting in a medium-level impact on the project. Delay in approval of submittals, design drawings, and sample materials: Delays in the consultant's review and approval of these critical project elements can disrupt the construction process and lead to a medium-level impact on the project. Delay in performing inspection and testing: Delays in the consultant's inspections and testing can delay the identification and resolution of issues, leading to a medium-level impact on the project.

4.6.3.3 low level of effect on a project is:

Inadequate experience of the consultant: While the consultant's experience is an important factor, its low-level impact suggests that other consultant-related factors play a more significant role in influencing the overall project outcomes.

4.7 Ranking of group causes of delay

No.	Group Cause	Owner		
		Mean	RII	Rank
1	**Owners related Delay**	3.17	0.63	3
2	**Consultant Related Delays**	3.04	0.60	2
3	**Contractors Related Delays**	3.29	0.65	1
	Grand Mean	3.16	**0.62**	

Sources:- own survey(2024)

Table 4.7 Ranking group causes of delay

According to the data on the table 4.7 the data indicate that contractor-related factors are the primary contributors to project delays, holding the highest rank. This suggests that issues arising from the contractor, such as poor performance, lack of resources, or construction defects, are the most significant drivers of schedule overruns and delayed project completion. Following the contractor-related factors, the client-related factors are ranked second in terms of their contribution to project delays.

This implies that decisions, changes, or other actions taken by the client play a notable role in causing projects to fall behind schedule. Finally, the consultant-related factors are placed in the third position, meaning they have a relatively lesser impact on project delays compared to the contractor and client-related factors. Nevertheless, the consultant's performance, recommendations, or involvement can still contribute to delays, albeit to a lesser degree than the other two categories.

and address the most significant contributors to construction project delays, ultimately enhancing overall project efficiency and success.

CHAPTER 5

CONCLUSION, MAJOR FINDINGS AND RECOMMENDATION

5.1 Introduction

This chapter sums up the key findings, conclusions, and suggestions that would assist in the prompt completion of future construction real estate projects, thus satisfying stakeholders. Furthermore, it proposes lessons to be learned for similar endeavors in the days ahead. Additionally, it offers practical recommendations for the parties involved in the construction of real estate project, including the client, contractors, and consultants, regarding the causes and consequences of project delays.

5.2 Conclusion

The research examines the causes and effects of construction delays in the Ayat real estate project in Addis Ababa, Ethiopia. The construction industry plays a crucial role in economic development, but projects often encounter significant delays that negatively impact timelines, budgets, and overall success. The research outlines several potential factors that can contribute to delays in construction projects related to client, contractor, and consultant delays. Quantitative research approach was used to capture quantitative data for the study. Questionnaire was used to identify the major causes and effects of delay in construction of this project. For the data analysis, both descriptive statistics were used. The primary contributors to project delays in building construction projects can be categorized into three main groups: contractor-related factors, client-related factors, and consultant-related factors. The analysis indicates that contractor-related factors hold the highest rank as the primary drivers of schedule overruns and delayed project completion. This suggests that issues arising from the contractor's performance, lack of resources, or construction defects are the most significant contributors to project delays. Following the contractor-related factors, the client-related factors are ranked second in terms of their contribution to project delays. This implies that decisions, changes, or other actions taken by the client play a notable role in causing projects to fall behind schedule. Finally, the consultant-related factors are placed in the third position, indicating that they have a relatively lesser impact on project delays compared to the contractor and client-related factors. Nevertheless, the consultant's performance, recommendations, Or Involvement Can still contribute to delays, albeit to a lesser degree than the other two categories.

