Project Work on Cause and Effect of Delay in a High-Rise Building Project: A Case Study of Oromia Police Commission

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APPROVED BY BOARD OF EXAMINERS

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Internal Advisor	**Signature**	**Date**
External Advisor	**Signature**	**Date**

DECLARATION

I hereby affirm that this research has not been previously submitted or approved for a master's degree by this or any other institution. To the best of my knowledge and belief, the thesis does not include any previously published or authored content from another individual, except where appropriate citations and references are provided within the project itself.

ACKNOWLEDGMENT

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ABSTRACT

This project work aims to investigate the causes and effects of delays in the construction of the Oromia Police Commission Headquarter (OPCHQ) project. A quantitative research approach was adopted, utilizing a survey questionnaire as the primary data collection tool. The questionnaire was administered to 33 professionals representing the consultant, contractor, and client sides involved in the project. The survey data were analyzed using the Relative Importance Index (RII) method to rank the identified delay factors. From the analysis, the top 10 causes of delays in the OPCHQ project were identified. Additionally, the questionnaire revealed the five most significant effects of these delays on the project. Based on the findings, recommendations were provided to mitigate and address the identified delay factors. These recommendations aim to improve project planning and scheduling, enhance communication and coordination among stakeholders, and address issues related to financial resources, permits, and availability of construction materials. This research contributes to the understanding of the causes and effects of delays in construction projects, specifically in the context of the OPCHQ project.

Key words

OPCHQ - Oromia Police Commission Head Quarter

RII – Relative importance index - is a non-parametric technique widely used by construction and facilities management researchers for analyzing structured questionnaire responses.

CHAPTER ONE

1. INTRODUCTION

The Oromia Police Commission is a high-rise building project that has been under construction for the past few years. The project has been facing delays in its completion, which has resulted in increased costs and reduced efficiency. This project work aims to investigate the causes and effects of delay in the Oromia Police Commission project.

The introduction section provides an overview of the study's background, problem statement, research questions, general and specific objectives, significance, scope, and organization. It serves as a foundation for the entire research, outlining the methodology employed, identifying the gaps and issues to be addressed, clarifying the research's purpose, and defining its scope.

1.1 Background of the study

Understanding the causes and effects of delay in high-rise building projects is crucial for effective project management and successful project outcomes. Delays in construction projects can differ depending on factors such as the country, type of construction, project scale, and budget, as mentioned by Sullivan (1) . This research aims to investigate the cause and effect of delay in a specific high-rise building project, focusing on the case of the Oromia Police Commission. By examining the unique context and factors contributing to delays in this project, valuable insights can be gained to inform future project management practices in the region and beyond.

The construction industry holds significant value within the global economy. Ethiopia's economy and population have experienced notable growth, leading to a substantial increase in construction activities, particularly in Addis Ababa and other regional capitals, as emphasized by Girma, Bekal (2).The Oromia Police Commission high-rise building project serves as an ideal case study due to its significance and relevance. The project involves the construction of a modern and functional high-rise building to meet the operational needs of the Oromia Police Commission. The building's complexity, size, and importance make it a suitable candidate for studying the causes and effects of delay in high-rise construction projects. Additionally, the Oromia Police Commission represents a prominent government institution responsible for ensuring public safety and security, making the successful completion of their building project crucial for their operational efficiency. Therefore,

investigating the delays in this project will contribute to a better understanding of the challenges faced by public sector organizations in delivering complex construction projects

This Project work aims to fill this some knowledge gap and shed light on the unique factors contributing to delays in high-rise construction. The findings will provide stakeholders with actionable recommendations to mitigate delays

1.2 Problem Statement

Various factors continue to hinder the timely achievement of construction project goals. It is noteworthy that, even in an era of advanced technology and increased adoption of project management practices, the issue of project delay remains unresolved Yang, (3).

The Oromia Police Commission high-rise building project has encountered significant challenges throughout its implementation, including extensive delays and substantial cost escalations. The project, which initially aimed to provide a modern and functional building for the Oromia Police Commission's operations, has experienced multiple contract amendments, leading to a quadrupling of the project's cost compared to the original documents. These amendments indicate a deviation from the initial project scope and requirements, potentially contributing to further complexities and delays. Understanding the causes and effects of these delays is critical to address the underlying issues and improve project management practices in the construction industry.

The first contract amendment for the Oromia Police Commission high-rise building project introduced modifications in the design and functional requirements, reflecting changes in the project's objectives and specifications. This alteration necessitated adjustments in the construction plan and procurement processes, potentially affecting the project timeline and overall progress. The subsequent contract amendment, which focused on price adjustments and additional scope of work, further compounded the project's complexities and resulted in significant cost escalations. These contract amendments highlight the evolving nature of the project and emphasize the need to investigate the impact of cause and effect of the project's delay.

The delays experienced in the Oromia Police Commission high-rise building project compared to the original project documents have resulted in substantial increase in the project's cost and also the quadrupling of the project's cost compared to the original documents. These effects not only affect the timely completion of the building but also

impact the commission's ability to efficiently carry out their operations. Identifying the root causes of the delays is vital for addressing these issues and implementing effective measures to minimize delays in future high-rise construction projects. Additionally, an evaluation of the effects of these delays will provide valuable insights into the consequences of project delays in the construction industry.

1.3 Research objective

1.31 General Objective

The General objective of the study was to Identify the causes and effect of OPCHQ project delay.

1.32 Specific Objective

The main objectives of this research are as follows:

1. To identify the causes of delay in the Oromia Police Commission project.

2. To determine the effects of delay on the project budget, schedule, and quality.

3. To propose recommendations that can help minimize delays in the project.

1.4 Research Questions

The research questions to be addressed in this study are the following:

1. What are the most critical factors causing construction delay in Oromia police commission head quarter project (OPCHQ)?
2. What are the most critical effect of construction delay in Oromia police commission head quarter project (OPCHQ)?

1.5 Significance of the study

The study on the causes and effects of delay in the Oromia Police Commission high-rise building project has several significant contributions to the construction industry, as well as to the project stakeholders. The following are some of the significance of the study:

- Identification of Root Causes: The study will help project stakeholders to identify the root causes of delay in the Oromia Police Commission project. By identifying the root causes, stakeholders can propose possible solutions to mitigate them and prevent future delays.

- Mitigation of Delays: The study will propose possible solutions and recommendations to mitigate the causes and effects of delay in the project. By implementing these solutions, project stakeholders can reduce delays and avoid negative impacts on project success factors such as cost, time, and quality.
- Improvement of Project Management: Through a comprehensive analysis of the causes and effects of delays, the study offers practical recommendations for addressing the identified challenges and improving overall project management.

1.6 Scope of the study

The scope of this project work encompasses a comprehensive analysis of the causes and effects of delay in the OPCHQ (Oromia Police Commission Headquarter) project. The study involves surveying a sample of 33 professionals from various disciplines within the construction industry. By examining their insights and experiences, the project aims to identify the key factors contributing to delays in the OPCHQ project and understand the implications of these delays on project outcomes.

