



**ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**ASSESSMENT OF DELAY FACTORS AFFECTING BUILDING
CONSTRUCTION PROJECT PERFORMANCE IN ADDIS ABABA (THE
CASE OF GRADE 1 BUILDING CONTRACTORS AND CONSULTANTS)**

**BY
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ADDIS ABABA, ETHIOPIA

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St. Mary's University, Addis Ababa, May 2022

DECLARATION

I declare that this thesis entitled “Assessment of Delay Factors Affecting Building Construction Project Performance in Addis Ababa. (The case of grade 1 building contractors and consultants)” is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree. All sources of materials used for the thesis have been duly acknowledged.

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Table of Contents

Acknowledgement.....	iv
List of tables.....	vii
List of figures.....	viii
Acronyms or Abbreviation.....	ix
Abstract.....	x
CHAPTER ONE	1
Introduction.....	1
1.1 Background of the Study.....	1
1.2 Statement of the Problem.....	2
1.3 Research Objectives.....	3
1.3.1 General Objective	3
1.3.2 Specific Objectives	3
1.4 Research Question	4
1.5 Significance of the Study	4
1.6 Scope of the Study.....	5
1.7 Limitations of the Study	5
1.8 Definition of Terms	6
1.9 Organization of the study.....	6
CHAPTER TWO	7
Literature Review	7
2.1 Conceptual and Operational Definition.....	7
2.1.1 Definition of Project.....	7
2.1.2 Definition of Project Management	8
2.1.3 Construction Project.....	8
2.1.4 The Theory of Performance.....	9
2.1.5 Performance Measurement Theory.....	10
2.2 Theoretical Framework.....	11
2.2.1 Key Performance Indicators to Measure Project Performance	11
2.2.2 Construction Projects and Performance.....	11
2.3 Empirical Framework	13
2.3.1 Factors Affecting Construction Project Performance	13
2.3.2 Delay Factors in Construction Projects	15
2.4 Research Gap	21
2.5 Conceptual Framework.....	22

CHAPTER THREE	23
Research Methodology	23
3.1 Research Design and Approach	23
3.2 Target Population	23
3.3 Sampling Techniques and Sample Size	23
3.4 Source of Data and Data Collection Tools	24
3.4.1 Source of Data	24
3.4.2 Data Collection Tools	25
3.5 Methods of data analysis	25
3.6 Data validity and reliability	26
3.7 Research Ethical Consideration	27
CHAPTER FOUR	28
DATA PRESENTATION, ANALYSIS AND INTERPRETATION	28
4.1 Data Presentation and Analysis	28
4.1.1 Analysis of Delay factors Affecting Building Construction Project Performance	28
4.1.2 Analyzing Delay Factors Effect on Cost, Time and Quality	32
4.2 Data Interpretation	35
4.2.1 Response Rate and Respondent Background	35
4.2.2 Delay Factors Affecting Building Construction Project performance in Addis Ababa	35
4.2.3 Delay Factors Effect on Cost, time and Quality	36
CHAPTER FIVE	37
SUMMARY, CONCLUSION AND RECOMMENDATION	37
5.1 Summary of Major Findings	37
5.2 Conclusion	38
Recommendation	39
Reference	41
APPENDICES	47

List of tables

<i>Table 1 Chronbach's Alpha</i>	26
<i>Table 2 consultant related delay factors rank</i>	28
<i>Table 3 Contractor related delay factors rank</i>	29
<i>Table 4 Client related delay factors rank</i>	30
<i>Table 5 External related delay factors rank</i>	31
<i>Table 6 Overall rank of the delay factors</i>	32
<i>Table 7 Cost factors rank</i>	33
<i>Table 8 Quality factors rank</i>	33
<i>Table 9 Time factors rank</i>	34

List of figures

Figure 1 Delay factors and project performance.....	22
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Acronyms or Abbreviation

KPI = Key Performance Indicator

RII = Relative importance index

PMI = Project Management Institute

SPSS= Statistical Package for social science

Abstract

Building projects in Addis Ababa are suffering a wide range of performance challenges. The goal of this study was to evaluate the delay factors that impact the performance of building construction projects. Through a thorough analysis of the literature, eighty-one (81) project delay factor characteristics were found. A structured questionnaire survey was undertaken among stakeholders, including consultants and contractors on selected building projects, to obtain their perspectives on the factors of project delays. This study classified delay factors into four categories: consultant-related, contractor-related, client-related, and external-related, and then examined their influence on delay using the relative importance index (RII) as a foundation for analysis. Primary data was acquired from 87 respondents through questionnaire. Relative importance index (RII) was utilized for analysis to identify important delay factors impacting project performance of building construction projects. The RII was computed for each delay factor and set of categories in order to rank the factors. Slow decision making, unanticipated surface and subsurface circumstances (such as soil, high water table), inefficient project planning and scheduling, and periodic work stoppage owing to cash flow restrictions and escalation of local material prices were among the study's findings. According to the study, the client related category had the most influence, followed by external related, contractor related, and client related had the least impact. The study also recommended a series of actions that directly resolve the issues raised for each stakeholder as well as the external related delay factors such as clients should collaborate closely with other stakeholders to improve project site delivery timeliness, contractors provide enough work planning and scheduling, as well as skilled site management and monitoring and consultants should ensure that proper site investigations are carried out both during the feasibility study and the conceptual design to guarantee that necessary procedures are taken during the detailed design to avoid work suspension during the construction phase to resolve design difficulties.

Key words: Project Performance, Delay factors, Building Construction project

CHAPTER ONE

Introduction

This chapter discusses the study's background, the problem statement, the research objectives (general and particular), and the importance of the study, research questions, the study's limitations, and the definition of key terms.

1.1 Background of the Study

Project is a complex, non-routine, one-time effort limited by time, budget and resource and performance specifications designed to meet customer needs (Arslan et al., 2009). The construction sector is considered as a major contributor of countries' economic growth and development especially in developing countries like Ethiopia (Anaman & Osei-Amponsah, 2007). The sector enables a country to mobilize and effectively make the most of local human and material resources. It creates a million of job opportunities to skilled, semi-skilled and unskilled workers. Besides, the sector generates extensive backward and forward linkages with other sectors of the economy which consider as one of the highest multiplier effects (Khan, 2008). Over the life of a facility, a construction project is completed through a series of planned and unexpected events and interactions with varying actors and processes in a continually changing environment.

Project success is defined as satisfying the stakeholders' expectations and accomplishing the project's goal. Success criteria or a person's notion of success in construction varies widely from project to project, based on the number of participants, scope of services, project scale, and owner competence in facility design, technology implications, and a variety of other factors (Tilahun Deneke ,2020)

Despite the rise of the Ethiopian construction sector and its significant contribution to the total national economy, various issues have been identified in the sector, necessitating solutions to continue and maintain the sector's growth rate in the foreseeable future. One of the major issues that must be addressed in the industry is the delay in project implementation, which can hinder or even halt projected economic progress (Tilahun Deneke ,2020).

Research by Hailemeskel, (2013) states that the Ethiopian construction industry has several challenges and limitations. These challenges have contributed to poor performance level of the industry which is manifested by delay, cost overrun, poor quality delivery. Delay in project implementation is defined as work that is completed later than expected in comparison to the original timeline. As a result, delays might be used as a signal of a problem with project scheduling. To establish mitigation solutions for schedule overruns, you must first identify the causes and circumstances causing the delay. Several studies have been undertaken on the subject of project delays. However, researchers conducted on different contexts, scopes and perspectives tend to reveal varying findings. This is because projects are working in dynamically changing environments Wysocki, (2014).

Delays also give rise to disruption of work and loss of productivity, late completion of project increased time related costs, third party claims, abandonment and termination of contract (Abdul Rahman 2006)

The purpose of this study is to evaluate and describe the opinions of contractors and consultants on project delay factors that affect project performance and success, as well as the reasons of project failure and how they might be avoided, managed, or controlled.

1.2 Statement of the Problem

When it comes to Ethiopia, the construction sector is one of the most essential contributors to the country's growth, and it is also the most important in terms of employment creation. However, it has seen a dip in recent years due to a variety of internal and external factors. The most significant of them is time and expense overrun, which hinders the building project's performance (Netsanet Berhanu ,2018)

The performance of construction could be assessed by the completion schedule, cost of completion, productivity of works completed and safety (Molavi and Barral 2016). This is the most important reason why many of the projects are left incomplete and developers move on to the next project. This is very important to understand the effect and factors affecting the time delay and cost overrun.

Despite its growth and high share of contribution to the overall national economy of Ethiopia, several challenges are being noticed in the construction sector that requires immediate actions. Tadesse.,Dakhli&Lafha(2016)states that delay of implementation is one of the significant problems in Ethiopian construction industry that needs immediate actions. A study by Werku,&Jha.(2016) shows that in Ethiopia only 8.25% projects have been completed on the original targeted completion date. The remaining 91.75% delayed 352% of its contractual time. It also states that construction delays are common problems in Ethiopian construction projects and major causes of project failure. Delay of construction project was the major and critical problem and it gave rise to the dissatisfaction of all parties.

Construction project delay has been a research topic for a decades and several studies have investigated causes of delay in other countries (Haseeb et al., 2011; Al-Kharashi& skitmore, 2009; Aibinu et al 2002;Frimpong eat al 2004;Alinaitwe, 2008; Sambasivan & Soon, 2007; Doloi et al, 2012; Mloof-ud-Dyian, & Rabbani, 2011). However, all of those studies are done in other countries and area specific.

(Samuel sibu ,2020) and (Adem Hussien ,2018) have looked into the factors that influence construction project success in a variety of ways. Some of the studies identified the most relevant characteristics in a variety of nations and project types, while others addressed the effects of different factors on the success and failure of construction projects and recommended solutions to enhance and minimize their effects. Therefore, applicability of such research in the construction context of Ethiopia still remains less explored, which limits the resources of the industry operators addressing the myriads of causes of delays presented in the literature. The aim of this study is to fill an important knowledge gap by identifying the various attributes for construction project delay

1.3 Research Objectives

1.3.1 General Objective

The aim of the study is to investigate and pin point major delay factors that affect the performance of building construction Addis Ababa.