5.3 Main Finding

5.3.1 The root causes of delays factors for contractor, consultant, and client.

For the contractor, the primary root causes of delays factors are:

- Shortage of Equipment: This refers to a lack of necessary construction equipment, machinery, or tools required for the project. This can lead to delays in completing specific tasks or activities on the construction site.
- Delays Due to Material Delivery: This involves delays in the procurement, transportation, or delivery of construction materials, which can disrupt the project timeline and prevent timely completion of work.
- Delay in Subcontractor Work: This occurs when subcontractors responsible for specific tasks or work packages experience delays, often due to their own resource constraints or coordination issues, which then impact the overall project progress.
- Low Productivity of Labor: This refers to inefficient or reduced productivity of the construction workforce, which can be caused by factors such as poor training, low morale, absenteeism, or inadequate supervision.
- Poor Safety Conditions on Site: Unsafe working conditions, such as lack of proper safety equipment, hazardous work environments, or inadequate safety protocols, can lead to project delays due to incidents, accidents, or the need to address safety concerns.
- Deficiency in Planning and Scheduling of the Project and Inadequate Contractor Experience: Poorly planned or scheduled construction projects, along with a lack of experience or expertise on the part of the contractor, can result in delays and disruptions throughout the project lifecycle.
- Rework Due to Errors during Construction: This involves the need to redo or correct work that was initially performed incorrectly, which can consume additional time and resources, leading to project delays.
- Poor Site Management and Supervision, and Poor Communication and Coordination: Ineffective site management, inadequate supervision, and poor communication and coordination among various stakeholders, such as the client, contractor, and subcontractors, can contribute to delays and disruptions in the construction project.

For the consultant, the primary root causes of delays factors are:

- Delay in Approving Major Changes in the Scope of Work: Delays caused by the consultant taking an extended period of time to review and approve significant changes to the project's scope, requirements, or specifications.
- Delay in Approval of Submittals, Design Drawings, and Sample Materials: Delays caused by the consultant taking an extended period of time to review and approve critical project submittals such as design drawings, material samples, shop drawings, etc.
- Unclear and Inadequate Details in Drawings: Delays caused by drawings and design documents provided by the consultant that lack sufficient detail or clarity, requiring additional clarification and rework.
- Delay in Performing Inspection and Testing: Delays caused by the consultant taking an extended period of time to conduct necessary inspections and testing of the work, holding up progress on the project.

For the client, the primary root causes of delays factors are:

- Delay in Progress Payments:

This refers to delays by the client in making scheduled progress payments to the contractor, which can disrupt the contractor's cash flow and project execution.

- Delay to Furnish and Deliver the Site:

This occurs when the client fails to provide the construction site to the contractor in a timely manner, delaying the start of the project.

- Change Orders by Owner during Construction:

This involves the client making frequent changes to the project scope or design during construction, which can lead to schedule delays and cost overruns.

- Delays in Approving Shop Drawings and Sample Materials:

This happens when the client takes an excessive amount of time to review and approve the contractor's shop drawings, samples, or other submittals, hindering the progress of the work.

- Slowness in the Decision-Making Process:

This refers to the client's inability to make timely decisions on various aspects of the project, which can lead to delays in the overall construction process.

5.3.2 The top delays factors

The top five construction project delays reveal some critical insights. Topping the first is the "shortage of equipment", **a contractor-related delay** with a mean value of 4.26 and a Relative Importance Index (RII) of 0.84. Closely following is the "delays due to material delivery", another **contractor-related factor** with a mean value of 4.23 and an RII of 0.84. The third-ranked delay is "delays in sub-contractor", also a **contractor-related issue**, with a mean value of 3.84 and an RII of 0.76. Interestingly, the fourth-ranked delay is **a client-related factor** - "delays due to progress of payment" - with a mean value of 3.70 and an RII of 0.74. Rounding out the five is the "low productivity of labor"**, a contractor-related delay** with a mean value of 3.69 and an RII of 0.73. These findings provide valuable insights for project managers to identify and address the most significant contributors to construction project delays, ultimately enhancing overall project efficiency and success.

5.4 Recommendation

The following recommendations were forwarded based on the research findings and conclusions. The root causes of project delays in constructions ayate real estate project are client ,contractor, consultant related delayed.