1.7 Study Limitations

Restricted Sample Size: study focuses solely on the Oromia Police Commission high-rise building project, which restrict the applicability of the findings to other construction projects.

Potential Bias: The study relies on a survey questionnaire, which is influenced by respondent bias. Additionally, participants may provide answers they perceive as socially desirable rather than their genuine perspectives.

1.8 Organization of the study

The introduction section provides an overview of the study, starting with the background and context of the high-rise building project. It sets the stage by highlighting the importance of investigating the cause and effect of delay in construction projects, emphasizing the need for a deeper understanding of this phenomenon. The purpose and objectives of the study are then outlined, clarifying the research's goals and what it aims to achieve. Additionally, the scope and limitations of the study are identified, acknowledging the boundaries within which the research will be conducted. These include any potential constraints, such as resource limitations or specific focus areas, that may impact the generalizability or breadth of the study's findings. By presenting these introductory aspects, the reader gains a clear understanding of the study's context, significance, objectives, and the scope within which it will be conducted.

The literature review section provides an overview of the relevant literature pertaining to delay factors in construction projects. It synthesizes and examines existing studies that have explored the causes and factors contributing to project delays. These studies serve as a foundation for understanding the complexities of delay in construction projects and provide insights into the various aspects that influence project timelines. Additionally, the literature review highlights how previous research has categorized delay factors based on the roles and responsibilities of key stakeholders, namely consultants, contractors, and clients. By grouping delays into these categories, the literature review offers a structured framework for understanding the specific contributions and impacts of each stakeholder group on project delays. This classification facilitates a comprehensive understanding of the different dimensions of delay and provides a basis for this study.

The research design for this study employed a quantitative approach, which involved the systematic collection and analysis of numerical data using Likert scale. To gather the required data, survey closed-ended questionnaires were selected as the primary data collection method. These questionnaires consisted of predetermined response options, enabling participants to choose their answers from a set list of choices. The use of closed-ended questions enabled specific and quantifiable data, simplifying the subsequent analysis process. The sample selection and data collection procedures were carefully designed to ensure the reliability and representativeness of the findings. By employing these methodologies, the study aimed to derive objective and generalizable insights into the research topic, contributing to a deeper understanding of the research questions at hand.

In this study, the collected data and information were presented in a comprehensive manner to facilitate a thorough analysis of the causes and effects of delays in a high-rise building project. The presentation of the data involved organizing and summarizing the collected information

Additionally, the study assessed the effects of these delays on the high-rise building project.. By evaluating the effects of delays, the study aimed to provide a comprehensive understanding of the consequences and implications of the identified causes. Overall, this research delved into the presentation of collected data, analysis of identified causes, and assessment of the effects of delays in a high-rise building project. By examining these aspects, the study aimed to shed light on the factors contributing to delays and their implications.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Introduction

Delay is the situation when the completion of a task or project exceeds the originally estimated time. It refers to the scenario where a construction project fails to meet its intended timeframe, resulting in the work not being finished as planned. Delay is a frequent occurrence in the construction industry, affecting almost all projects .Muhammad, (4).

While the severity of project delays and cost overruns may differ from country to country, they are universally prevalent issues in the global construction industry Al-Najjar, 2008 (5).Delay can be described as the exceeding of the specified completion date in a contract or the agreed-upon delivery date for a project Ramya, (6). It refers to the situation where work is postponed without fully halting the construction, going beyond the contracted or mutually agreed-upon deadline Dinakar, (7).

2.2 Issues to be addressed by Literature Review

The literature review for the study on the cause and effect of delay in a high-rise building project, focusing on Oromia Police Commission, will address key issues related to project delays in the construction industry. Here are important topics and issues that can be covered in the literature review:

1. Causes of project delays in construction:
    - Explore various factors that commonly contribute to delays in construction projects, such as inadequate planning, design changes, poor communication, resource constraints, and external factors (e.g., weather conditions, regulatory issues).
    - Examine studies and theories that have identified and categorized delay causes in construction projects, including high-rise buildings, and their relevance to the specific context of the Oromia Police Commission's project.
    - Examine delays and their relation with stakeholders which are Consultant, Client and Contractor
2. Effects of project delays:

- Investigate the consequences of project delays on various aspects, such as project cost, quality, safety, stakeholder satisfaction, and overall project success.

2.3 Classification of delay

Most importantly, delays can be seen in these four major categories as

1. Critical or Non-Critical.

2. Excusable or Non-Excusable,

3. Compensable or Non-Compensable

4. Concurrent or Non-Concurrent. Trauner, (8)

2.4 Cause of Delay

Numerous research studies have investigated delays in construction projects over the years, with scholars proposing different factors and clusters of factors that contribute to the occurrence of delays. The existing literature review reveals that these factors have been categorized into as many as eleven groups, including those related to consultants, contractors, design, equipment, external factors, labor, materials, owners, projects, engineers, and human behavior, among others and . However, this particular project work has reorganized these factors into four overarching categories: consultant-related, contractor-related, client-related, and external-related factors.

2.41 Consultant Related Delay Factors

Numerous research investigations have highlighted that factors related to consultants contribute significantly to schedule delays. Aibinu and Odeyinka (9) argue that insufficiently detailed drawings, delayed issuance of instructions, and inadequate oversight have a significant impact on delays associated with consultants. Al-Khalil and Al-Ghafly (10) reached the conclusion that inadequate on-site supervision by consultants represents the primary cause of delays. Similarly, Al-Kharashi and Skitmore ,(11) identified delays in approving significant changes to the scope of work, consultants' lack of experience, and tardiness in reviewing design documents as crucial factors contributing to delays.

Chan and Kumaraswamy ,(12) discovered delays in the provision of design data, insufficient experience within the design team, and individual research. El-Razek et al, (13) reached the conclusion that alterations in design during construction, modifications in material categories

and specifications during construction, and design mistakes made by designers all contributed to the delays. Faridi and El-Sayegh , (14) identified sluggish compilation and endorsement of blueprints, unfinished blueprints, specifications, or documents, and alterations in blueprints as factors causing delays associated with consultants.

Iyer and Jha ,(15) pinpointed insufficient project planning at the outset and a consultant's hesitancy in making timely decisions as primary reasons for delays. Chan and Kumaraswamy (12) identified unforeseen soil conditions, delays in providing design information, and required modifications to the work as significant delays caused by consultants. Ling and Hoi ,(16) examined the factors contributing to delays from a technical risk perspective, which encompassed design flaws, estimation inaccuracies, and failures in implementing new technologies.