1.3.2 Specific Objectives

- To identify the delay factors that affect building construction project performance.

- To identify the delay factors that have most significant on the performance of building construction project in Addis Ababa.
- To assess the delay factors based on the construction project performance constraints of cost, quality, and time

1.4 Research Question

The following main research questions are offered to operationalize the above-mentioned research problems and objectives:

- What are the delay factors that affect the performance of building construction project?
- Which of the delay factors has the most significance on the performance of a building construction projects in Addis Ababa?
- Which of the delay factors has influence on each construction project performance constraints that are cost, quality and time?

1.5 Significance of the Study

This research gives the preliminary findings of a research aimed at identifying the links between project elements that affect project effectiveness. The focus of the study is on distinguishing between elements that tend to improve and those that tend to inhibit project performance. The specific significances of the study are listed as follows;

- **Knowledge generation**

The research's findings can be used as important lesson-learning material for project managers and personnel. It may be used to educate novice project managers entering the construction industry with the obstacles and concerns they would face during their careers.

- **To solve practical problems of project schedule management**

The research findings may be applied at the project level to solve project delay problems by paying special attention to these primary delay reasons and putting in place adequate contingency measures to reduce the occurrence. Identifying and prioritizing project delay reasons allows project managers and stakeholder groups to focus on these few but critical elements and give them more attention. The ranking took into account the frequency of occurrence as well as the severity of the delay causes' influence. This is because certain

things occur frequently but have a low influence, whereas others do not occur frequently but have a significant impact once they do.

- **In hopes to pave the road for future research**

The findings of this study can potentially be utilized as a starting point for other studies looking at building project delays

- **As a source of information for the creation of policy or strategy**

The findings of this study can be used as input and areas of focus by policymakers and strategy planners in the construction industry.

1.6 Scope of the Study

The study's conceptual scope is confined to analyzing the effect of project delay factors on the performance of building construction. Its goal is to identify the delays in construction projects carried out in Addis Ababa by private local building contractors of Grade-1 and consultants. The research will look at projects that started and finished between 2015 and 2022. It only contains projects that are finished on time, ahead of schedule, late and active. Projects that have been cancelled or abandoned for whatever reason are not included in the scope. Geographically this study is confined to the city of Addis Ababa.

1.7 Limitations of the Study

The following are some of the study's limitations: First, because the research is being performed in Addis Ababa, the findings cannot be generalized to the national level. Secondly, despite the fact that there are numerous elements that impact construction project performance that are classified in various ways in different research, only those relating to contractors, consultants, clients, and external factors were considered in this study. Thirdly the results received from the questionnaire may be biased due to respondents' personal experiences and beliefs regarding delay factors and the tenure of stakeholder organizations. Furthermore, a number of them spent an unusually lengthy time to complete the surveys. As a consequence, the data analysis was completed in a reasonably quick time. The study, on the other hand, was restricted to grade 1 building contractors and consultants.

1.8 Definition of Terms

- **Key performance indicator (KPI):** is a type of performance measurement which evaluates the success of an organization or of a particular activity in which it engages.
- **Time overruns:** is defined as the extension of time beyond planned completion dates.
- **Cost overruns:** is the difference between the original cost estimate of project and actual construction cost on completion of works.
- **Owner:** Organization for whom the construction project is being undertaken.
- **Contractor:** A natural or juridical person under contract with an owner to construct the construction projects.
- **Performance:** The accomplishment of a given construction projects against the contractual cost, time and quality standards.

1.9 Organization of the study

The Structure of the Research Study The study is divided into five chapters. The first chapter covers the following topics: introduction, problem statement, research objectives and research questions, significance of the study, scope of the investigation, and constraints of the study. The second chapter is devoted to literature reviews on the study's topic. The third chapter discusses research design and methodology, sources of data and sample techniques, data collection techniques, and data processing. The fourth chapter is devoted to research discussion. The fifth chapter contains a summary of the results, conclusions, and recommendations. The final pages of the paper include questionnaire appendices and references.

CHAPTER TWO

Literature Review

This section of the thesis is devoted to a literature review that is directly related to the objective of the study and the research questions presented in the first chapter. This section discusses the definition of project, project performance and construction project, the theory of performance and performance measurement, concept of construction performance and factors affecting construction project performance

2.1 Conceptual and Operational Definition

2.1.1 Definition of Project

Many project management experts have their own definitions of what a project is. However, the definition of projects provided by the Project Management Institute Guide of PMBOK has caught my attention for this research. A project is defined as a temporary activity performed to generate a unique product, service, or outcome, according to the Association for Project Management, (2012). Projects are conducted to achieve goals by delivering deliverables. An objective is described as a desired goal, a strategic position to be accomplished, a purpose to be fulfilled, a result to be acquired, a product to be manufactured, or a service to be rendered.

Projects are temporary, but their deliverables may exist beyond the end of the project. Projects may produce deliverables of a social, economic, material, or environmental nature. International Project Management Association define project as followed, “A project is a time and cost constrained operation to realize a set of defined deliverables up to quality standards and requirements.”(International Project Management Association, 2006).

A project is a unique, transient endeavor, undertaken to achieve planned objectives, which could be defined in terms of outputs, outcomes or benefits. (Association for Project Management, 2012.)

A project is an endeavor in which human, financial, and material resources are organized in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives. (Rodney Turner, 1999.)

A project is any undertaking that has definite, final objectives that represent specified values to satisfy some need or desire. It is normally characterized by limitations placed on time, cost, and resources such as people, skills, equipment, and materials. A project is a cluster of activities that is relatively separate and clear cut. It has a distinct mission and a clear termination point. A project might be a part of a broader program, yet its main theme lies in identifying a nice, neat work package within a bewildering array of objectives, alternatives, and activities. (Vijay Verma, 1995)

2.1.2 Definition of Project Management

The application of information, skills, tools, and procedures to project activities in order to achieve project requirements is known as project management. Project management is performed by implementing and integrating the project management processes that have been defined for the project. Organizations may use project management to execute projects more effectively and efficiently. Individuals, groups, and public and private organizations can use effective project management to achieve the following goals: Meet business objectives; Meet stakeholder expectations; Be more predictable; Increase chances of success; Deliver the right products at the right time; Resolve problems and issues; Respond to risks in a timely manner; Identify, recover, or cancel underperforming initiatives; optimize the utilization of organizational resources Manage restrictions (e.g., scope, quality, timeline, budget, and resources); Balance the impact of restrictions on the project (for example, additional scope may increase cost or delay); and better manage change. Missed deadlines, cost overruns, poor quality, rework, uncontrolled project growth, loss of reputation for the company, dissatisfied stakeholders, and failure to achieve the project's objectives are all possible outcomes of poorly managed projects or the lack of project management. Within enterprises, effective and efficient project management should be regarded a strategic capability (Samuel sibu ,2020)

2.1.3 Construction Project

Construction industry is complex in nature because it contains large number of project parties as clients, consultants, contractors, stakeholders, shareholders and regulators. The complexity and fragmented nature of the industry and its highly casual employment of labor makes it sensitive to poor contract performance. (Helen, et, al, 2015)

Construction is an act or a process of constructing. It consists of a series of actions to produce either a new set of buildings and infrastructure or may involve alterations in the existing buildings and infrastructure (Radosavljevic & Bennett 2012). A construction project is a part of construction work that is being attempted or undertaken. A project involves a series of complex or interrelated activities and tasks that consume resources to achieve some specific objectives. It has to be completed within a set of specifications under a limited budget (Munns & Bjeirmi 1996; Pinto & Slevin 1988). There are numerous challenges and problems facing the construction industry all over the world. Construction projects are famous for being over budget, late and burdened with scope creep. Many of the problems facing the construction industry are delays, over budgeting and poor quality. The traditional construction management approach has been effective in solving some of these problems. The Construction Management has been defined as the overall planning of a project by allocating the appropriate resources to finish the project on time, at budget and at targeted quality. “Scope triangle “which illustrates the relationship between the three tradeoffs in a project cost, time & quality. Successful project management can be achieved by bringing together the tasks and resources necessary to accomplish the project objectives and deliverables within the specified time constraints and within the planned budget (Marwa Gamal Swefie Fall, 2013).

The successful completion of a project results in the organization moving to the future state and achieving the specific objective. A project is usually deemed to be a success if it achieves objectives according to their acceptance criteria, within an agreed timescale and budget” (Association for Project Management, 2012). Projects are started to achieve commercial possibilities that are in line with the strategic goals of a company. A business case is frequently created prior to the start of a project to define the project objectives, needed investment, and financial and qualitative criteria for project success.

2.1.4 The Theory of Performance

To clarify performance and performance improvements the theory of Performance developed having six foundational concepts to structure a framework. To perform is to generate valued outcome. A performer can be an individual or a group of people engage in a shared effort. Developing performance is a step-by-step process, and level of performance describes location in the step. Current level of performance depends on 6 components: context, level of knowledge, levels of skills, level of identity, personal factors, and fixed factors (Mbugua, Harris, Holt &

Olomolaiye 1999). According to Elger (2007), effective performance improvement has three axioms: engagement in reflective practice, immersion in an enriching environment and a performer's mindset. Performances advance through number of levels that characterize the effectiveness of performance. The high performing level can produce the following categorized:

- I. Increment of quality; its related to meeting or exceeding the expectations of stakeholders and amount of waste/ complaints goes decrease,
- II. Increment of capability; it is ability to undertake more difficult performances or projects enhance
- III. Increment of capacity; that ability to create more throughput increases,
- IV. Increment of knowledge; depth and breadth of knowledge increases,
- V. Increment of skills level; increase in span of application and effectiveness through enhancing abilities to set goals and by maintain a positive outlook.
- VI. Increment of motivation; individuals develop professionalism

2.1.5 Performance Measurement Theory

Mbugua, et al., (1999) and Love and Holt, (2000) have acknowledged a difference between the indicators, the measures and the measurement of performance. According to Mbugua et al., (1999), performance indicators show the measurable confirmations that verify a planned activity has achieved the desired result. And when indicators can be measured with high degree of precision, they are called measures. Yet it is very difficult to find a precise measurement or indicator. Performance measures are numerical/quantitative indicators (Sinclair & Zairi, 1995). As Sinclair and Zairi, (1995); Mbugua, et al., (1999) definition performance measurement is a systematic way of evaluating the process from input to output that serve as tool for continuous improvements.

