



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

**“ASSESSMENT OF THE RELATIVE IMPORTANCE OF PROJECT DELAY
FACTORS ON GRADE ONE CONTRACTORS IN ADDIS ABABA.”**

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**JUNE, 2021
ADDIS ABABA, ETHIOPIA**

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DEPARTEMENT OF PROJECT MANAGEMENT
MBA PROGRAM

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**A THESIS PAPER SUBMITTED TO ST. MARY'S UNIVERSITY SCHOOL OF
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APPROVED BY THE BOARD OF EXAMINERS

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ENDORSEMENT

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

Advisor

Signature



DECLARATION

I hereby declare this thesis entitled “Assessment of the Relative Important of Project Delay Factors on Grade One Contractors in Addis Ababa” 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, and that all sources of material used for the thesis have been duly acknowledged.

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Signature: _____



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Abstract

The construction industry is growing rapidly in Ethiopia, particularly in Addis Ababa. However, it becomes hard to finalize projects at the allocated cost and time planned initially. Construction project delays become a critical issue from time to time. As a result, this study was carried out to gather information on the most important factors that contribute to construction project delays and mitigation methods for reducing delays on grade one contractors in Addis Ababa. The study uses a descriptive research design on the causes of project delay. Quantitative method is used and the research used stratified random sampling technique for the questionnaire survey. For the investigation, thirty-nine delay-causing factors were chosen from seven groups that contribute to the causes of delay. Interview was conducted with fifteen respondents on mitigation measures of project delay. One hundred and eight questionnaires were distributed to three primary project stakeholders in construction industry, which are contractors, consultants, and clients. Eighty-two of the questioners are filled properly and completely then used as an input for data analysis. Relative Importance Index (RII) was used to analyze and rank the delay causing factors and effects of project delay. According to the survey, the most important delay causing factors are material shortages in the market, price increases/price escalation, inadequate planning and scheduling, material delivery delays, progress payment delays by owners, longer waiting periods for approval and supervision, and awarding projects to the lowest bid price. The interview conducted on mitigation methods of project delays suggests that adequate project detailed planning and project monitoring and evaluation practices are delay minimizing methods.

Key words: construction project delay, delay factors, effects of delay, project stakeholders, mitigation methods.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

The construction industry has an important role in any country's economic development. In Ethiopia it has made a significant contribution to the development and growth of the economy through infrastructure and job creation. The industry has evolved into one of the most important investments for countries seeking long-term development. The construction industry has a percentage share of the construction sector to GDP of 4.5% in 2000/01 and increased up to 5.8% in 2009/10 (MUDC ,2012). Thus, sustainable development of the construction industry is vital, which has a number of impacts on the wider economy (Durdyev & Ismail ,2016).

Project goals which are defined in terms of delivery should meet the objectives set at the project planning stage. It is fundamental for a project to be on time, on budget, under scope and of specified quality to be successful. Time frames, defined scopes, specified quality and limited cost are measures that characterize project success PMBOK (2013). These major project constraints are interrelated and dependent on one another, that failure on one of those will affect the project as a whole.

Project delay happen when the projects are extended the time scheduled in the planning stage (Assaf and Al-Hejji 2006). The project schedule which is planned at the beginning of the project is susceptible to being changed many times leading to time delays. Following schedule delay, project delay may be a major problem for contractors as well as the client, resulting in serious of adverse effects like costly disputes and unfavorable relationships between all project stakeholders. It means loss of revenue and resources for the client due to lack of productions facility and loss of profit for the contractor due to higher overhead costs which goes as far as total project abandonment.

Large number of factors can be mentioned causing construction project delays. Payment difficulties from clients, poor contractor management; material procurement, poor technical performance, and escalation of material prices have

been identified as the main delay factors according to (Roger Gibson, 2008). Lack of contractor competency, poor designers and estimation, unfixed management problems related to site and procedural techniques have been identified as major causes of delay. In Kuwait, financial difficulties, changing orders, insufficient experience of contractors are the main delay factors. (Motaleb,2010). Inadequate planning, scheduling and financing by contractors, and change orders by clients have been reported to be the main factors causing delays in Malesya, (K. Ernawati ,2007).