2.42 Contractor Related Delay Factors

Aibinu and Odeyinka ,(9) recognized that challenges with finances, equipment malfunctions and maintenance issues, planning and scheduling problems, shortages of materials and equipment, slow mobilization, and limited manpower were the primary factors contributing to this type of delays. Al-Khalil and Al-Ghafly ,(10) noted that difficulties with financing and cash flow, inadequate project management, and insufficient manpower were significant factors to consider.

Chan and Kumaraswamy ,(12) recognized that insufficient site management and supervision, as well as inadequate project planning and scheduling, are factors that contribute to delays. Faridi and El-Sayegh , (14) identified a shortage of manpower, inadequate site supervision and management, and untimely availability of materials as the main causes of delays within the contractor-related category.

In another investigation Chan and Kumaraswamy ,(12) determined that insufficient contractor expertise, ineffective project planning and scheduling, and subpar site management and supervision were significant factors. Al-Khalil and Al-Ghafly ,(10) employing factor analysis, reached the conclusion that the most impactful contributors were on-site accidents resulting from a lack of safety measures, the utilization of improper or outdated construction methods, and delays in material delivery. In a separate study, Iyer, and Jha,., (15) pinpointed poor human resource management, labor strikes, and the exceptional nature of project activities demanding extensive technical expertise as causes of delays during the construction process.

2.43 Client Related Delay Factors

Aibinu and Odeyinka (9) reached the conclusion that significant issues included clients experiencing financial difficulties, the occurrence of variation orders, and delays caused by slow decision-making. In a distinct study, Hemanta et al., Hemanta, ,Anil, Iyer, and Sameer, (17) it was observed that a lack of incentives for contractors to complete projects early and sluggish decision-making by owners were crucial factors. Al-Khalil and Al-Ghafly,(10) identified the delay in progress payments by the client as a critical aspect.

Assaf and Al-Hejji (18) identified the factors causing delays related to the owner, which included delays in progress payments by the owner, delays in providing the contractor with a furnished and delivered site, change orders initiated by the owner during construction, late revisions and approvals of design documents by the owner, delays in approving shop drawings and sample materials, inadequate communication and coordination by the owner and other parties involved, slow decision-making processes by the owner, conflicts arising from joint-ownership of the project, absence of incentives for the contractor to finish ahead of schedule, and instances of work suspension initiated by the owner.

Assaf and Al-Hejji (18) pinpointed sporadic halts in construction due to financial difficulties and delays in making payments to the contractor as the primary causes within this classification. Chan and Kumaraswamy (12) recognized alterations initiated by the client, impractical contract timeframes imposed by the client, and sluggishness in decision-making as significant factors.

2.44 External Related Delay Factors

Aibinu and Odeyinka ,(8) noted that successive critical factors included price increases, adverse weather conditions, labor disputes and strikes, government regulations, delays in obtaining permits from the government, civil unrest, and unforeseen natural events. In a separate study, the most significant cause of delay, according to Aibinu and Odeyinka ,(8) was the delay in obtaining work permits from authorities.

Assaf and Al-Hejji (18) identified the external factors causing delays as follows: the impact of subsurface conditions (such as soil composition and high water table), delays in obtaining permits from the municipality, the adverse effects of hot weather on construction activities, the disruption caused by rain during construction, the unavailability of utilities on the site (including water, electricity, and telephone services), the influence of social and cultural factors, traffic control and limitations at the construction site, accidents occurring during

construction, unexpected variations in site conditions, changes in government regulations and laws, delays in receiving services from utility providers (such as water and electricity), and delays in conducting final inspections and obtaining certification from third-party entities.

Assaf and Al-Hejji (18) additionally recognized that legal conflicts and ineffective penalties for delays, scarcity of construction materials in the market, and delays in the production of specialized building materials were factors that contributed to the occurrence of delays.

2.5 Effect of Construction Delays

In their research conducted in Aibinu and Jagboro (19) investigated the impact of construction delays on the timely completion of projects within the construction industry in Nigeria. They identified six distinct consequences that emerged as a result of these delays: exceeding the scheduled time, surpassing the estimated cost, disagreements, resorting to arbitration, complete abandonment of the project, and involvement in legal disputes.

In a study conducted by Aibinu and Jagboro (19) the focus was on examining the impact of construction delays on the construction industry. The researchers identified six specific effects that arise from delays in projects.

1) Cost overrun

2) Time overrun

3) Dispute

4) Arbitration

5) Litigation and

6) Abandonment

2.6 Summarization of the literature review

Based on the literature review, this project will focus on examining various operational independent variables that can be categorized into three groups: client-related, contractor-related, and consultant-related delays. A total of 40 delay factors identified from the literature will be investigated using quantitative research methods to determine the causes of delay in the OPCHQ project. Additionally, five operational dependent variables representing the effects of delays in construction have been identified through the literature review. The study

will assess the extent to which these effects persist in the OPCHQ project as a result of the delays that have occurred..

Table 2.1 Summaries of Factors on cause of delay

Cause of Delay in building as per Literature Review			
Client Related	**Consultant Related**	**Contractor Related**	**External Factors**
Slow decision-making	Design changes and revisions	Inadequate project planning:	Weather conditions
Incomplete or delayed project brief	Inadequate project documentation	Labour shortages	Regulatory and permit delays
Financing issues	Lack of coordination	Poor subcontractor management	Political instability
Scope changes	Design errors or omissions	Material procurement issues	Economic fluctuations
Permitting and regulatory delays	Slow response to requests for information	Equipment availability and breakdowns	Material shortages.
Land acquisition issues	Limited availability or expertise	Ineffective project communication	Infrastructure limitations
Stakeholder conflicts	Inaccurate cost estimates	Inaccurate cost estimation	Community or stakeholder opposition
Lack of project management experience	Inadequate contract administration	Poor project management	Force majeure events
Delayed payments	Inadequate supervision	Change order delays	Utility relocations
Legal disputes	Compliance with regulatory requirements	Quality control issues	Supply chain disruptions

Table 2.2 Summaries of Factors on cause of delay

Effect of Delay in high rising building as per Literature Review
Increased Costs
Schedule Disruptions
Reduced Productivity
Damaged Stakeholder Relationships
Reputational Damage
Increased Costs

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the study's overall framework for obtaining relevant data, conducting analysis, interpreting findings, and presenting results was discussed. The goal is to reach a conclusion and provide practical recommendations. The focus is specifically on key aspects such as research approach and design, target population and sample, data collection methods and tools, as well as data analysis and presentation.

3.2 Research Approach and Design

For this research, the methodology chosen and implemented revolved around conducting a thorough review of existing literature. In addition, a structured questionnaire survey was developed from the literature review to evaluate the causes and effect of delays in OPCHQ construction projects.

The survey questionnaires aim to gather crucial information, including:

A. Details about the personal characteristics of the respondents, such as Age, education level, and gender.

B. Insights into the primary reasons for project delays and cost overruns.

C. Understanding the overall impact of delays and cost overruns.

D. Identification of the parties accountable for the causes of delays and cost overruns.

To achieve this, a Likert scale with five points ranging from 1 to 5 was employed to gauge the level of consensus among the respondents regarding the identified factors as causes and effects of delays. This scale facilitated the ranking of these factors by analyzing their respective relative importance index.