5.4.1 Client related delays And Recommendations for each of the delay factors related to client side

- Delay in Progress Payments:- To mitigate delays caused by delays in progress payments, it is recommended that clear and specific payment terms be established in the contract, with defined timelines for processing and approving payment applications. Additionally, the contract should include provisions for penalties or interest charges in the event of late payments, incentive's the owner to adhere to the agreed-upon payment schedule. Regular communication and transparency between the contractor and the owner regarding the payment process can also help identify and resolve any issues promptly.
- Delay to Furnish and Deliver the Site:- Ensuring the timely furnishing and delivery of the site is crucial to avoid delays. The contract should clearly specify the owner's responsibilities in this regard, including the provision of access, utilities, and any necessary permits or approvals. Regular coordination and communication between the contractor and the owner can help identify and address any potential delays in the site delivery process. Additionally, the inclusion of liquidated damages or other penalties for late site delivery can incentive the owner to fulfill their obligations in a timely manner.

- Change Orders by Owner during Construction:- While change orders are sometimes unavoidable, it is recommended to minimize their impact on the project schedule. The contract should include clear procedures for initiating, reviewing, and approving change orders, with defined timelines for the decision-making process. Additionally, the contract should outline the potential impact of change orders on the project schedule and provide for appropriate time extensions and compensation for the contractor.
- Delays in Approving Shop Drawings and Sample Materials:- To address delays in the approval of shop drawings and sample materials, it is recommended to establish a well-defined submittal review process in the contract, with specific timelines for the owner's or the architect's review and approval. The contract should also specify the consequences of delayed approvals, such as time extensions or the ability to proceed with the work based on the contractor's submittal.
- Slowness in the Decision-Making Process:-Slow decision-making can significantly impact the project schedule. To address this, it is recommended to clearly define the decision-making process in the contract, including the parties involved, the required approvals, and the timelines for decisions. Regular coordination meetings and open communication between the contractor, the owner, and other stakeholders can help identify and resolve any delays in the decision-making process.

5.4.2. Contractor related Delays And Recommendations for each of the delay factors on contractor side

- Shortage of Equipment:-To address delays caused by a shortage of equipment, it is recommended that the contractor carefully plan and schedule the equipment requirements for the project, taking into account the availability and lead times for procurement. The contractor should also maintain a well-managed equipment fleet, with a preventive maintenance program to ensure the reliability of the equipment. Additionally, the contractor should consider renting or leasing equipment when necessary to supplement their own resources and avoid delays.
- Delays Due to Material Delivery:-Delays in material delivery can significantly impact the project schedule. To mitigate this, the contractor should develop a comprehensive material management plan, which includes accurate forecasting of material requirements, establishing reliable supply chains, and maintaining effective communication with suppliers. The contractor should also consider exploring alternative suppliers or materials to have backup options in case of delays with the primary sources.

- Delay in Subcontractor Work:-Delays in subcontractor work can be addressed by implementing robust subcontractor management practices. This includes carefully selecting and vetting subcontractors, establishing clear contractual obligations and timelines, and closely monitoring subcontractor performance. Regular communication and coordination between the contractor and subcontractors can help identify and resolve any issues that may lead to delays.
- Low Productivity of Labor:-To improve labor productivity, the contractor should focus on providing adequate training, supervision, and motivation for the workforce. This may include implementing incentive-based programs, improving working conditions, and promoting a safety-first culture on the site. Additionally, the contractor should ensure that the right mix of skilled labor is available for the tasks at hand.
- Poor Safety Conditions on Site:-Maintaining a safe work environment is not only a legal requirement but also crucial for preventing delays due to accidents or incidents. The contractor should develop and enforce comprehensive safety protocols, provide appropriate personal protective equipment, and ensure regular safety training for all workers on-site. Proactive safety management can help reduce the risk of delays caused by safety-related issues.
- Deficiency in Planning and Scheduling of the Project and Inadequate Contractor Experience:-Effective planning and scheduling are essential for project success. The contractor should have a thorough understanding of the project requirements, resource availability, and potential risks. This includes developing a comprehensive project plan, a detailed schedule, and contingency plans to address unforeseen events. For projects that require specialized expertise, the contractor should consider partnering with experienced subcontractors or consultants to supplement their own capabilities.
- Rework Due to Errors during Construction:-Minimizing the need for rework is crucial for maintaining the project schedule. The contractor should implement quality control measures, such as regular inspections, clear quality standards, and effective communication with the project team, to identify and address any issues before they escalate. Additionally, the contractor should provide adequate training and supervision to the workforce to reduce the likelihood of construction errors.
- Poor Site Management and Supervision, and Poor Communication and Coordination:-Effective site management, supervision, communication, and coordination are essential for ensuring the smooth execution of the project. The contractor should establish clear