To make performance continuously improve, numerous performance measurements have emerged in literature. That includes the financial (Brown and Lavenrick 1994; and Kaka & Alsharif, 1995), client satisfaction (Chinyio & Olomolaiye, 1998), industry (Construction Industry Board, 1998) employee (AbdelRazek, 1997), and project performance measures (Belassi and Tukel, 1996) as cited in (Mbugua, et al., 1999).

Cordero (1990) classifies performance measurement based on the method of measurement and area of measurement. The methods of measurement of performance categorized as the commercial performance, the technical performance, and the overall performance. The areas of performance

measurement are at the planning & design level, the marketing level and manufacturing level etc., and for the overall performance are at the level of a firm or strategic business unit. Furthermore, he proposes a model of performance measurements in terms of outputs and resources to be measured at different levels. Outputs are measured to verify successful accomplishment of the objectives and resources are measured to make sure efficiency that minimum amount of input utilized to produce maximum amount of output. However, in his model, Cordero (1990) failed to reflect the interests of stakeholders, their needs and expectations.

2.2 Theoretical Framework

2.2.1 Key Performance Indicators to Measure Project Performance

The performance of the construction industry is considered as a source of concern to both public and private sector clients (Okuwoga, 1998). Karim and Marosszeky (1999) measured project performance by using Key performance indicators (KPI). KPIs enable to compare between different projects and enterprises to identify the existence of particular patterns. The specialist contractors hoped that the data trends observed will provide insight into certain inefficiencies that are prevalent in the market. They aim to use the data expose the inefficiencies and as a basis for industry development (Karim & Marosszeky, 1999).

The key performance indicators (KPIs) used to measure project performance include factors such as time, cost, quality, client satisfaction; client changes, business performance and safety in order to enable measurement of project and organizational performance throughout the construction industry. This information can then be utilizing for benchmarking purposes, and will be a critical component of any organization move towards achieving best practice (DETR, 2000). Lehtonen (2001) confirmed that performance measurement is a pressing issue both in academics and in business. Samson and Lema (2002) stated that KPIs are very imperative in order to bring value to stakeholders. For these, should be equipped with the right processes and capabilities. The KPIs also serve to trace the most competitively and distinctive processes and capabilities from which purely need improvement or maintenance.

2.2.2 Construction Projects and Performance

Project success is almost the ultimate goal for every project. Success of construction projects depends mainly on success of performance. Many previous researches had been studied on

performance of construction projects. Dissanayaka and Kumaraswamy (1999) remarked that one of the principal reasons for the construction industry's poor performance has been attributed to the inappropriateness of the chosen procurement system. Thomas (2002) identified the main performance criteria of construction projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting. Chan and Kumaraswamy (2002) stated that construction time is increasingly important because it often serves as a crucial benchmarking for assessing the performance of a project and the efficiency of the project organization.

Construction performance can be evaluated through various dimensions of performance indicators such as time, quality, cost, client satisfaction, health, safety and overall business performance (Enshassi, Mohamed & Abushaban, 2009). They further argue that time, cost, and quality are the 3 predominant performance evaluation dimensions. Chan and Chan (2004) also agreed with Enshassi, et al. (2009), that both point out that cost, time and quality are the three basic and most important performance indicators in construction projects.

According to Chan and Chan (2004), different parties such as client, consultant, contractor, and subcontractor have their own understanding and interpretation to project performance. However, researchers in construction projects agree time, cost and quality project success indicators sometimes called the golden triangle, as basic performance measures (Othman, Torrance & Hamid, 2006; Sambasivan & Soon, Le-hoai, Dai & Lee, 2008; Abdullah et al., 2010).

King (2015), on the other hand stated sound Project Management practices in line with stakeholder's interest described in terms of meeting the intended, purpose, the level of quality, time, cost; and safely and while protecting the environment. According to (Okoye, Ngwu, & Ugochukwu, 2015; Gwaya, Masu, & Wanyona, 2014; Amalraj & Doucet, 2007), the success of a project is measured by the extent to which it meets the predetermined criteria of cost, time, safety, resource allocation, and quality as determined by the owner which are quite difficult to meet in most construction projects

2.3 Empirical Framework

2.3.1 Factors Affecting Construction Project Performance

Though the factors influencing the cost, duration, and quality performance of building projects are defined differently in various literature. One classification of factors influencing the success of building projects is the classification of factors based on their result as cost, time, and quality factors. However, identifying variables based on their outcomes may have certain limitations. Because cost, time, and quality are the three limitations of a project that are interrelated, it is difficult to specify factors just as cost, time, or quality factors. Thus, factors that affect one constraint are likely to affect the remaining two requirements. Factors influencing project success were classified into three groups based on this categorization:

2.3.1.1 Cost Factors

Cost factor is a category that contain factors particularly affecting the project cost. These are factors that have an impact on the project cost performance. Yafiah (2013) indicates that procurement selection criteria of cost, time, quality, project characteristics and external environmental factors have effects on project performance. Fetene (2008) on his study the most frequent effects of cost overrun were delay, due to disagreement with stakeholders, supplementary agreement, and budget shortfall of project owners. Similar study conducted by Abdullah et al. (2010), indicated that rise and fall in price of material, cash flow and financial difficulty faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are categorized as most critical factors that affect construction cost performance. Yet frequent design changes and owner interference are considered as the least affecting factors on construction cost performance. Amusan (2011) also identified factors such as inadequate planning, inflation, never-ending variation order, contractor's inexperience, and change in project design were critical construction cost performance, while project complexity, shortening of project period and fraudulent practices are the list responsible for cost overrun.

2.3.1.2 Quality Factors

Quality factor is a category that contain factors particularly affecting the project quality performance. According to Curt (2005), the quality management system monitors and analyzes quality of the constructed project and predicts quality problems and issues. There are distinctive quality measures are; the first one is quality control tests: tasks performed in number, frequency

of non-conformance issues, frequency of change requests and root causes, percentage of passed/failed, turnover, cost of rework, and cost of quality (ii) Quality Assurance Cost (cost of resources): quality assurance cost as a percentage of construction cost, cost of quality and Cost of quality as percentage of construction cost. Lepartobiko (2012) stated that quality can be assured by identifying and eliminating the factors that cause poor project performance. Jha and Jha (2006) found that the project manager's competence and top management support are found to contribute significantly in enhancing the quality performance of a construction project. Lack of contractor experienced topped the quality related cause of project failure.

Chan and Kumarswamy (1997) also proposed different categorization of those factors that affect project performance. These scholars categorized factors into eight major factor categories: project related, client related, design related, contractor related, material, labor, equipment and external factors. According to Chan and Kumarswamy (1997) Project related factors include project characteristics, necessary variation, communication among various parties, speed of decision making involving all project teams, and ground conditions. Client-related factors include client characteristics, project financing, client variations and requirement and interim payment to contractors. Design-team related factors consist of design team experience, project design complexity, and mistakes and delay in producing design document. Contractor-related factors comprise factors related to: contractor experience in planning and controlling the project, site management and supervision, degree of subcontracting, and contractor's cash-flow. Material factors include material shortage, material changes, procurement programming, and proportion of off-site prefabrication. Human factors encompass: labor shortage, low skill levels, weak motivation, and low productivity. Equipment factors include equipment Shortages, low efficiency, breakdown, and wrong selection. The last one is External factors comprise those such as: waiting time for approval of drawings and test samples of materials, and Environmental concerns and restrictions

2.3.1.3 Time Factors

Time factors is one category of factors that contain factors particularly affecting the project time performance. These are factors that have an impact on the project time performance. For these the contractors' management capability has significant impact on cost and time performance of building projects (Aje, Odusami and Ogunsemi, 2009). Another study done by Wiguna and Scott

(2005) showed the critical risks affecting both project time and cost perceived by the building contractors were similar. They were: inflation on material price, owners design change, faulty design, delayed payments on contracts, weather conditions, and defective construction work. The most considerable contributing factor for time delays of global projects was delay in payments whereas design-related factors also caused the most delays.

2.3.2 Delay Factors in Construction Projects

A number of studies have been conducted in regard to delays in construction projects for decades with scholars advancing various factors and groups of factors that contribute to causing delays. Available literature reviewed indicate categorization of the various factors in groups of up to eleven (11) categories of consultant-related, contractor - related, design-related, equipment-related, externality - related, labor-related, material-related, owner-related, project-related, engineer-related and human-behavior. This study however re-clustered these factors into four (4) broad categories of consultant-related, contractor-related, client-related and external-related factors.

2.3.2.1 Consultant Related Delay Factors

Several studies have identified consultant related assert that incomplete drawings, late issuance of instructions and inadequate supervision critically impacted on consultant related group of delays. Al-Khalil and Al-Ghafly (1999) concluded that inadequate site supervision by the consultant was the major cause of delay. Al-Kharashi and Skitmore (2009) identified delays in approving major changes in the scope of works, inadequate experience of the consultant and late in reviewing design documents as critical. In a separate study, Arditi (1985) identified delays in design work and inadequate site inspection as the main causes of consultant related delays.

Assaf and Hejji (1985) identified the consultant related delay factors as; delay in performing inspection and testing by consultant, delay in approving major changes in the scope of work by consultant, inflexibility (rigidity) of consultant, poor communication and coordination between consultant and other parties, late review and approval of design documents by consultants, conflicts between consultant and design engineer, inadequate experience of consultant. Assaf (2006) identified design errors made by designers, changes in types and specifications during construction, insufficient communication between owner and consultant during design stage as critical.