The information was collected solely through a survey as the primary research tool. The survey was created to align with the study's objectives. To ensure the data's accuracy, Likert-style questions were incorporated, where participants indicated their agreement level with the variables on a five-point Likert scale. Coded responses were entered into Statistical Package for the Social Sciences (SPSS) version 25 and EXCEL, for data analysis.

The survey for the OPCHQ project involved individuals in the client, consultant, and contractor roles, with a total of 33 participants. The number of participants meets the requirements of the central limit theorem, ensuring that the results obtained are statistically significant. This theorem states that a sample size of over 30 is sufficient for obtaining reliable results Kwam and Vidakovic (20).

3.3 Research Population and Sampling

3.31 Sample Design

The study obtained a comprehensive list of all professionals involved in the project and stratified them in to three groups. The first group comprised firms from consultant while the second group was from contractors the last group from clients. The major criterion in selecting the firms was based on profession and involvement in the project.

Structured questionnaires with closed-ended questions were distributed to a specific group of respondents consisting of contractors, clients, and consultants involved in the OPCHQ project. The aim was to collect primary data. These questionnaires were designed to acquire information about construction projects that are directly related to the undertakings of OPCHQ project.

3.32 Sample Size

3.33 Census Technique

Census technique involves a comprehensive study of every unit or individual within the population under investigation. This method is particularly useful when the population size is relatively small, typically less than 100. One notable advantage of using the census technique is its ability to provide an accurate and precise measurement of the entire population, unlike sampling methods that rely on a subset of the population.

To ensure the relevance and accuracy of the data collected, professionals from the client, consultant, and contractor roles were carefully chosen based on their active involvement in the project and their positions within their respective parties. As a result, two distinct groups were formed onsite professionals and office professionals, encompassing all three parties involved. The combined technical staff in these two groups amounted to 35 individuals. Out of these, 33 staff members were identified as suitable candidates for providing the necessary information required for this study.

3.4 Data Collection

In the project work investigating the causes and effects of delays in the construction of the Oromia Police Commission headquarters, data collection was conducted using surveys administered through questionnaires.

The objective of the data collection process was to gather information directly from relevant stakeholders involved in the construction project, such as project managers, architects, engineers, contractors, and other personnel. By utilizing surveys via questionnaires, the researchers aimed to obtain specific insights and perspectives regarding the causes and effects of delays in the project.

To ensure the effectiveness of the data collection process, several considerations were taken into account. The questionnaires were carefully constructed, using Closed-ended questions, to gather quantitative data. The questions were formulated in a clear and concise manner to minimize ambiguity and facilitate easy comprehension for the participants.

The survey administration process involved reaching out to the identified stakeholders and distributing the questionnaires to them.

Overall, the use of surveys via questionnaires for data collection in the project work on the cause and effect of delays in the Oromia Police Commission headquarters construction project allowed for systematic gathering of information directly from stakeholders, providing valuable insights to address the research objectives.

3.5 Data Analysis

The data collected for this study was analyzed using descriptive statistics. The analysis focused on primary data obtained through questionnaires and literature review. The measurement type used in this study was ordinal scales, which involved assigning integer values in descending order to the factors and variables assessed in the questionnaires. To facilitate the analysis, the collected questionnaires were processed using the statistical software package SPSS v 25.To input the data into SPSS, a Likert scale with five points was utilized. The scale assigned the following interpretations: "5" represented "extremely significant," "4" denoted "very significant," "3" indicated "moderately significant," "2" signified "slightly significant," and "1" represented "not significant." In the analysis, variables receiving ratings of "4" and "5" were considered as significant contributors to construction delay and cost overruns. Conversely, variables receiving ratings of "1" and "2"

were deemed insignificant contributors to delay and cost overruns. A rating of "3" suggested uncertainty regarding the variable or factor. The obtained results were then used to compare the viewpoints of key respondents from OPCHQ regarding the factors influencing the causes and effects of delay on the OPCHQ project.

3.52 Data Presentation

Once the analysis of the collected data was finalized, the findings were presented in a concise and comprehensible manner. The results were discussed and interpreted, establishing connections between the presented data and the conceptual foundations of the researched factors. To present the data effectively, the study utilized various methods such as tables, and bar charts, These visual representations were employed to enhance the presentation and facilitate a clear understanding of the information conveyed.

3.6 Reliability and Validity

Reliability and validity of the questionnaire used will be addressed using Cronbach Alpha. Reliability pertains to the consistency and stability of the questionnaire's measurements, ensuring that it yields consistent results when administered to the same group of respondents under similar conditions.

Validity, on the other hand, ensures that the questionnaire accurately measures the intended constructs.

By addressing the reliability and validity of the questionnaire, this study aims to enhance the quality and credibility of the findings on the causes and effects of delay in the OPCHQ project. These considerations will help ensure consistent and accurate measurements, enabling the researchers to obtain reliable data that reflects the intended constructs and contributes to a robust analysis of the research topic.

Table 3.1 Cronbach alpha coefficient for the overall questionnaires

Reliability Statistics	
Cronbach's Alpha	N of Items
0.679	30

A Cronbach's alpha value of 0.679 indicates an acceptable level of validity and reliability.

Table 3.2 Cronbach alpha coefficient for individual variables

Cronbac Aplha	
Client related	
Work Experience	0.664
Slow decision making	0.683
Incomplete or delayed project brief	0.649
Financing issues	0.646
Scope changes	0.652
Permitting and regulatory delays	0.649
Land acquisition issues	0.660
Stakeholder conflicts	0.677
Lack of project management experience	0.681
Design changes and revisions	0.668
Consultant Related Factors	
Inadequate project documentation	0.682
Lack of coordination	0.631
Design errors or omissions	0.642
Slow.response.to requests for information	0.633
Limited availability or expertise	0.666
Inaccurate cost estimates	0.690
Inadequate contract administration	0.719
Inadequate supervision	0.650
Compliance with regulatory requirements	0.673
Contractor Factors	
Inadequate project planning	0.655
Labor shortages	0.714
Poor subcontractor management	0.675
Material procurement issues	0.698
Equipment availability and breakdowns	0.680
Ineffective project communication	0.672
Inaccurate cost estimation	0.691
Poor project management	0.709
Change order delays	0.698

Quality control issues	0.683
External Factor	
Weather conditions	0.679
Political instability	0.663
Economic fluctuations	0.677
Material shortages	0.676
Infrastructure limitations	0.673
Community or stakeholder opposition	0.677
Force majeure events	0.679
Utility relocations	0.666
Supply chain disruptions	0.655
Regulatory and permit delays	0.699

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1 INTRODUTION

This part of the research dealt with the analysis and discussion of the data gathered from questionnaire survey.Overall, the Results and Discussion section will provide a comprehensive and insightful account of the cause and effect of delay in the OPCHQ project, contributing to the body of knowledge in the field and offering practical implications for project stakeholders and practitioners.