roles and responsibilities, implement effective communication channels, and promote a collaborative work environment.

5.4.3 Consultant related delays Recommendations for each of the delay factors on consultant side

- Delay in Approving Major Changes in the Scope of Work:- The consultant plays a critical role in reviewing and approving any significant modifications to the originally agreed-upon thesis objectives, methodology, or deliverable s. Delays in this approval process can disrupt the research timeline, prevent the incorporation of important new developments, and hinder the overall progress of the thesis work. It is recommended that the consultant establish clear procedures and timelines for reviewing and approving scope changes, and that regular communication be maintained between the consultant and the researcher to proactively identify and address any potential scope issues.

- Delay in Approval of Submittals, Design Drawings, and Sample Materials:- Delay in approving submittals, design drawings, and sample materials Another consultant-related delay factor that can affect project success . The consultant is typically responsible for reviewing and approving these critical project documents and any delays in this process can have ripple effects throughout the research timeline. It is important that the consultant dedicates sufficient resources and attention to the timely review and approval of these submitting, and that clear communication channels are established to facilitate the smooth flow of information between the researcher and the consultant.
- Unclear and Inadequate Details in Drawings:- Consultant-related delays can also arise from unclear or inadequate details in the drawings provided for the project success . If the consultant-generated drawings lack crucial information or are ambiguous, it can lead to confusion, rework, and delays as the researcher attempts to interpret and implement the design. It is recommended that the consultant ensure the drawings are comprehensive, well-annotated, and aligned with the research objectives, and that any questions or clarifications are promptly addressed to minimize disruptions to the project timeline.
- Delay in Performing Inspection and Testing:-Finally, delays in the consultant's performance of inspections and testing can also impact the progress work. The consultant is often responsible for overseeing and verifying the quality and integrity of the research process and outcomes, and any delays in these activities can slow down the overall workflow. It is important that the consultant allocates sufficient resources and adheres to agreed-upon inspection and testing schedules to avoid disruptions to the thesis timeline.

5.5 Future Direction

- Expand the Scope of the Study

This study focused on the Ayat real estate construction project in Addis Ababa, Ethiopia. Future research could expand the scope to include other real estate construction projects in Ethiopia or the broader East African region. This would provide a more comprehensive understanding of the causes and effects of construction delays across a larger sample size and geographical area.

- Longitudinal Analysis

A longitudinal study tracking the progress and delays of the Ayat real estate construction project or similar projects over an extended period could provide valuable insights. This would allow researchers to observe how delay factors and their impacts evolve over time, and identify any changes in the relative importance of different causes.

- Integration of Advanced Analytics and Technology

Incorporating the use of data analytics, building information modeling (BIM), and other emerging technologies could enhance the understanding of construction delays and support the development of more proactive and data-driven solutions.

- External analysis

Future research on the causes of construction delays in the real estate sector in Ethiopia could take an external analysis approach to provide a more comprehensive understanding of the issue. This could involve examining the influence of macro-economic and political factors, analyzing industry-level dynamics and benchmarking against regional/global peers, exploring supply chain and logistics challenges, conducting a stakeholder ecosystem analysis, investigating environmental and sustainability considerations, as well as assessing the impact of technological and innovation trends.