According to (Matta & Ashkena, 2007), construction project delays are a global concern that impacts the overall economy of a country. Delayed projects have adverse effects that are negative and unfavorable for all project stakeholders. Some of these effects are time overrun, cost overrun, dispute, arbitration, litigation and total abandonment Pickavance, K. (2005).

The increasing number of constructions indicates the need and significance of the industry. Completing the project on scheduled time saves lots of money, which shows efficiency and effective project management. Unfortunately, it is rare that projects are finalized on time. Therefore, the identification, quantification and analysis of project delays has become vital. Most delays occur due to the major stakeholders of the construction industry which are clients, consultant and contractor. Contractors see most of the delays as the responsibility of the clients, while clients usually want to put the blame on the contractor or third parties. This study will be conducted to determine the major causes, effects, and mitigating methods of construction project delays in Addis Ababa's grade one contractors.

1.2. Statement of the Problem

Construction projects face project delays throughout Addis Ababa and in Ethiopia. Failure to keep the planned project details will cause failure in the project as a whole. According to (Worku and Jha 2016), project delays are the most common problem in Ethiopian construction. (Alhaji & Danladi 2012) concluded, the delay occurs frequently in medium and large size projects, and is considered severe in small projects.

According to Worku and Jha (2016), 8.25% of construction projects have been finished as planned initially. The rest 91.75% has been delayed three times the planned or targeted project time. This is a signal that most construction projects behind schedule are facing project delays. Because the construction industry involves a number of project stakeholders and is functioning in a dynamic environment, it is important to undertake research to identify the causes of construction project delay.

When the projects are delayed, either the completion time of the project will be prolonged to finalize the project or the progress of the project will be speeded up to a great extent in order to deliver it on time. The first one lead to arbitration, litigation, and penalties, etc. And the latter will lead to incurring additional costs, and unfortunately, both will end up with loss of money. What is worse, accelerating the process of the project delivery will also affect the quality of the output, which causes client dissatisfaction (Hendrickson & Au, 2003).

Today, many stakeholders in construction are becoming increasingly concerned about the duration of construction projects because of increasing interest rates, inflation, commercial pressures (Neal Morris, (2007), and of course, it potentially ends up in disputes and claims, litigation and arbitration. The delay of any construction project affects not only the immediate agents of the construction project but all stakeholders involved in it, the society as a whole. Since the construction industry has a significant contribution to any country's development, adverse effects of construction project delays affect the country.

The cost overrun, the time overrun (delay) and under qualified work are clear indicators of a failed project. Furthermore, the impact of such delays is related to the project's cost, so the longer the delay, the higher the costs associated with it. Delay also affects the final revenue of the construction company, the quality of the final product, in addition to the direct and indirect costs incurred. The more time is spent on completing a given project, the higher the costs the construction project entails.

Even though a number of studies has been carried out previously on the subject under current study focuses, the previous study does not fully address all possible delay attributed to project delay. Because of the unique features of projects, the

causes of project delay may vary for specific project from country to country, region to region, and even project to project. Therefore, my research will focus on grade one contractors in Addis Ababa, Ethiopia. Many scholars have conducted research on the subject in different countries. The study of (Tigist T, 2018) finds out the relative importance of delay causing factors and effects of delay on housing project 9, but not include mitigation measures of project delay. The study of (Berhane B, 2018) is also conducted on the causes of delay in road projects in Addis Ababa. The research lacks mitigation measures that shall be taken to minimize the risk of project delay. In general, this research aims to identify the most important delay causing factors, and mitigation measures of project delays on projects being implemented by grade one contractors in Addis Ababa.

1.3. Objective of the Study

1.3.1. General Objective

The objective of this study is the assessment of the relative importance of project delay factors on Grade One Contractors in Addis Ababa.

1.3.2. Specific Objective

1. To identify factors influencing project delay under grade one contractors in Addis Ababa.
2. To describe relative importance of delay factors on grade one contractors in Addis Ababa.