4.2 Response Rate and Demographic Data

4.21 Descriptive analysis of general information of respondents

This section will provide a detailed account of the data collected, analysed, and interpreted throughout the study. It will include a summary of the causes of delay identified in the OPCHQ project, highlighting the most significant factors that contribute to delays. The effects of these delays on the project's progress and outcomes will also be discussed, emphasizing the implications and consequences they have on various aspects of the project.

Table 4.1 Descriptive analysis for Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	31	93.9	93.9	93.9
	Female	2	6.1	6.1	100.0
	Total	33	100.0	100.0	

Figure 4.1 Descriptive analysis for Gender

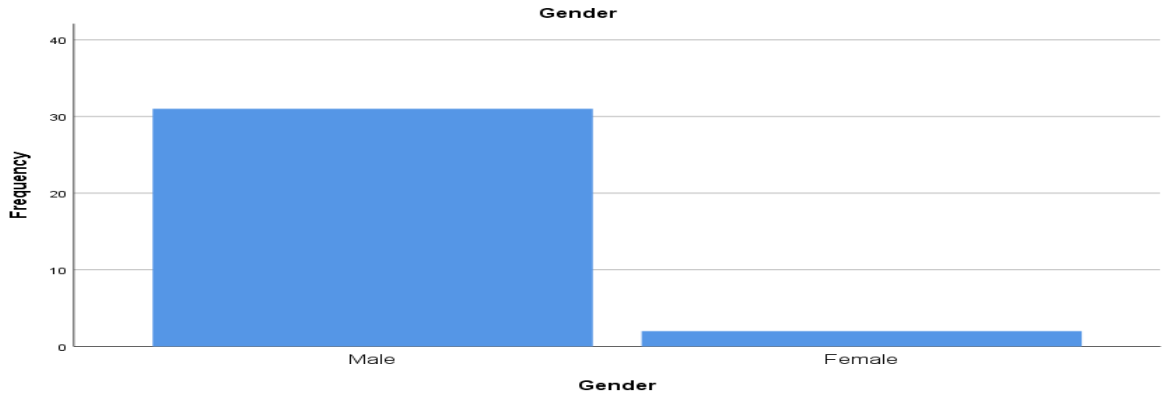

Table 4.2 Descriptive analysis for Position of respondent

Position of respondent					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Project Manager	1	3.0	3.0	3.0
	Project Coordinator	1	3.0	3.0	6.1
	Construction Engineer	1	3.0	3.0	9.1
	Resident Engineer	2	6.1	6.1	15.2
	Site Engineer	8	24.2	24.2	39.4
	client engineer	5	15.2	15.2	54.5
	consultant engineer	11	33.3	33.3	87.9
	other	4	12.1	12.1	100.0
	Total	33	100.0	100.0	

Figure 4.2 Descriptive analysis for Position of respondents

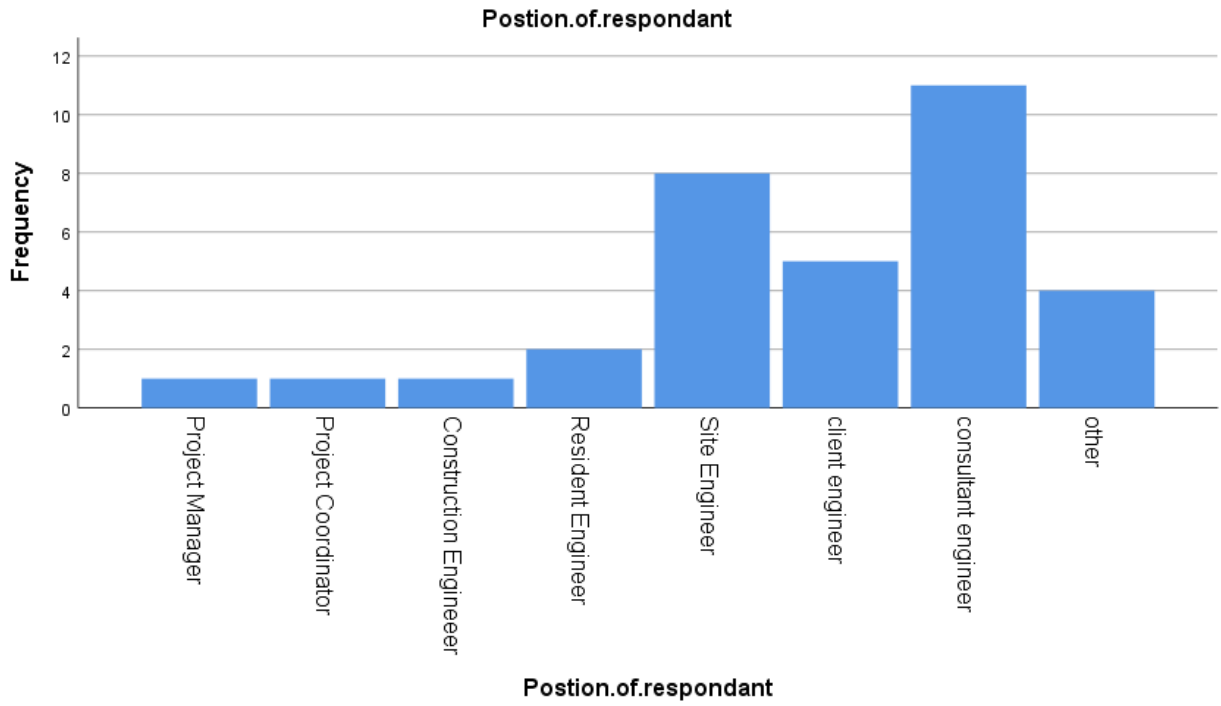

Table 4.3 Descriptive analysis for Educational Level

Educational level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Master's Degree	2	6.1	6.1	6.1
	Bachelor Degree	31	93.9	93.9	100.0
	Total	33	100.0	100.0	