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APPENDIX-A

Questioner ST. MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES Department of Project Management

Assessment on the Causes and Effects of Project Delay in Building Construction Projects; The Case for ayate real estate construction project

This questioner is to be filled by the clients, contractors and consultants who are responsible in the project. The purpose of this study is to assess the overall causes of delay in the building construction project in the case for ayate real estate construction. The questionnaire is meant to secure relevant data to the study & has no intention except is solely for academic purpose and its confidentiality is maintained. Therefore, your valuable support in responding to the question raised is of paramount importance to the success of the study. Hence, I sincerely request you to fill the questionnaire so carefully. The quality and quantity of information you provide determines the ultimate of the study. Thank you in advance for your every cooperation.

The rating is organized in five measure of weighting you ordered them as follows;

Rating Scale	**Very High**	**High**	**Moderate**	**Low**	**Very Low**
	5	**4**	**3**	**2**	**1**

1. General Information

Please check which most accurately describes:

All information, including all results and personal information from participating individuals will be kept strictly confidential and be used only for research purposes.

1.1. Organization type

1. Owner
2. Contractor
3. Consultant

1.2. Respondent gender

1. Male
2. Female

1.4. Educational Background

1. TVET/ Diploma
2. 1st Degree
3. 2nd Degree
4. PhD

1.5. Experience in Building construction work (in years)

1. 1-5
2. 6-10
3. 11-15
4. 16+

1.6. Job Designation

1. Project Manager
2. Quality Manager
3. Project Office Engineer
4. Site Engineer
5. Surveyor
6. Supervisor

Other, Specify_____

2. Factors that cause building projects delay in Ethiopian Construction Works Corporation

A Likert scale is used to scale responses in which to identify delays and their impacts to the Building Construction Projects.

Rating Scale	**Very High**	**High**	**Moderate**	**Low**	**Very Low**
	5	**4**	**3**	**2**	**1**

I. Owners Related Delays

The result of factors of client related delays.

No	**Causes of Delays**	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
1	Delays in revising and approving design document					
2	Change orders by owner during construction.					
3	Delays in approving shop drawing and sample materials.					
4	Slowness in decision making process.					
5	Poor communication and coordination.					
6	Conflict between joint- ownership of the project					
7	Delay to furnish and deliver the site.					
8	Delay in progress payment.					
9	Suspension of work by owner.					

I. Contractors Related Delays

No	**Causes of Delays**	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
1	Poor communication and Coordination					
2	Delay in sub - contractor work					
3	Inadequate contractors experience.					
4	Deficiency in planning and scheduling of project					
5	Poor safety conditions on site					
6	Delays due to material delivery					
7	Shortage of equipment					
8	Rework due to errors during construction					
9	Conflicts between contractor and other parties.					
10	Difficulties in financing project					
11	Under estimation of cost of the project by contractor					
12	Poor qualification of contractor's technical staff					
13	Low productivity of labor					
14	Shortage of labors					
15	Poor site management and supervision					

3. Consultant Related Delays

No	**Causes of Delay**	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
1	Delays in approving major changes in the scope of work					
2	Unclear and inadequate details in drawings					
3	Delay in producing design document					
4	Insufficient data collection and survey before design.					
5	Delay in approval of submittals, design drawings, and sample materials, etc.					
6	Delay in performing inspection and testing					
7	In adequate experience of consultants.					

4: EFFECTS OF DELAY ON CONSTRUCTION PROJECTS

Statement	Strongly agree	Agree	Neutral	Strongly Disagree	Disagree
	1	2	3	4	5
Time overrun.					
Increase in final cost of project.					
Tying down of client capital due to non completion of the project.					
Wastage and under-utilization of man power and resources.					
Abandonment of building project.					
Reduced profit.					
Dispute between parties involved.					
Litigation					
Arbitration					