1.4. Research Questions

The research attempts to answer the following questions:

1. What are factors influencing project delay under grade one contractors Addis Ababa?
2. What are the relatively important project delay factors in grade one contractors in Addis Ababa?

1.5. Research Significance

All stakeholders will benefit from the study since the problem affects stakeholders as a whole. The research will contribute to overcoming the effects of delay, that cause the need for research, by mitigating causes and proposing methods that minimize the effect of specific cause of delay. Stakeholders will be aware of the many different factors that can cause delay of projects. This study will also come up with a different contextual list of delay causes that can be used as a benchmark to control and monitor existing and future projects. The recommendations given if considered are to benefit the stakeholders to prevent loss of economic resources due to project delays.

Recommendations for improvement or elimination of specific causes of delay may then be made within the construction industry, based on the outcome of this research. The research will also serve as a support for what has been researched in the past by other scholars about the subject matter. It will also provide some information to researchers who wish to study more about the problem of project delays, the effects and mitigation measures.

1.6. Research Scope

The scope of this specific research is guided and limited to causes, effects and mitigation measures of the subject matter which is project delay. It is qualitative and qualitative research which aims to understand different causes, effects and mitigation measures for project delays on grade one contractors in Addis Ababa. Since there are many projects owned by grade one contractors in Ethiopia, research will focus on grade one contractors who have projects in Addis Ababa. Other regional projects are excluded to define the scope in Addis Ababa. Questioners will be specified on causes and effects for project delay.

The research for this thesis will be conducted exclusively in Addis Ababa, and will address only the survey parameters as limited by the responses submitted by respondents, who are contractors, clients, and consultants involved with grade one contractors in the Ethiopian construction industry.

1.7. Limitations of the Study

The major limitations of this study are lack of timely response of some of the respondents for the distributed questionnaires. Respondents take longer period of time to fill questionnaires and some filling inadequately. And also time limitation of research duration has impacts on the research.

1.8. Organization of the Study

This study consists of five well-defined chapters. Chapter one is introduction with the background, statement of the problem, general and specific research objective, significance of the study and scope and limitation of the research. Chapter two focuses on related literature review with the topic, differences and similarities as well as arguments of different writers regarding, their definition, types of delay, the causes, the effect of and mitigation methods of project delay. Third chapter presents methodologies used in conducting the study and description of the study area, research design, data sources, target populations, data collection instruments, data collection procedures, methods of data analysis and validity & reliability of the instrument. Chapter four includes the result and discussion of the study, data collected and analyzed using the data analysis tools. Finally, the last and fifth chapter shows the summary, conclusion and recommendation.

CHAPTER TWO

LITERATURE REVIEW

Introduction

In this section of the thesis, theoretical approaches to examining the definition, cause and effect of delays in construction projects will be viewed. This investigation is important so as to provide a significant part of the input for the factors to be considered for the research on the subject matter. Furthermore, this chapter discusses studies on the causes, effects, and mitigation methods for construction project delays in Ethiopia and other countries, as well as their experiences. This study is expected to fill the literature gap since a little has been done previously.

2.1. Theoretical Literature Review

A project is a group of tasks or activities, performed in a determined time period, so as to meet a specific set of objectives. The definable schedule of projects indicates a determined start and end. The end is reached when the project objectives have been reached or when the project is terminated because its objective will not or cannot be met, according to (Harvey A. Levine, 2002).

Projects are referred to be successful when they are completed within the scheduled time, without exceeding the allotted budget, and according to the specified quality and standards. As a result, proper project management practices such as proper planning of each and every element of a project, proper implementations including controlling, and proper project close-up increase project success in terms of the three basic principal requirements listed above. Any alteration in terms of the planned time, scope and cost will lead to debate that the project is not successful or failed to meet its requirements. (James P. Lewis, 1995).