Chan and Kumaraswamy (1997) identified delays in design information, inadequate design team experience and mistakes and discrepancies in design documents. In a separate study, El-Razek (2008) concluded that design changes during construction, changes in material types and specifications during construction and design errors made by designers contributed to delays. Faridi and El-Sayegh (2006) identified slow preparation and approval of drawings, incomplete drawings, specifications and or documents and change in drawings as factors of consultant related delays. Gündüz (2013) identified delay in performing inspection and testing, poor communication and coordination with other parties, and conflicts between consultant and design engineer as the most significant in causing delays.

In a study analyzing factors affecting delays in Indian construction projects, Hemanta (2012) concluded that lack of commitment and Architect's reluctance for change contributed to delays. Iyer and Jha (2005) identified the factors of inadequate project formulation in the beginning and reluctance in timely decision by the consultant as key causes of delay. Kumaraswamy and Chan (1998) identified the factors of unforeseen ground conditions, delays in design information and necessary variations of works as key consultant related delays. Ling and Hoi (2006) looked at the causative factors in terms of technical risks that included design failure, estimation error and new technology failure. Lo (2006) identified the factor of poor site management and supervision as the main cause of consultant related delay. Mansfield (1994) highlighted the problems of poor contract management, mistakes and discrepancies in contract documents and inspection and testing of completed portions of work as key causes of consultant related delays.

Olawale and Sun (2010) identified the factors of inadequate evaluation of project's duration, discrepancies in contract documentation and contract and specification interpretation disagreement as causes of delay under consultant-related. Sambasivan and Soon (2007) identified contract management, preparation and approval of drawings, quality assurance and control and waiting time for approval of tests and inspections as factors causing delays under the consultant-related categories.

2.3.2.2 Contractor Related Delay Factors

Available literature contends that proper project planning, availability of materials, equipment and adequate labor are key critical success factors for the successful implementation of building

construction projects. A number of studies have been carried out in those key critical dimensions in order to assess their relative contributions to schedule delays in the construction industry.

Aibinu and Odeyinka (2006) identified financial difficulties, equipment breakdown and maintenance problems, planning and scheduling problems, material and equipment shortages, slow mobilization and shortage of manpower as main contributors to this category of delay factors. Al-Khalil and Al-Ghafly (1999) observed that financing and cash flow challenges, poor project management and inadequate manpower were key considerations.

Al-Kharashi and Skitmore (2009) contend that poor qualification of contractor's technical staff, poor site management and supervision and difficulty in financing the project were critical. Arditi (1985) observed that inadequate supply of materials, and contractor's financial difficulties were the main causes of delay. Assaf and Al-Hejji (2006) identified the contractor related delay factors as; difficulties in financing project by contractor, conflicts in sub-contractors schedule in execution of project, rework due to errors during construction, conflicts between contractor and other parties (consultant and owner), poor site management and supervision by contractor, poor communication and coordination by contractor with other parties, ineffective planning and scheduling of project by contractor, improper construction methods implemented by contractor, delays in sub-contractors work, inadequate contractor's work, frequent change of sub-contractors because of their inefficient work, poor qualification of the contractor's technical staff, delay in site mobilization. Assaf (1995) identified inadequate contractor finance, shortage of manpower, slow delivery of materials and errors committed during construction works affected delivery of the projects.

Chan and Kumaraswamy (1997) identified the factors of poor site management and supervision and improper project planning and scheduling that contribute to causes of delays. El-Razek (2008) observed that contractor's inadequate financial resources and slow delivery of materials were the major causes of delays. Faridi and El-Sayegh (2006) identified shortage of manpower, poor site supervision and management and non-availability of materials on time as lead causes of delays under contractor related category. In a separate study, Gündüz (2013) concluded that inadequate contractor experience, ineffective project planning and scheduling, and poor site management and supervision respectively ranked highly. Hemanta (2012) using factor analysis conclude that site accidents due to lack of safety measures, use of improper or obsolete construction methods, and

delay immaterial delivery contributed the highest impact. In a resource management and labour strike and uniqueness of the project activities requiring high technical know-how as causes of delay during construction process. Kumaraswamy and Chan (1998) identified poor site management and supervision, inadequate contractor experience and delays in subcontractor's works as key causes of delay. In a separate study, Ling and Hoi (2006) assessed the vulnerability of Singaporean firms undertaking construction projects in India in terms of economic risks (materials supply, labour supply, and equipment availability), financial risks (relating to credit rating, capital supply and cash flow), managerial risks (relating to productivity, quality assurance, cost control and human resource management) and technical risks (relating to equipment and systems failure, collision and accidents).

Several studies have identified material related delay factors as one of the key dimensions in contractor related delays that has contributed significantly to causes of schedule delays in construction projects. Chan and Kumaraswamy (1997) concluded that shortage of material and poor procurement of material topped as contributors to causes of delays. In a separate study, Kumaraswamy and Chan (1998) identified shortage of materials in the market as a factor causing delay, poor quality of materials, and escalation of material prices and late delivery of materials as factors causing delay. Assaf and Al-Hejji (2006) identified the material related delay factors as; shortage of construction materials in market, changes in material types and specifications during construction, delay in material delivery, damage of sorted material while they are needed urgently, delay in manufacturing special building materials, late procurement of materials, late in selection of finishing materials due to availability of many types in market.

Other scholars examined the contribution of equipment related attributes to contractor delay factors and assessed their significance in causing schedule delays in construction projects. Chan and Kumaraswamy (1997) identified the factor of shortage of equipment and improper equipment as factors that contribute to causes of delays. Assaf and Al-Hejji (2006) identified equipment breakdowns, shortage of equipment, and low level of equipment-operator's skill, low productivity and efficiency of equipment, lack of high-technology mechanical equipment as causes of delays.

2.3.2.3 Client Related Delay Factors

Several studies have identified owner related delay factors to cause schedule delays. Aibinu and Odeyinka (2006) concluded that Clients' cash flow problems, variation orders and slow decision

making were critical. In a separate study, Hemanta (2012) observed that lack of incentive for contractors for early finish and slow decisions from owners were critical. Al-Khalil and Al-Ghafly (1999) considered delay in making progress payments by the client as critical. Al-Kharashi and Skitmore (2009) identified lack of finance to complete the works and slow decision making by the owner as having greatest impacts to delays. Arditi (1985) identified delay in payments to contractor and frequent change orders had the greatest effect.

Assaf and Al-Hejji (2006) identified the owner related delay factors as; delay in progress payments by owner, delay to furnish and deliver the site to the contractor by the owner, change orders by owner during construction, late in revising and approving design documents by owner, delay in approving shop drawings and sample materials, poor communication and coordination by owner and other parties, slowness in decision making process by owner, conflicts between joint-ownership of the project, unavailability of incentives for contractor for finishing ahead of schedule and suspension of work by owner. Assaf (1995) identified intermitted stoppage of works due to cash flow challenges and delays in making progress payment to the contractor as the main causes under this category.

Chan and Kumaraswamy (1997) identified client-initiated variations, unrealistic contract durations imposed by client and low speed of decision making as key. El-Razek (2008) identified delays in effecting payments to contractors and slow decision-making process were critical causes of delays. Faridi and El-Sayegh (2006) identified slowness in owner's decision-making process and changes in materials type and specification during construction by the owner as factors that contribute to causes of delay under this category. Gündüz, et al., (2013) identified change orders, delay in site delivery and slowness in decision making as the most significant factors under this category. In a separate study, Hemanta,(2012) identified slow decision from owner and unrealistic time schedule imposed in contract as causes of delays.

Iyer and Jha (2005) identified the factors of vested interest of client's representative in not getting the project completed in time, project completion date specified but not yet planned by the owner and urgency emphasized by the owner while issuing tenders as key causes under this category. In a separate study, Kumaraswamy and Chan (1998) identified client-initiated variations as a major cause of delay. Lo (2006) identified the factor of unrealistic contract duration as the major cause of delay under the client related category. Mansfield 1994) identified the factors of financing and

payment of completed works and design changes by client as key causes of delays. Nkado (1995) identified the factors of specified sequence of completion, priority on construction time, financial ability and possible changes to initial design as the major causes of delay under this category. Olawale and Sun (2010) identified the factors of design changes by client, and financing and payment for completed works as main causes of delays. Sambasivan and Soon (2007) identified the factors of inadequate client's finance and payments for completed works, owner interference and slow decision making as critical causes of delays under the client-related category

2.3.2.4 External Related Delay Factors

Several studies have identified external related delay factors category as one of the groups of causes of schedule delays in construction projects. Aibinu and Odeyinka (2006) observed that price escalation, inclement weather, labour disputes and strikes, government regulations, slow permit by government, civil disturbances and acts of God consecutively were critical. In a separate study, delay in obtaining work permits from authorities was ranked as the most significant cause of delay by Aibinu and Odeyinka (2006). Arditi (1985) identified unfavourable weather conditions as the major cause of external related delays.

Assaf and Al-Hejji (2006) identified the external related delay factors as; effects of subsurface conditions (e.g. soil, high water table, etc.), delay in obtaining permits from municipality, hot weather effect on construction activities, rain effect on construction activities, unavailability of utilities in site (such as, water, electricity, telephone, etc.), effect of social and cultural factors, traffic control and restriction at job site, accident during construction, differing site (ground) conditions, changes in government regulations and laws, delay in providing services from utilities (such as water, electricity), delay in performing final inspection and certification by a third party.

Assaf and Al-Hejji (2006) also identified legal disputes and ineffective delay penalties, shortage of construction materials in market, and delay in manufacturing special building materials as factors that contributed to delays. Assaf (1995) identified delay in manufacturing building materials and delays in obtaining permits from authorities as the main cause of external-related delay. Chan and Kumaraswamy (1997) identified unforeseen ground conditions and long waiting time for approval of drawings as critical factors. El-Razek (2008) identified unfavorable weather conditions as key. Faridi and El-Sayegh (2006) identified the factors of subsurface soil conditions and unfavorable weather conditions as contributors to delays. Gündüz, (2013) identified delay in

obtaining permits, global financial crisis and unexpected surface and subsurface conditions as the key factors.