Figure 4.3 Descriptive analysis for Educational level

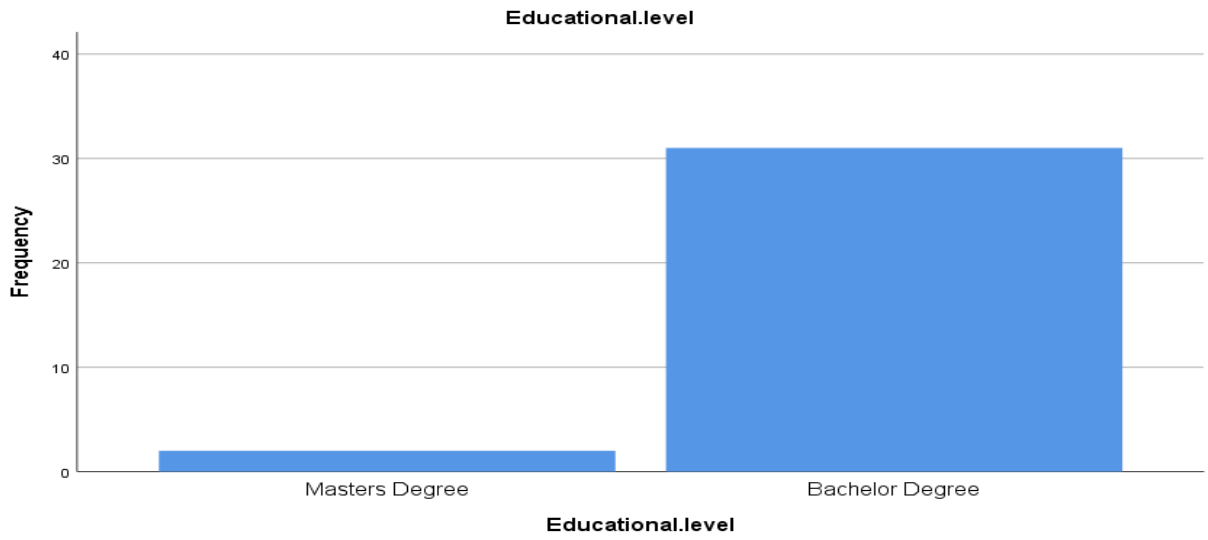

Table 4.4 Descriptive analysis for Field of study

Field of study					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Civil Engineering	19	57.6	57.6	57.6
	Architecture	1	3.0	3.0	60.6
	COTM	13	39.4	39.4	100.0
	Total	33	100.0	100.0	

Figure 4.4 Descriptive analysis for field of study

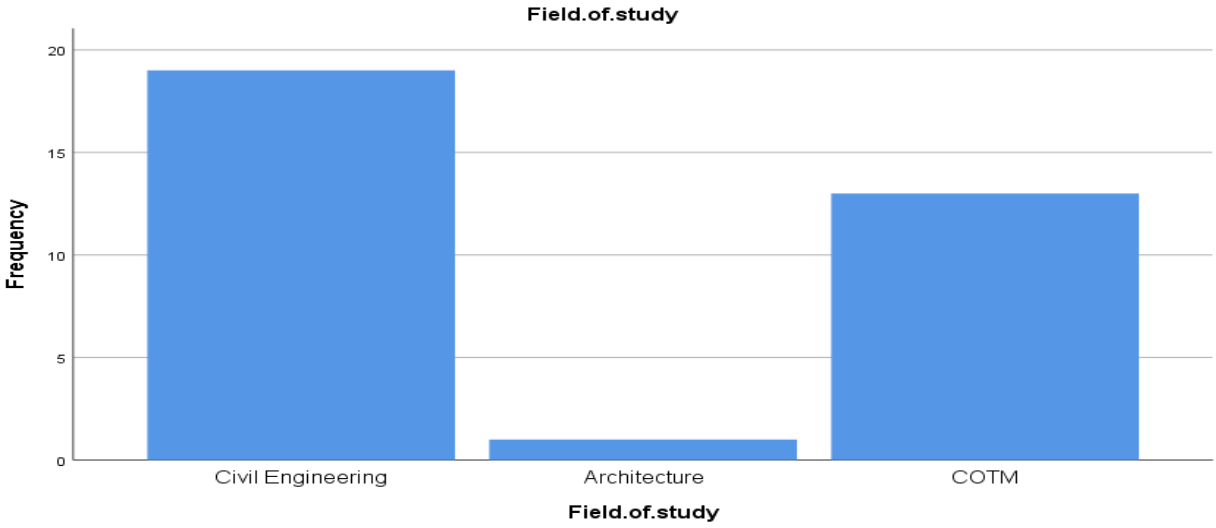

Table 4.5 Descriptive analysis for Work Experience

Work.Experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-4	6	18.2	18.2	18.2
	4-8	16	48.5	48.5	66.7
	8-12	8	24.2	24.2	90.9
	>12	3	9.1	9.1	100.0
	Total	33	100.0	100.0	

Figure 4.5 Descriptive analysis for work experience

Table 4.6 Descriptive analysis for company type

Company type					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Client	5	15.2	15.2	15.2
	Contractor	14	42.4	42.4	57.6
	Consultant	14	42.4	42.4	100.0
	Total	33	100.0	100.0	

Figure 4.6 Descriptive analysis for company type

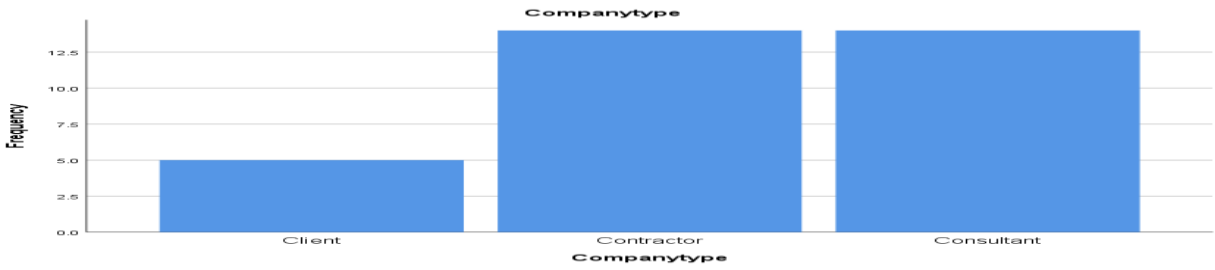

Table 4.7 Summary of respondent's personal data

Frequencies		%
Gender		
Male	31	93.9
Female	2	6.1
Position of respondents		
Project Manager	1	3.0
Project Coordinator	1	3.0
Construction Engineer	1	3.0
Resident Engineer	2	6.1
Site Engineer	8	24.2
client engineer	5	15.2
consultant engineer	11	33.3

other	4	12.1
Education Level		
Master's Degree	2	6.1
Bachelor Degree	31	93.9
Field of study		
Civil Engineering	19	57.6
Architecture	1	3.0
COTM	13	39.4
Work Experience		
1-4	6	18.2
4-8	16	48.5
8-12	8	24.2
>12	3	9.1
Company type		
Client	5	15.2
Contractor	14	42.4
Consultant	14	42.4

4.22 Interpretation and Discussion

The survey results indicate a clear gender imbalance among the respondents. The majority of participants were male, accounting for 93.9% of the total, while females represented only 6.1%. This distribution is illustrated in the accompanying table. Examining the professional backgrounds of the respondents, it can be observed that 24.1% were site engineers, with project managers, project coordinators, and resident engineers each comprising 3% of the respondents. Construction engineers, client engineers, and other positions collectively made up the majority, accounting for 66.9% of the survey participants. This suggests that the respondents encompassed a diverse range of relevant professional roles, capable of providing the desired information for this study. Additionally, Table 4.1 provides insight into the educational attainment of the respondents. It reveals that 6.1% of the participants held graduate degrees, while the remaining 93.9% had completed either a Master's or Bachelor's degree.