The construction industry is a very essential and fundamental sector for the development and economic growth of a nation's economy. For this reason, successful completion of construction projects enhances the economic condition of a nation in terms of socio-economic growth and improves standards of living. Delays

in construction has significant impacts on the economic status of a nation (Assaf & Al-Hajji S, 2006). The social and economic costs of delay can be surprisingly high and, to some extent, cannot be compromised by the industry itself. When all delays cannot be absorbed by the owner/client, whether the government or private owners, the project will be abandoned. As a result, it is fundamental to predict and identify problems in the primal stages of construction and analyze the basic/core causes of delay and apply the most effective and efficient solutions to prevent further negative impacts of delay (Pickavance.K 2006).

2.1.1. Definition of Delay

Different researchers define delay in different ways. According to (Abd Majid 1997), delays are defined as the time overrun beyond the date of contract or when the date that activities on the critical path have been delayed. Construction delay has been defined as happening of takes late from the planned schedule on the contract document (Pickavance K. 2006). Additional days of work added to the contract periods required due to the incomplete works is also defined as delay by (Talukhaba, A. A. 1999).

According to (Abbas 2006), the delivery of works as compared to the planned schedule or contract schedule is what is referred to as delay. A Delay occurs when the progress of a contract lags behind its scheduled program signed by contracting parties. It may be caused by any contracting party and may be a direct result not only one but of one or more circumstances. (A. Dinakar, 2014), defines delay as it is the slowing down of activities without stopping construction entirely and that can lead to time overrun on the far side of the date that the parties have agreed upon for project delivery. (Worku and Jha 2019) also described delay as slowing down of a work without stopping it completely. Construction projects are scheduled according to a time frame based on the size of the project. The time limit will be mentioned in contract documents signed by contracting parties. A delay can be defined as the time that elapses after the delivery date specified in the contract (Divya & Ramya 2015).

(Majid 2006) explains delay as a loss of time while 'Time' relates to the period of time for finishing the construction project. When projects are delayed, that means that it is extended to other time frames that are different from the original or the

planned at the beginning of the project. (Lo, Fung, and Tung 2006) define delay as a slowing of work but not a complete stoppage of construction, which can result in time overruns either above or below budget.

A contract delay has adverse are only a few days behind schedule, but unfortunately, some are delayed over a year. Construction project delays and additional costs are unavoidable consequence and effects on both the client and contractor and it often raises the disputatious issue of who to hold for delay responsibility, which may result in conflicts that in no time reach the courts.

2.1.2. Types of Delay

According to (Braithwaite, 2016), late completion of any project is not only caused by a single contracting party but in general caused by the actions or interactions of the project parties, including the contractors, consultants, owners, or others (e.g. force majors or acts of God). Accordingly, sources and the contractual risk allocation for delay-causing events, have been categorized into four categories as follows;

- Critical or Non-Critical.
- Excusable or Non-Excusable,
- Compensable or Non-Compensable
- Concurrent or Non-Concurrent.

2.1.3 Critical or Non-Critical Delays

Delays that are a consequence of extended project completion times are known as critical delays, while delays that don't cause elongation of project completion time are known as non-critical delays. The general concept of critical and non-critical delays comes from the critical path method of scheduling. In spite of the type of schedule projects apply, all projects have critical activities that are set as a milestone for the specific project. If these critical activities are delayed, the milestone date or project completion date will be delayed. Sometimes, the term controlling item of work is used in contract documents referring to critical activities. And it refers to critical activities or critical paths that if delayed will cause delay in the completion

date as a whole. Non-critical delays are delays that are not included in the critical path which do not delay ultimate project delivery (Trauner & Theodore, 2009).

2.1.4 Excusable or Non-Excusable Delays

All delays are either excusable or non-excusable. Generally, an excusable delay that results from an unforeseeable circumstance beyond either the contractor's or the subcontractors' control. Delays considered excusable according to general provisions in public agency specifications are general labor strikes, fires, floods, owner-direct changes, errors and omissions in the plans and specifications, differing site conditions or unforeseeable conditions, severe weather, intervention by outside agencies and lack of action by government bodies, such as building inspection (Ahmed 2017). In spite of the above conditions which are excusable, decisions concerning delay must be made in accordance with the context of the specific contract of the specific project. The contract document should clarify the conditions that are to be considered as valid delays to the specific project and that justify time extensions to the contract completion date (Trauner & Theodore, 2009). Non-excusable delays are when delays result from the contractor's control or that are foreseeable/predictable. Late performance of subcontractors, untimely performance by suppliers, and faulty workmanship by the contractor or subcontractors and labor strike are some of the delays causing events that are considered non-excusable.