A study conducted by Hemanta (2012) revealed that extreme weather conditions and obtaining permission from local authorities were critical in causing delays. In a separate study, Iyer and Jha (2005) identified the factors of harsh climatic conditions at the site, hostile political and economic environment and hostile social environment as key contributors to delays. Kumaraswamy and Chan (1998) identified unfavorable weather conditions as a factor causing delay. Ling and Hoi (2006) assessed external related delays in terms of natural risks (weather systems and geological systems) and political risks that include war, civil disorder and industrial relations actions that affect the progress of the project. Lo (2006) identified the factors of environmental restrictions, slow coordination and seeking of approvals from concerned authorities, uncontrollable external factors and inclement weather were key in causing delays within this category.

Mansfield (1994) identified the factors of changes in site conditions and inclement weather as causes of external related delays. Nkado (1995) identified the factors of unfavorable weather and regulations are key causes of delays. Olawale and Sun (2010) identified the factors of unpredictable weather conditions, dependency on imported materials, inflation of prices, weak regulation and control and unstable government policies as causes of delay. Sambasivan and Soon (2007) identified the main causes under external-related delays as unfavorable weather conditions, regulatory changes, problems with neighbors and unforeseen site conditions.

2.4 Research Gap

This chapter discusses the definition of a project, the concepts of project management, construction projects, the theory of performance, performance measurement, and key performance indicators to measure performance, construction projects and performance, factors affecting construction project performance and finally discussed the delay factors in four categories. All of the aforementioned concepts, ideas, and research-based discoveries benefited the researcher in understanding the topic at hand and identifying gaps indicated by many academics in the field of education project implementation.

2.5 Conceptual Framework

The researcher adapted the conceptual framework proposed by Samuel (2020) for his research in by resurrecting several literatures. Factor Affecting Public Construction Project Performance: The Case of Addis Ababa Roads and Condominium Projects The researcher provided the following link between the three primary performance indicators; quality, schedule, and cost variances, as well as the overall elements that contribute to the construction project performance gap, based on the studied literature. This proposal was diagrammatically represented in order to clarify the notion of this research, which primarily focuses on delay factors and construction project performance.

Source: Samuel Siblu (2020)

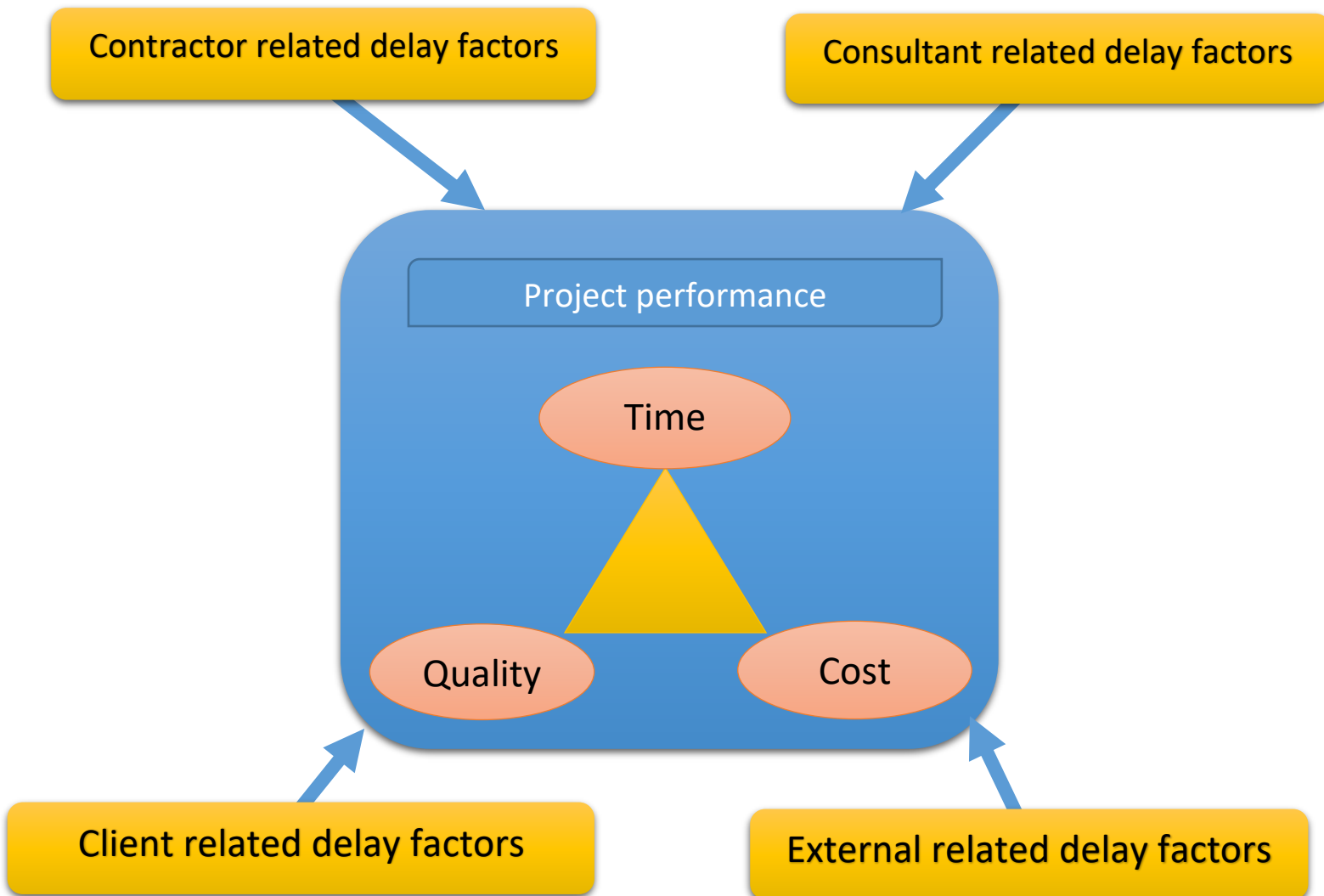


Figure 1 Delay factors and project performance

CHAPTER THREE

Research Methodology

This chapter summarizes the study's research design and methodology. The researcher elaborated on the research design, data collection instruments, sample size and methodology, data analysis, and ethical concerns.

3.1 Research Design and Approach

Mixed-method research design was used since it combine multiple research methods to create the best path for a specific research project, which was used for analyzing both qualitative and quantitative data. The study involved a qualitative investigative literature review. The quantitative methods were used to generate numerical data, which were then be statistically manipulated to meet the objectives via descriptive statistics (frequencies and percentages). Primary and secondary data were collected and analyzed using Statistical Package for social science (SPSS).

3.2 Target Population

This research looked at the performance of building construction projects in Addis Ababa. As a result, the study focuses on projects that are currently being built in Addis Ababa. The project's performance was primarily concerned with all stakeholders in the construction process but the target population of the study was organized in cluster ways that includes bi-partite such as contractor and consultant. Target population was population of project managers and supervising engineers who have work experience in private local Grade-1 contractor and consultant companies. The number of registered Grade-1 contractors and consultants in Ethiopia for 2018 budget year are 83 and 60 respectively, total is 163 www.constructionproxy.com (assessed on May 17, 2018).

3.3 Sampling Techniques and Sample Size

A simple random sampling method was applied to select the sample from the population of each cluster. The questionnaire was applied to certain informants in the investigation. According to Kothari (2004) if the sample populations are less than 10,000 the required representative sample size will be computed by the proportion of sample size formula.

According to Kothari (1990) if $N < 10,000$ the formula is, $fn = n / (1 + n/N)$

Where= the desired sample size when the population is less than 10,000 n =the sample size of the population N = the estimated population size.

Accordingly,

- For contractor $n=167$, $N=80$

$$fn = 167 / (1 + 167/80) = 167 / (1 + 2.088) = 167 / 3.08 = 54$$

- For Consultant $n=167$, $N=60$

$$fn = 167 / (1 + 167/60) = 167 / (1 + 2.78) = 167 / 3.78 = 45$$

Hence for this research professionals working as contractors 54 samples and 45 consultants' samples were selected from a total population of 80 contractor workers and 60 consultant employees in the Addis Ababa building construction projects.

After the sample size was determined, individual respondents were selected using simple random sampling by using lottery method after developing the sampling frame by obtaining list of active project managers, resident engineers and counter-part engineers currently working on active, finished and late building construction projects.

3.4 Source of Data and Data Collection Tools

3.4.1 Source of Data

Both primary and secondary data collecting devices were utilized to acquire information from relevant sources.

- **Primary data:** Primary data are data generated by the researcher specifically for the goal of solving the study challenge. It is the information gathered by the researcher from the sample population. The primary data was collected from contractors (project managers), and consultants (resident engineers) and counter-part engineers
- **Secondary data:** Secondary sources of data were gathered from journal reviews, publications, previous research efforts, and books official websites and other search engines.

3.4.2 Data Collection Tools

Primary data for this study were collected by survey of structured questionnaires from sample respondents. Respondents were given a questionnaire with closed-ended questions about the research problem. This is because the questionnaire is the most effective tool for reaching everyone in the sample. Respondents were requested to indicate which delay factors they considered to have significant effects on performance of projects based on their experience and other factors. The questionnaire adopted a 5-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree). The study used purposive sampling to select key informants from all the categories of respondents so as to ensure that the right respondents with the relevant knowledge, authority and experience on the different themes were adequately selected. A review of the literature aided in the collection of a list of criteria said to have been employed in the structure of the questionnaires. Before collecting data from the real sample, the questionnaire was pretested on a few non-sampled respondents, and appropriate changes were made to the questionnaire based on the input received.

3.5 Methods of data analysis

Prior to analysis, responses were filtered and edited. The data was analyzed using descriptive statistics, which resulted in the identification of technical information. Tables were used to present the data's findings. The work was guided by the use of the Statistic Package for Social Science (SPSS), into which the respondents' scores for each component were input, and the responses from the 100 questionnaires were statistically analyzed for further insight. The qualitative data on major delay factors and the relative importance index were examined using Microsoft Excel software. The impact of each element to total delay factors was investigated, and the attributes were ranked in terms of their criticality as assessed by respondents using the Relative Importance Index (RII) which was computed using equation and the results of the analysis are presented in Table 1 to Table 9

$$RII = \sum W / A * N \quad (0 \leq RII \leq 1)$$

Where:

- W – is the weight given to each factor by the respondents and ranges from 1 to 5, (where “1” is “strongly disagree” and “5” is “strongly agree”);

- A – is the highest weight (i.e. 5 in this case) and;
- N – is the total number of respondents.