Table 4.1 presents the breakdown of the respondents' areas of study. It indicates that 57.6% were civil engineering professionals, 3% were architects, and 39.4% were experts in construction technology and engineering. Similarly, the respondents' work experience was categorized as follows: 18.2% had 1 to 4 years of experience, 48.5% had 4 to 8 years, 24.2% had 8 to 12 years, and 9.1% had more than 12 years. In terms of professional roles, 15.2% were clients, 42.4% were contractors, and 42.4% were consultants. It is worth noting that the respondents were selected based on their ability to provide valuable insights derived from their extensive experience, which was deemed important for the survey.

Results or Findings

Table 4.8 Client Related Delay Factors

Client related factors	RII	Rank
Slow decision-making	0.884848	3
Incomplete or delayed project brief	0.442424	31
Financing issues	0.709091	13
Scope changes	0.890909	2
Permitting and regulatory delays	0.866667	4
Land acquisition issues	0.654545	14
Stakeholder conflicts	0.363636	36
Lack of project management experience	0.575758	19
Delayed payments	0.436364	33
Legal disputes	0.345455	38

Table 4.9 Consultant Related Delay Factors

Consultant related factors	RII	Rank
Design changes and revisions	0.836364	6

Inadequate project documentation	0.442424	31
Lack of coordination	0.630303	16
Design errors or omissions	0.715152	12
Slow response to requests for information	0.721212	11
Limited availability or expertise	0.466667	29
Inaccurate cost estimates	0.478788	28
Inadequate contract administration	0.527273	21
Inadequate supervision	0.363636	36
Compliance with regulatory requirements	0.515152	24

Table 4.91 Contractor Related Delay Factors

Contractor Related Factors	**RII**	**Rank**
Inadequate project planning:	0.636364	15
Labour shortages	0.49697	26
Poor subcontractor management	0.618182	18
Material procurement issues	0.818182	8
Equipment availability and breakdowns	0.527273	21
Ineffective project communication	0.836364	6
Inaccurate cost estimation	0.557576	20
Poor project management	0.775758	9
Change order delays	0.509091	25
Quality control issues	0.527273	21

Table 4.92 External Related Delay Factors

External Factors	RII	Rank
Weather conditions	0.751515	10
Political instability	0.630303	16
Economic fluctuations	0.957576	1
Material shortages.	0.842424	5
Infrastructure limitations	0.412121	34
Community or stakeholder opposition	0.236364	40
Force majeure events	0.484848	27
Utility relocations	0.254545	39
Supply chain disruptions	0.393939	35
Regulatory and permit delays	0.460606	30

4.23 Interpretation and Discussion

The collective perceived Relative Importance Index (RII) of each individual cause, as reported by all participants, was utilized to evaluate the overall rankings and provide a comprehensive understanding of the factors contributing to construction delays in the OPCHQ project. These rankings also made it possible to cross compare the relative importance of the items as perceived by the three groups of participants (Table 3). In this context, compared by their average RII the three most important groups of causes of delays are contractor-related (RII: 0.630), client-related (RII: 0.616) and consultant-related (RII: 0.569) delays.

Table 2 presents the findings of the study, which identified the top 10 factors contributing to delays in the OPCHQ construction project. The table includes the names of the factor groups and their corresponding RII values. Based on the rankings derived from the RII, the three most significant factors causing delays are: (1) Economic fluctuations (RII: 0.957576), (2) Scope changes (RII: 0.890909), and (3) Slow decision-making (RII: 0.884848). On the other hand, the three factors with the least impact on delays are legal disputes (RII: 0.345), utility

relocations (RII: 0.254), and community or stakeholder opposition (RII: 0.236). Consequently, it is evident that factors such as scope change communication and disputes related to delays have relatively less importance compared to others.

Table 9.13 Top 10 causes of delays

Group of Factors	Cause of Delay	RII	Rank
External Related	Economic fluctuations	0.957576	1
Client Related	Scope changes	0.890909	2
Client Related	Slow decision-making	0.884848	3
Client Related	Permitting and regulatory delays	0.866667	4
External Related	Material shortages.	0.842424	5
Contractor Related	Ineffective project communication	0.836364	6
Consultant Related	Design changes and revisions	0.836364	6
Contractor Related	Material procurement issues	0.818182	8
Contractor Related	Poor project management	0.775758	9
External Related	Weather conditions	0.751515	3

4.3 Effect of Delay

4.31 Interpretation and Discussion

The impact of the delay on the OPCHQ project is described in the following table. The primary effect is an increase in cost (RII=0.933333), which is evident in the project's contract amount escalating from 386 million ETB to its current value of 1.5 billion ETB. Additionally, schedule disruption (RII=0.921212) is the second most significant effect, resulting in the project's original completion date of October 2020 being surpassed, with only 70% of the project completed as of June 1, 2023. Thirdly, damaged stakeholder relationships (RII=0.842424) are evident through the consultant's multiple warnings recorded in the site book and letters directed towards the contractor. Furthermore, reputational damage (RII=0.678788) has been incurred by both the consultant and the contractor, with the client expressing frustration through repeated letters and complaints. Lastly, reduced productivity (RII=0.527273) is notable, particularly among professionals working for the contractor and consultant, who have displayed lethargy and disinterest in the project, leading to a decline in productivity levels.

Table 9.14 Effect of Delay

Effect Of delay	**RII**	**Rank**
Increased Costs	0.933333	1
Schedule Disruptions	0.921212	2
Reduced Productivity	0.527273	5
Damaged Stakeholder Relationships	0.842424	3
Reputational Damage	0.678788	4

CHAPTER FIVE

5. CONCULSION AND RECOMMANDATION

5.1 CONCULSION

After conducting a thorough review of the literature and analyzing the research data as discussed in earlier chapters, this fourth chapter provides a summary of the key findings and identifies the emerging issues that have emerged from the study. Drawing upon these findings, a conclusion has been reached, and a set of recommendations has been proposed as potential actions to effectively address the emerging issues.

The objective of the study was to identify the primary reasons for delays that impact the performance of the OPCHQ project. A thorough review of existing literature was conducted to identify the documented causes of delay. Through the literature review and a preliminary study, a total of 40 delay causes were identified and categorized into four groups. Questionnaires were then distributed to the three main parties involved in the construction process. The study presented the most significant factors that cause delays to each of the four groups and to the whole project based on their respective importance metrics. The findings revealed that three factors were attributed to the client's group, three factors to the contractor's group, one factor to the consultant's group, and three factors were due to external factors. These factors showed a significant impact on the project's performance.