2.1.5 Compensable and Non-Compensable Delays

A compensable delay is one in which a contractor receives financial compensation from the owner for the event that causes the delay. In relation to the excusable and non-excusable delays, only excusable delays can be compensable. As an example of this type of delay would be the delayed submission of technical drawings from the client's architect in which the blame is on the architect not the contractor. An excusable, compensable delay mostly leads to a time extension and leaves the owner with financial disadvantages due to claim from the contractor (Soon, 2010).

Non-compensable delays are caused by third parties or events beyond the control of either the client or the contractor, as well as when either the client or the contractor

is at fault. In this case, even if the delay is excusable, the contractor will not get any compensation for the delay from the client. To reduce ambiguous claims from contracting parties, it is always recommended to have a clear ground on the contract document that defines each element of delay (Fugar *et. el* 2010).

2.1.6. Concurrent and Non-Concurrent Delays

Concurrent delays come when there are two or more separate and independent delays happening at the same time period (Kane et al 2008). It happens when both parties to the construction contract delay the project during an excusable but non compensable delay. Concurrent delays may occasionally be an excusable delay with compensation, which may have some benefits for the contractor in terms of time extension, remission of liquidated damages, and potential delay of damages subject to the terms of the contractual agreement.

2.2. Empirical Literature Review

2.2.1. Causes of Delays

Delays in construction projects can be caused by different factors. These factors are either internal or external based on the delay causing agent. Internal delays are those caused by a consultant/designer, owner, consultant, or contractor, whereas external delays are those caused by the government, suppliers, subcontractors, nature, and so on. The study (Dinakar 2014) on construction project delay categorizes causes of delay as client caused, contractor caused, consultant caused, labor caused, material caused, equipment caused and external factors. Specifically, lack of healthy communication between parties directly involved in the project is the cause of most delays, the study finalized. Delays caused by the contractor were found to be higher than delays caused by the client and consultant. External factors contribute less to delays relative to delays caused by contractors, clients and consultants.

According to (J.J. Shi, *et el*, 2001), the top five ranking delay causing factors were identified as: payment delays by clients, slow decision making and bureaucracy in the client's organization, inadequate planning, project scheduling, and delays caused by rain. (Abdul-Rahman, H., 2006) conducted a study on the causes of delay that

shows the major cause of delay in Malaysia to be difficulties in obtaining permits, cash flow problem/financial deficit and list bidder bid award system. According to a Hong Kong-based study, the construction industry is experiencing delays due to the project team's slow decision-making process, unanticipated site conditions, client problems, and poor site management. (Chan and Kumaraswamy 1997). In large projects, the major causes of project delay are financial problems, poor site management and lack of resources, according to (Assaf & Al-hejii 2006). The study classified the causes of delay as owner caused, consultant caused and contractor caused. The researchers summarize that change order by all parties of the project is the major cause of time overrun that leads to project delay.

In Indonesia, causes of project delay are associated with the owner of the project, main contractor and consultants of the project (Wateno 2015). As a result, slow decision making, a lack of coordination, ineffective meetings, bulk policies and procedures, unnecessary intervention, and delays for no apparent reason have been identified as the root causes of construction project delays in Indonesia. (Mansfield *et al* 1994), research in Nigeria indicates the cause of delay as variation in cost of resources/materials, improper financial and payment arrangements, unorganized contract management and insufficiency of materials. Furthermore, a Florida study found that the most common causes of delay are building permit approval, specification changes, incomplete drawings, and change orders (Ahmed *et al.* 2002).