Finally, the study's findings are examined, presented in table and relevant recommendations to reduce the overall impact of project delay factors were presented.

3.6 Data validity and reliability

To assess a scale's internal consistency reliability, three approaches can be utilized simultaneously: inter item correlations, Cronbach's alpha, and corrected item-total correlations. Cronbach's alpha (α) must be at least 0.70 for all things found under the same construct to maintain internal consistency (Nunnal & Bernstei, 1994). According to Lance, Butts, and Michels (2006), however, this often quoted criterion may be misleading, and basic research should rely on scales that generate scores with a minimum reliability of 0.80.

Table 1 Chronbach's Alpha

NO	Name of construct	Items included	Chronbach's Alpha (α)
1	Consultant related delay factors	18	0.839
2	Contractor related delay factors	28	0.86
3	Client related delay factors	15	0.81
4	External related delay factors	20	0.816
5	Overall delay factors	87	0.92

3.7 Research Ethical Consideration

This study's success was largely attributable to the participants' openness and willingness to contribute their data. As a result, the researcher undertook to perform this study in an honest and respectful manner toward both the respondents and the information they gave. The researcher followed the following ethical guidelines:

- a) Do No Harm-protecting the individual subject from any harm.
- b) All participants were assured confidentiality and anonymity.
- c) Individuals taking part in this study may expect their personal information to be kept strictly confidential at all times.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

This section covers the presentation, analysis, and interpretation of data collected from respondents via questionnaires and literature review

4.1 Data Presentation and Analysis

4.1.1 Analysis of Delay factors Affecting Building Construction Project Performance

Contractor-related variables, consultant-related factors, client-related factors, and external factors are the four basic kinds of factors that impact building projects. The Relative Importance Index (RII) was created to rate several elements that impact project performance depending on their category.

4.1.1.1 Consultant related delay factors affecting building construction project performance

Table 2 consultant related delay factors rank

CODE	NO	ITEM	RII	RANK
	1	CONSULTANT RELATED DELAY FACTORS		
CONSU	1.11	Insufficient data collection and survey before design	0.770	1
CONSU	1.06	Delay in reviewing and approving design changes	0.763	2
CONSU	1.12	Insufficient estimation of original contract duration	0.761	3
CONSU	1.05	Delay in preparing interim payment certificates	0.759	4
CONSU	1.09	Inadequate project management assistance	0.759	4
CONSU	1.08	Inadequate definition of substantial completion	0.736	6
CONSU	1.17	Unclear and inadequate details in drawings	0.736	6
CONSU	1.03	Delay in assessing/evaluating major changes in the scope of work	0.733	8
CONSU	1.04	Delay in performing inspection and testing	0.722	9
CONSU	1.1	Inadequate site investigation	0.720	10
CONSU	1.13	Lack of experience of consultant in construction projects	0.706	11
CONSU	1.15	Poor communication and coordination with other parties	0.706	11
CONSU	1.02	Conflicts between consultants	0.687	13
CONSU	1.16	Poor use of advanced design software	0.678	14
CONSU	1.18	Unfavorable contract clauses	0.678	14
CONSU	1.01	Complexity of the project	0.676	16
CONSU	1.07	Design errors made by designers	0.674	17
CONSU	1.14	Misunderstanding of owner's requirements	0.508	18

Table 2 Source field survey 2022

According to the summary of results in table 2, the key delay factors affecting building construction project performance in Addis Ababa were insufficient data collection and survey (RII=0.77), delay in reviewing and approving design changes (RII=0.763), insufficient estimation of original contract duration (RII=0.761), delay in preparation of interim payment certificates (RII=0.759), and inadequate project management assistance (RII=0.759).

4.1.1.2 Contractor related delay factors affecting building construction project performance

Table 3 Contractor related delay factors rank

CODE	NO	ITEM	RII	RANK
CONT	2.09	Ineffective project planning and scheduling	0.825	1
CONT	2.17	Poor procurement of construction materials	0.775	2
CONT	2.1	Late delivery of materials	0.759	3
CONT	2.07	Inappropriate construction methods	0.752	4
CONT	2.19	Poor site management and supervision	0.749	5
CONT	2.03	Financial indiscipline/dishonesty	0.743	6
CONT	2.04	Frequent equipment breakdowns	0.738	7
CONT	2.16	Poor communication and coordination with other parties	0.731	8
CONT	2.24	Slow mobilization of labour	0.731	8
CONT	2.18	Poor quality of construction materials	0.729	10
CONT	2.13	Low productivity of labour	0.722	11
CONT	2.28	Unreliable subcontractors	0.722	11
CONT	2.27	Unqualified / inadequate experienced labour	0.720	13
CONT	2.12	Low motivation and morale of labour	0.717	14
CONT	2.05	Improper equipment	0.713	15
CONT	2.08	Incompetent project team	0.710	16
CONT	2.11	Low efficiency of equipment	0.710	16
CONT	2.14	Obsolete technology	0.703	18
CONT	2.2	Rework due to errors	0.701	19
CONT	2.21	Shortage of equipment	0.694	20
CONT	2.06	Inadequate contractor experience	0.678	21
CONT	2.23	Slow mobilization of equipment	0.676	22
CONT	2.22	Shortage of labour	0.667	23
CONT	2.15	Personal conflicts among labour	0.657	24

CONT	2.26	Subcontractor turn-over	0.657	24
CONT	2.02	Damage of materials	0.653	26
CONT	2.01	Absenteeism	0.644	27
CONT	2.25	Strike	0.609	28

Source field survey 2022

The research revealed that the top five most contractor-related delay factors affecting project performance were ineffective project planning and scheduling with a RII of 0.825, poor procurement of construction materials with a RII of 0.775, late delivery of materials with a RII of 0.759, inappropriate construction methods with a RII of 0.752, and poor site management and supervision with a RII of 0.749.

4.1.1.3 Client related delay factors affecting building construction project performance

Table 4 Client related delay factors rank

	NO	ITEM		
CODE	3	CLIENT RELATED DELAY FACTORS	RII	RANK
CLIENT	3.15	Slowness in decision making	0.851	1
CLIENT	3.1	Intermittent stoppage of work due to cash flow constraints	0.821	2
CLIENT	3.14	Poor communication and coordination with other parties	0.809	3
CLIENT	3.13	Lack of incentives for contractor to finish ahead of schedule	0.805	4
CLIENT	3.05	Delay in approving design documents	0.779	5
CLIENT	3.09	Inadequate information during project feasibility study	0.772	6
CLIENT	3.02	Changes in material types and specifications during construction	0.756	7
CLIENT	3.08	Design changes by owner or his agent during construction	0.731	8
CLIENT	3.11	Lack of capable representative	0.731	8
CLIENT	3.06	Delay in payments	0.722	10
CLIENT	3.07	Delay in site delivery	0.720	11
CLIENT	3.12	Lack of experience of owner in construction projects	0.715	12
CLIENT	3.04	Corruption tendencies	0.703	13
CLIENT	3.01	Change orders	0.683	14
CLIENT	3.03	Conflicts between joint-owners	0.625	15

Source field survey 2022

The study aims to determine the extent to which client-related delay factors affect the performance of building construction projects in Addis Ababa. Slow decision-making (RII=0.851), intermittent work stoppage due to cash flow problems (RII=0.821), inadequate communication and coordination with parties (RII=0.809), lack of incentive for contractor to finish ahead of schedule

(RII=0.805), and delay in approving design documents (RII=0.779) had great effect on project performance of building construction project. Several studies that were analyzed on the literature review agreed on the results of this study that slowness in decision making is a key client-related delay factor that affects the performance of building construction projects. Conflicts between joint-owners, according to the study, do not have a great effect on the performance of building construction projects.

4.1.1.4 External related delay factors affecting building construction project performance

Table 5 External related delay factors rank

	NO	ITEM		
CODE	4	EXTERNAL RELATED DELAY FACTORS	RII	RANK
EXT	4.18	Unexpected surface & subsurface conditions (such as soil, high water table)	0.830	1
EXT	4.08	Escalation of local material prices	0.816	2
EXT	4.17	Shortage of construction materials	0.795	3
EXT	4.05	Delay in obtaining permits from local authority	0.793	4
EXT	4.06	Delay in providing services from utilities (such as water, electricity)	0.775	5
EXT	4.15	Price fluctuations on the international market	0.775	5
EXT	4.03	Conflict, war, and public enemy	0.770	7
EXT	4.1	Global financial crisis	0.763	8
EXT	4.07	Environmental and social factors	0.733	9
EXT	4.04	Delay in manufacturing materials	0.726	10
EXT	4.12	Legal disputes between project participants	0.722	11
EXT	4.09	Geopolitical and regional stability	0.720	12
EXT	4.13	Loss of time by traffic control and restriction at project site	0.715	13
EXT	4.11	Ineffective delay penalties	0.708	14
EXT	4.19	Unfavorable weather conditions	0.703	15
EXT	4.2	Unreliable suppliers	0.699	16
EXT	4.16	Problem with neighbors	0.651	17
EXT	4.14	Natural disasters (flood, hurricane, earthquake)	0.639	18
EXT	4.02	Changes in government regulations and laws	0.630	19
EXT	4.01	Accidents during construction	0.600	20

Source field survey 2022

The study revealed that unexpected surface and subsurface conditions (such as soil, high water table) with (RII of 0.83), escalation of local material prices with (RII of 0.816), shortage of construction materials with (RII of 0.795), delay in obtaining permits from local authority with

(RII of 0.793), and delay in providing services from utilities (such as water, electricity) had a huge effect on the performance of building construction projects in Addis Ababa.