Top ten factors causing delays for OPCHQ project are (1) Economic fluctuations (2) Scope change (3) Slow decision making, (4) Permitting and regulatory delays, (5) Material shortages, (6) Ineffective project communication, (7) Design changes and revisions, (8) Material procurement issues, (9) Poor project management, (10) Weather conditions

The occurrence of delays is unavoidable, but their occurrence can be reduced or prevented by identifying and analyzing their causes effectively. This study aimed to evaluate the causes and consequences of delays and examine the factors responsible for them, focusing on the OPCHQ project as a case study. The objective is to implement suitable measures to mitigate the impacts of delays.

5.2 RECOMMANDATIONS

5.21 Consultant Related Recommendations

It is important for consultants to handle all design changes explicitly during the project's execution while still achieving the desired outcome of the final project.

● Consultants should promptly rectify any design errors to prevent delays in the progress of the project.

● Adequate site investigations should be conducted by consultants during the feasibility study and conceptual design phases to address any design challenges in the detailed design stage, thereby avoiding work suspension during construction.

● Working drawings must be clearly and accurately drawn, including dimensions and labels to scale, to prevent any ambiguity during the construction process.

● The consultant should ensure the presence of a competent representative on-site who can make binding decisions and ensure that necessary measurements are taken before covering works, facilitating the preparation of interim payment certificates.

5.22 Contractor Related Recommendations

● During the pre-contract and bidding phase, contractors should carefully consider the project requirements to select works that align with their competitive advantage.

● Contractors need to ensure sufficient cash flow is available for executing the works and avoid diverting project funds for non-project purposes, preventing financial constraints during the project's execution.

● Contractors should possess the necessary experience for a given assignment, assemble a competent project team, and employ appropriate construction methods.

● It is important for contractors to engage in proper planning and scheduling of the works, ensuring effective site management and supervision to monitor critical activities. Their aim should be to complete projects within the specified timeframe while meeting quality and cost requirements.

5.23 Client Related Recommendations

It is essential for clients to carefully consider the potential impact on critical activities when requesting design changes during the construction phase, aiming to prevent delays. ● All

change order requests should undergo a thorough evaluation to assess their effects on the anticipated work quality, scope, cost, and potential claims or disruptions. This evaluation is crucial in avoiding unnecessary disputes and legal complications. ● Clients need to prioritize proper planning and cost estimation during the pre-contract stage to prevent intermittent work stoppages due to funding constraints. Such stoppages not only extend the construction period but also increase contractors' overhead costs and expenses associated with mobilization and demobilization during the suspension period.

5.24 External Related Recommendations

● It is crucial for all project stakeholders to collaborate and proactively address any disputes that arise during the construction phase to prevent unnecessary delays caused by litigation processes.

● All stakeholders must prioritize comprehensive planning to account for unforeseen circumstances that could potentially extend the construction period, escalate costs, and pose risks to property and the well-being of project participants.

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APPENDCIES

Research Questionnaires.

ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

GRADUATE STUDIES FACULTY OF PROJECT MANAGMENT

Dear respondents,

The objective of this research is to gather insights from key informants regarding the factors contributing to delays and evaluate their effect on the Oromia Police Commission Headquarter project (OPCHQ). Your genuine cooperation in providing precise and dependable information is crucial for the successful completion of this study. Please rest assured that any information shared will be treated confidentially, and the researcher will assume responsibility .Thank you for your participation

Sincerely,

Daniel Bogale

CAUSE AND EFFCT OF DELAY IN OPCHQ PROJECT

SECTION A: DEMOGRAPHIC CHARACTERISTICS AND ORGANIZATIONAL RELATED INFORMATION

1. Respondent organizations/stakeholders

Client ☐ Contractor ☐ Consultant ☐

2. Respondent's sex : Male ☐ Female ☐

3. Respondent's Designation

Project Manger ☐ Project coordinator ☐ Project Engineer ☐

Resident Engineer ☐ Site Engineer ☐ Office Engineer ☐

Client Engineer ☐

4. Respondent's Education Level

PHD ☐ Master's ☐ Degree ☐ Diploma ☐

5. Respondent's Field of Study

Civil Engineering ☐ Architectural ☐ COTM ☐

6.Relevant Work Experience

1-4 ☐ 4-8 ☐ 8-12 ☐ >12 ☐

SECTION B: FACTORS INFLUENCING TIME OVERRUNS OF WATER WORKS CONSTRUCTION PROJECTS IN OROMIA WATER WORKS CONSTRUCTION PROJECTS IN OROMIA REGIONAL REGION.

NOTE: E.S. = EXTREMELY SIGNIFICANT (5); V.S. = VERY SIGNIFICANT (4); M.S. = MODERATELY SIGNIFICANT (3); S.S. = SLIGHTLY SIGNIFICANT (2); N.S. = NOT SIGNIFICANT (1)

No.	**Cause of Delay In OPCHQ project**	**E.S.** (5)	**V.S.** (4)	**M.S.** (3)	**S.S.** (2)	**N.S.** (1)
	Client Related Factors					
1	Slow decision-making					
2	Incomplete or delayed project brief					
3	Financing issues					
4	Scope changes					
5	Permitting and regulatory delays					
6	Land acquisition issues					
7	Stakeholder conflicts					
8	Lack of project management experience					
9	Delayed payments					
10	Legal disputes					
	Consultant Related Factors					
1 2	Design changes and revisions Inadequate project documentation					
3	Lack of coordination					
4	Design errors or omissions					
5	Slow response to requests for information					
6	Limited availability or expertise					
7	Inaccurate cost estimates					
8	Inadequate contract administration					
9	Inadequate supervision					
10	Compliance with regulatory requirements					

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No.	Cause of Delay In OPCHQ project	E.S. (5)	V.S. (4)	M.S. (3)	S.S. (2)	N.S. (1)
	Contractor related Factors					
1	Inadequate project planning:					
2	Labour shortages					
3	Poor subcontractor management					
4	Material procurement issues					
5	Equipment availability and breakdowns					
6	Ineffective project communication					
7	Inaccurate cost estimation					
8	Poor project management					
9	Change order delays					
10	Quality control issues					
	External Factors					
1	Weather conditions					
2	Political instability					
3	Economic fluctuations					
4	Material shortages.					
5	Infrastructure limitations					
6	Community or stakeholder opposition					
7	Force majeure events					
8	Utility relocations					
9	Supply chain disruptions					
10	Regulatory and permit delays					

No.	Effect of Delay In OPCHQ project	E.S. (5)	V.S. (4)	M.S. (3)	S.S. (2)	N.S. (1)
1	Increased Costs					
2	Schedule Disruptions					
3	Reduced Productivity					
4	Damaged Stakeholder Relationships					
5	Reputational Damage					

For your additional comments:

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_____