According to a study conducted in Kuwait by (Koushki, *et al.* 2005), change orders, employers' financial issues, and contractor-related difficulties are found to cause delays and cost overruns. (C. Semple, *et al.* 1994) from Canada conducted a study that concluded that a lack of a scope of work and unusual weather conditions were major causes of project delays in public construction projects. According to (Yahya, *et al.* 2013), the causes of delays in Pakistan are classified and assigned a percentage: contractor (48.75%), consultant (17.5%), owner (16.25%), government (8.75%), and shared (8.75%). The study identified the causes of delays in Pakistan's construction industry to be unproductive labor, poor cost estimation, poor site management, lack of supervision and audit, insufficient project scheduling, faulty design, poor construction methodology, unfinished drawings and untimely payments as the causes for delayed projects. The study of (Haseeb, *et al.* 2011) that was conducted in

Pakistan indicates changes in design/faulty designs, poor communication and unbound involvement problems among the contracting parties and scarcity of materials as delay causing factors.

(Owolabi *et al.* 2014) conducted a study to identify causes and effects of delay in Nigeria. As a result, shortage of budget to finance project completion, modification in drawings, poor and ineffective communication among project parties, inadequate information from consultants, long process of decision making and contractors' financial condition are found to be major causes of delay in Nigeria. According to the study, project management issues, faulty contract documents, equipment failure, technical mistakes during construction, unfavorable weather conditions, fluctuating resource prices, improper organizational hierarchy, and labor problems were also causes of delay in the Nigerian construction industry.

(Koushki, *et al.* 2005), carried out a study on the causes of delay in Kuwait. Causes of delay were categorized into 11 groups of delay. Results indicate that major causes of delay were legal problems, poor details on the drawings and slow decision making of owners. The research concluded that these causes of delay appear to be at the beginning of the project and can be minimized and save the project from the effects of delay. (Roger Gibson, 2008) made a survey on the causes and effects of delays in public construction in Jordan. 55 delay causing factors were identified and grouped in to four categories as client causing, contractor causing, consultant causing and external factors. The researchers conclude that there is a lack of good management by the contractor, frequent client changes of mind on the design, insufficient planning and follow up by the contractor, using the least bidder technique to choose contractors, which results in low execution, changes in scope, errors in design and faults in contract documents, late payments by the client, rework due to defect during construction, and modification. Another study on public projects in Jordan by (Ashraf & Ghanim 2016) indicates inadequate planning, financial issues, delayed payments, lack of contractor experience, poor labor effectiveness, long process of decision making and problems associated with sub-contractor are found to be critical causes of project delay. The study conducted in Ethiopia by (Abdo 2006) on public building construction shows that 94% of the 52 surveyed public building projects have experienced delays. And also, time extension

was found to be an average of 89.9%. These numbers show that project delay is a critical issue which needs attention.

In addition, the study of (Abdo 2006) concluded that inadequate planning, overly ambitious time schedule, late payment to contractors, shortage and delayed material supply, unknown underground conditions, changed order and increasing prices of resources are causing delays in public building construction in Ethiopia. The findings of (Tsegay *et al.* 2017) indicate that poor project planning, ambitious scheduling, slow delivery of resources, corruption, shortage of site utilities, price increase of materials, delayed and inadequate design and late budget are mentioned as major causes of delay in Ethiopian construction projects. A study conducted by (Robel 2015) states that financial difficulties, limited capacity of local contractors and management issues are major causes of delay. Furthermore, slow material delivery, poor supervision, weak decision making by consultants, lack of coordination of clients, poor site organization and late payment approval are mentioned by the researcher as reasons for delays occurring in Ethiopia.

The (Worku *et al.* 2019) study shows 91.75% of projects are delayed with the remaining only 8.25% of projects are finished according to the targeted schedule in Ethiopia. This indicates the problem of project delays in Ethiopia is critical. The study also identified the most frequent causes of project delays in Ethiopia. As a result, insufficient project planning, financial problems of the contractor, poor schedule and material management on project site, payment delays on finalized works, lack of skillful professionals both at the office and project, price escalation on resources and labor problems are identified as prior causes of delay in Ethiopia. (Sambasiva *et al.* 2007) conducted a study in Malaysia on the causes and effects of project delays in the construction industry, identifying 28 critical delay causing factors organized into eight aggregation causes.