4.1.1.5 Overall top delay factors affecting building construction project performance

Table 6 Overall rank of the delay factors

CODE	NO	ITEM		
		ALL DELAY FACTORS	RII	RANK
CLIENT	3.15	Slowness in decision making	0.851	1
EXT	4.18	Unexpected surface & subsurface conditions (such as soil, high water table)	0.830	2
CONT	2.09	Ineffective project planning and scheduling	0.825	3
CLIENT	3.1	Intermittent stoppage of work due to cash flow constraints	0.821	4
EXT	4.08	Escalation of local material prices	0.816	5
CLIENT	3.14	Poor communication and coordination with other parties	0.809	6
CLIENT	3.13	Lack of incentives for contractor to finish ahead of schedule	0.805	7
EXT	4.17	Shortage of construction materials	0.795	8
EXT	4.05	Delay in obtaining permits from local authority	0.793	9
CLIENT	3.05	Delay in approving design documents	0.779	10

Source field survey 2022

As summarized on the table 6. The study found that client-related delay factors had a strong influence on building construction project performance, with an aggregated relative relevance index of 0.748, and were listed as top delay causes. External related delay factors come in second with an aggregate relative index of 0.728, contractor related delay factors come in third with an aggregate relative index of 0.710, and consultant related factors have the least impact on building construction project performance with an aggregate relative index of 0.709.

4.1.2 Analyzing Delay Factors Effect on Cost, Time and Quality

The study used delay factors with direct connections between the variables cost, time, and quality. Because these three variables are constraints that can impact project performance, so the research has classified the delay factors based on their direct link to the variables that were explained in the literature review. The classification of elements impacting the success of construction projects as cost, time, and quality considerations is one type of classification. Identifying factors based on their results, on the other hand, may have some limitations. Because cost, time, and quality are

three interdependent project constraints, it is difficult to characterize issues only as cost, time, or quality factors. As a result, things that impact one limitation are likely to affect the remaining two.

4.1.2.1 Cost factors

Table 7 Cost factors rank

CODE	NO	ITEM		
		COST FACTORS	RII	RANK
CLIENT	3.1	Intermittent stoppage of work due to cash flow constraints	0.821	1
EXT	4.08	Escalation of local material prices	0.816	2
CLIENT	3.13	Lack of incentives for contractor to finish ahead of schedule	0.805	3
EXT	4.17	Shortage of construction materials	0.795	4
EXT	4.15	Price fluctuations on the international market	0.775	5
EXT	4.03	Conflict, war, and public enemy	0.770	6
EXT	4.1	Global financial crisis	0.763	7
CONT	2.03	Financial indiscipline/dishonesty	0.743	8
CLIENT	3.08	Design changes by owner or his agent during construction	0.731	9
EXT	4.09	Geopolitical and regional stability	0.720	10

Source field survey 2022

The results show that the delay factors with the strongest effect and cost in building construction projects in Addis Ababa are intermittent stoppage of work due to cash flow constraints, escalation of local material prices, and a lack of incentives for contractors to finish ahead of schedule etc... Several studies on the literature review identified financial difficulty, inflation, and price rises and falls as major delay factors that contribute to project performance fluctuations.

4.1.2.2 Quality factors

Table 8 Quality factors rank

CODE	NO	ITEM		
		QUALITY FACTORS	RII	RANK
EXT	4.18	Unexpected surface & subsurface conditions (such as soil, high water table)	0.830	1
CONT	2.17	Poor procurement of construction materials	0.775	2
CLIENT	3.02	Changes in material types and specifications during construction	0.756	3
CONT	2.07	Inappropriate construction methods	0.752	4
CONT	2.19	Poor site management and supervision	0.749	5

CONT	2.04	Frequent equipment breakdowns	0.738	6
CLIENT	3.11	Lack of capable representative	0.731	7
CONT	2.18	Poor quality of construction materials	0.729	8
CONT	2.27	Unqualified / inadequate experienced labor	0.720	9
CLIENT	3.12	Lack of experience of owner in construction projects	0.715	10

Source field survey 2022

As a direct result, the delay factors that have the largest effect and are regarded as the most important quality factor in building construction projects in Addis Ababa are unexpected surface and subsurface conditions (such as soil, high water table), Poor construction material procurement and changes in material types and specifications during construction.

4.1.2.3 Time factors

Table 9 Time factors rank

CODE	NO	ITEM		
		TIME FACTORS	RII	RANK
CLIENT	3.15	Slowness in decision making	0.851	1
CONT	2.09	Ineffective project planning and scheduling	0.825	2
EXT	4.05	Delay in obtaining permits from local authority	0.793	3
CLIENT	3.05	Delay in approving design documents	0.779	4
EXT	4.06	Delay in providing services from utilities (such as water, electricity)	0.775	5
CONSU	1.06	Delay in reviewing and approving design changes	0.763	6
CONSU	1.05	Delay in preparing interim payment certificates	0.759	7
CONT	2.1	Late delivery of materials	0.759	7
EXT	4.07	Environmental and social factors	0.733	9
CONT	2.24	Slow mobilization of labor	0.731	10

Source field survey 2022

As a result, the delay factors that have the most impact and are recognized as the most critical time factor in Addis Ababa building construction projects are Slowness in decision making, Ineffective project planning and scheduling, and delay in acquiring permissions from local authorities

4.2 Data Interpretation

4.2.1 Response Rate and Respondent Background

To collect primary data, 99 questionnaires were delivered to the selected respondents, who included contractors (54 samples) and consultants (45 samples). Out of the total of 99 issued surveys, 48 from contractors and 39 from consultants were returned, yielding an 87.87 percent response rate.

4.2.2 Delay Factors Affecting Building Construction Project performance in Addis Ababa

As a result of the study, the complexity of the project, design errors made by designers, and misunderstanding of the owner's needs had less of an impact on the project performance of a building construction project. As a result, this finding is supported by the Al-Kharashi and Skitmore (2009), Kumaraswamy and Chan (1998), and Olawale and Sun (2010) researches discussed in the literature review, but several of the studies found that inadequate supervision, incomplete drawings, and late issuance of instructions had an effect on the project performance of a building construction project in globally.

The study also intended to prove that slow equipment mobilization, labor shortages, personal disputes among workers, subcontractor turnover, material damage, absenteeism, and strike had less of an impact on building construction project performance. Available literature asserts that proper project planning, availability of materials, equipment, and adequate labor, since Ineffective project planning and scheduling was supported as the major contractor related delay factor that affect building construction projects by several studies like Chan and Kumaraswamy (1997),Gündüz, et al.,(2013),Kumaraswamy and Chan (1998).

However, the researcher contends that the outcome of the results was due to the fact that the Client is not always expected to be technically and knowledgeable in building construction in order to embark on a development project, and as a result, they hire the services of experts such as consultants and contractors to execute the work on their behalf and to their satisfaction.

In addition, the study revealed that problems with neighbors, natural disasters, changes in government regulations and laws, and accidents had less of an impact on the performance of building construction projects in Addis Ababa. The findings of the study also support the findings of other studies in the literature that unexpected ground conditions and delays in acquiring permits

are the key external related delay factors that impact building construction project performance in Addis Ababa and other nations.

The study also attempted to uncover the top five factors that had a significant impact on project performance in building construction. These are, first and foremost, slowness in decision making (94.5 percent of respondents agreed), unexpected surface and subsurface conditions (such as soil, high water table) (91.6 percent of respondents agreed), ineffective project planning and scheduling (86.2 percent of respondents agreed), and intermittent work stoppage due to cash flow constraints (85.1 percent of respondents agreed), escalation of local material prices (80.6 percent of the respondents agreed). In terms of analyzing the influence of delay factors in the context of Addis Ababa, the delay factors that registered RII less than 0.676 were assessed to have less of an impact on the project performance of building construction projects in Addis Ababa.

4.2.3 Delay Factors Effect on Cost, time and Quality

The research findings are likewise consistent with the literature research results also reveal that escalation of local material prices is a major cost factor that affects the performance of building construction projects that agrees with like Abdullah (2010).

Several studies on the literature review, such as Jha and Jha (2006), indicated that lack of contractor experience agreed with research findings that because lack of contractor experience is the cause of poor procurement of construction materials and inappropriate construction methods, and results also agreed with Curt (2005)'s statement that stated frequency of change requests is a major quality factor that affects the performance of building construction projects.

According to the literature study (Aje, Odusami, and Ogunsemi, 2009) and Wiguna and Scott (2005), the key delay factors that contribute to project performance fluctuations include contractor planning and scheduling, poor design, and delayed payment. The research findings are likewise consistent with the literature in that incorrect project planning and scheduling, inefficient project planning and scheduling, and delays in approving design documents are all important time variables that impact building construction performance.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter summarizes the significant findings, draws conclusions, and offers suggestions. The purpose of this study was to assess the delay factors that affect the performance of building construction projects in Addis Ababa. This study included a qualitative and quantitative research technique, which makes the descriptive method more credible.

5.1 Summary of Major Findings

A problem in a construction project are caused by a variety of causes that can be generally classified. The purpose of this study was to examine the influence of delay factors on building construction project performance in Addis Ababa, using Addis Ababa as a case study, so that suitable mitigation strategies may be implemented to mitigate the consequences of delay factors. A thorough literature study was conducted to examine four goals. There were 81 delay attributes identified and classified into four categories: consultant related delay factors, contractor related delay factors, client related delay factors, and external related delay factors. The computed RIIs served as a standard for evaluating all of the qualities and groups of delays, forming the foundation for defining the most relevant and inconsequential aspects in the Addis Ababa context. Sixty-six (66) variables with $RII > 0.676$ were deemed important, whereas factors with $RII < 0.676$ were deemed inconsequential, with a total of fifteen (15) factors falling into this category. According to the findings of the survey, the following are the top crucial delay reasons in each category that were assessed to have a strong impact on project performance.

Due to consultant-related delay factors the top critical delay factors that affect project performance of building construction project are insufficient data collection and survey before design, delay in reviewing and approving design changes, insufficient estimation of original contract duration, delay in preparing interim payment certificates, and inadequate project management assistance.

From contractor-related delay factors ineffective project planning and scheduling, poor procurement of construction materials, late delivery of supplies, inappropriate construction methods, and poor site management and supervision are the top important delay factors that impair building construction project performance.

Due to client-related delays decision-making sluggishness, intermittent work interruption owing to cash flow difficulties, ineffective communication and collaboration with other parties, lack of incentives for contractors to finish ahead of schedule and a delay in approving design document are crucial delay factors that impact building construction project performance.

The most important delays that hamper the execution of building construction projects include because of external delays are unexpected surface and subsurface conditions (such as soil and a high water table), local material price spikes, construction materials are in limited supply, and there are delays in obtaining licenses from municipal authorities, as well as delays in delivering utilities (such as water and electricity). According to the study, the client related category had the most influence, followed by external related, contractor related, and client related had the least impact.

One sort of categorization is the classification of aspects influencing the success of building projects as cost, time, and quality issues. According to the findings of the study, the escalation of local material costs is a key cost element that impacts the performance of building construction projects, which is consistent with the findings of other studies. According to the research findings, inadequate procurement of construction materials and incorrect construction procedures are important quality problems that impact building construction performance because of a lack of contractor expertise. The research findings also show that improper construction project planning and scheduling, ineffective project planning and scheduling, and delays in approving design documents are key time variables that impact building construction performance.

5.2 Conclusion

The following conclusions are formed in response to the basic questions based on the findings: The purpose of this study was to examine the effects of delay factors on building construction project performance in Addis Ababa. According to the findings of the study, there are various delay factors that impact the performance of building projects. These delay factors differ in terms of the frequency with which they occur and the severity with which they impair project performance, both of which are essential in analyzing the problem of project success. As a result, the study evaluated project delay factors by considering both the frequency and severity of effects. Various delay factors are graded based on their relative importance index. The top major factors

are listed in the following order: Slowness in decision making, unexpected surface & subsurface conditions (such as soil, high water table) and Ineffective project planning and scheduling.

The study also attempted to identify the delay factors and assess their effects in relation to their contribution to the building project. A literature review was undertaken to assist categorize the delay reasons and explore four targets. Client, Consultant, Contractor, and external have different levels of contribution of occurrence as project delay factors, and the research found that client related delay factors, external related delay factors, contractor related delay factors, and consultant related delay factors have been ranked to have a major effect on the performance of building construction projects, respectively. The research's findings also debunk a long-held belief among many people both inside and outside the construction business that contractors were the primary reason of poor performance, despite the lack of a solid study to back up their assertions.

The study also revealed that cost, time, and quality are important factors influencing building construction performance. Local material costs are an important cost factor that influences the performance of building construction projects. Inadequate construction material procurement and inappropriate construction methods are significant quality problems that impair building construction performance due to a lack of contractor experience. Improper project planning and scheduling are critical time factors that affect the performance of buildings.

Recommendation

Based on the findings the following recommendations may be made to reduce and control delay issues in building projects.

For consultants

- The consultants should ensure that proper site investigations are carried out both during the feasibility study and the conceptual design to guarantee that necessary procedures are taken during the detailed design to avoid work suspension during the construction phase to resolve design difficulties.
- The consultant should ensure, all working drawings must be meticulously made, with all measurements and markings specified to scale.
- The consultant should ensure that a competent representative is present on the construction site in order to make quick, binding judgments and to ensure that works that must be

measured prior to covering are performed in order to permit the development of interim payment certificates.

- Consultants should ensure that all design changes made throughout the course of the project are handled transparently.

For contractors

- The contractor should provide enough work planning and scheduling, as well as skilled site management and monitoring.
- Contractors must ensure that they have appropriate competence for the required assignment, that they deploy a competent project team, and that they apply suitable construction methods for the required work.
- Contractors should ensure outstanding site management and supervision of the works in order to keep an eye on key activities, save costs by constantly working on reducing non-value adding processes, and execute projects on time and within budget.

For clients

- Clients should collaborate closely with other stakeholders to improve project site delivery timeliness.
- Clients should ensure that proper planning and costing of the works is done during the pre-contract period to avoid intermittent stoppage of works due to funding constraints
- Clients should make certain that interim payment certificates are paid on time and within the prescribed time frame, not only to avoid interest penalty requirements, but also to promote the growth of works and ensure timely completion

For external related

- Any project stakeholders should work together to ensure that all issues are settled during the building stage to avoid postponing the scheduled execution time throughout the litigation process. All stakeholders must ensure that enough planning is in place to account for unplanned events that may delay construction time, increase costs, and cause property damage and injury to project participants.

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APPENDICES

Research questionnaire

ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

MASTERS OF PROJECT MANAGEMENT

Questioner prepared for respondents for the assessment of delay factors affecting building construction project performance in Addis Ababa. The case grade 1 building contractors and consultants.

Dear Respected Respondents,

My name is Abel Teshome and I am carrying out a project work **to assess the delay factors affecting building construction project performance in Addis Ababa in case of grade 1 building contractors and consultants.** The information you provide is used for research purpose only, and will be kept confidential at all levels. Considering your experience in project works, your participation in this survey will significantly contribute to the accuracy and usefulness of the research outcome. I appreciate taking your time to complete the survey. I kindly request you to remember that the quality of this work is completely dependent up on your frank opinions. Please consider each statement carefully before you give it an evaluation. If you have any query, please do not hesitate to contact me. I am available at your convenience through Tel. +251920009093

Instruction:

No need to mention your name (anonymous)

Part I: Demographic data/ Respondent Profile/

Please put tick mark (√) on your choice(s).

1. Please indicate your gender: Male Female
2. Age of respondents (year): 20-29 30-39 40-49 50 and above
3. Level of education: Certificate Diploma: BA/BSC MA/MSc
4. Job title.....

5. Work Experience: Less than 5 6-10 years 11-15 years Over 15 years
6. Would you specify the project currently you worked on -----?
7. Which organization do you represent?
- Consultant
- Contractor
- Others (specify)_____

Part-II: Factors affecting project Performance:

Instructions

The following are possible contributing delay factors for project performance gap taken from literature. From your experience, please express your opinion on the importance of the following delay factors in causing performance gap on your project. Please putting a tick (√) mark parallel to a number from 1 to 5 using the scale below.

1 = strongly disagree

2 = disagree

3 = undecided

4 = agree

5 = strongly agree

NO	ITEM	DEGREE OF RANK				
		1	2	3	4	5
1	CONSULTANT RELATED DELAY FACTORS					
1.01	Complexity of the project					
1.02	Conflicts between consultants					
1.03	Delay in assessing/evaluating major changes in the scope of work					
1.04	Delay in performing inspection and testing					
1.05	Delay in preparing interim payment certificates					
1.06	Delay in reviewing and approving design changes					
1.07	Design errors made by designers					
1.08	Inadequate definition of substantial completion					
1.09	Inadequate project management assistance					
1.1	Inadequate site investigation					

1.11	Insufficient data collection and survey before design					
1.12	Insufficient estimation of original contract duration					
1.13	Lack of experience of consultant in construction projects					
1.14	Misunderstanding of owner's requirements					
1.15	Poor communication and coordination with other parties					
1.16	Poor use of advanced design software					
1.17	Unclear and inadequate details in drawings					
1.18	Unfavourable contract clauses					
NO	ITEM	DEGREE OF RANK				
2	CONTRACTOR RELATED DELAY FACTORS	1	2	3	4	5
2.01	Absenteeism					
2.02	Damage of materials					
2.03	Financial indiscipline/dishonesty					
2.04	Frequent equipment breakdowns					
2.05	Improper equipment					
2.06	Inadequate contractor experience					
2.07	Inappropriate construction methods					
2.08	Incompetent project team					
2.09	Ineffective project planning and scheduling					
2.1	Late delivery of materials					
2.11	Low efficiency of equipment					
2.12	Low motivation and morale of labor					
2.13	Low productivity of labor					
2.14	Obsolete technology					
2.15	Personal conflicts among labor					
2.16	Poor communication and coordination with other parties					
2.17	Poor procurement of construction materials					
2.18	Poor quality of construction materials					
2.19	Poor site management and supervision					
2.2	Rework due to errors					
2.21	Shortage of equipment					
2.22	Shortage of labor					
2.23	Slow mobilization of equipment					
2.24	Slow mobilization of labor					
2.25	Strike					
2.26	Subcontractor turn-over					
2.27	Unqualified / inadequate experienced labor					
2.28	Unreliable subcontractors					
NO	ITEM	DEGREE OF RANK				

3	CLIENT RELATED DELAY FACTORS	1	2	3	4	5
3.01	Change orders					
3.02	Changes in material types and specifications during construction					
3.03	Conflicts between joint-owners					
3.04	Corruption tendencies					
3.05	Delay in approving design documents					
3.06	Delay in payments					
3.07	Delay in site delivery					
3.08	Design changes by owner or his agent during construction					
3.09	Inadequate information during project feasibility study					
3.1	Intermittent stoppage of work due to cash flow constraints					
3.11	Lack of capable representative					
3.12	Lack of experience of owner in construction projects					
3.13	Lack of incentives for contractor to finish ahead of schedule					
3.14	Poor communication and coordination with other parties					
3.15	Slowness in decision making					
NO	ITEM	DEGREE OF RANK				
4	EXTERNAL RELATED DELAY FACTORS	1	2	3	4	5
4.01	Accidents during construction					
4.02	Changes in government regulations and laws					
4.03	Conflict, war, and public enemy					
4.04	Delay in manufacturing materials					
4.05	Delay in obtaining permits from local authority					
4.06	Delay in providing services from utilities (such as water, electricity)					
4.07	Environmental and social factors					
4.08	Escalation of local material prices					
4.09	Geopolitical and regional stability					
4.1	Global financial crisis					
4.11	Ineffective delay penalties					
4.12	Legal disputes between project participants					
4.13	Loss of time by traffic control and restriction at project site					
4.14	Natural disasters (flood, hurricane, earthquake)					
4.15	Price fluctuations on the international market					
4.16	Problem with neighbors					
4.17	Shortage of construction materials					
4.18	Unexpected surface & subsurface conditions (such as soil, high water table)					
4.19	Unfavorable weather conditions					
4.2	Unreliable suppliers					