2.2.2 Effects of Delays

The effects of delay are consequences that follow the causes of delay. Delayed projects experience the impacts of changes that are affecting the project in different ways. Research on various impacts delay has in different countries by different scholars is revised as follows. The study of (Kikwasi, G.J 2012) also summarizes

that delays in construction projects followed by time overrun, conflict caused by misunderstanding and projects going beyond funding. According to (Li and Dawe 2000), project managers face additional costs, poor quality of work and rework when project delays occur.

A study by (Pickavance, K. 2005) reveals six effects of delay on project delivery in the Nigerian construction industry which are: time overrun, cost overrun, dispute, arbitration, total abandonment and litigation. A research conducted in Nigeria on the effects of delay discovered that budget overrun, time overrun, disagreement, law suit and finally project cancellation are the impacts of project delay. (Aibinu & Jagboro 2002). A study carried out by (Sambasivan & Soon 2007), identified and summarized the effects of construction delays in the construction industry as dispute, total abandonment, arbitration, time overrun, cost overrun and litigation. In their study on the causes, effects, and minimization of delays in construction projects, (Divya et al 2015) concluded that time overrun and cost overrun are the most common effects of delay. Loss of productiveness, late finalization of project, time related cost, claims, and project termination are the major effects of project delay according to (Abdul-Rahman et al. 2010).

2.2.3. Methods of Minimizing Project Delays

Projects are defined as successful when they are completed on time, on budget, within scope, and to the specified quality. The success of a project is important for all stakeholders. Construction projects involve many stakeholders. Construction projects are planned not only for specified stakeholders but also to contribute to the community and sustainable development of a nation. Project delay is becoming a critical barrier to project success which needs to be mitigated. Mitigation methods could be different as the causes and effects are different as a result of the unique characteristics of construction projects.

(Assaf *et al.* 2006), suggested improving the situation of construction project delays by timely payment and incentives for early compilation, sufficient training of human resources and awarding contractors with adequate capacity than least bidder technique. A study from Nigeria on the effects of delay recommended that

acceleration of project activities and back up allowances will minimize the effects of delay in construction projects (Aibinu and Jagboro 2002).

A study conducted by (Crawford 2003) recommended that adequate planning, assurance of adequate funds, ensure sufficient time, money and attention is given at the design stage, rewarding reliable consultants and contractors, recruit professionals with proper and sufficient skill and assure timely delivery of materials as mitigation measures to minimize time delay and cost overrun. A research in Jordan by (Odeh *et al.* 2002) concluded that rewarding timely completion of tasks, offering different training for project participants, following better approaches on the type of contract and enforcing liquidated damage clause are methods that assist in minimizing project delay and consequences followed. Methods of minimizing construction delays are as follows according to (Lo, *et al.* 2006): -

- Accurate cost estimation at the planning stage
- Accurate time estimation at the planning phase
- Effective strategic planning
- Capable project manager
- Multidisciplinary, effective and efficient, competent project team
- Convenience and acceptability of construction materials
- Commitment to projects
- Regular progress meeting
- Awarding bids to the qualified and experienced consultant and contractor
- Proper emphasis on past experience; community involvement
- Systematic follow up mechanism
- Strong flow of information and smooth communication channels;
- Utilize up to date technology
- Absence of bureaucracy.

(Chan and Kumarasamy 1997) recommended that the minimization of time overrun would need organized and professional management teams, detailed and extensive investigation of site conditions and developing a strong communication web with a healthy hierarchy. Effective and to-the-point planning and scheduling, use of up-to-date technology, precise cost estimation while planning, proper material procurement, proper emphasis on selecting experienced contractors and consultants,

adequate site management and supervision, complete and proper design and specification of projects are stated as methods of minimizing construction project delays. According to (Odeh *et al.* 2002), proper application and enforcement of liquidated damage clauses and offering complimenting incentives for timely completion of tasks or milestones are mentioned as delay mitigation methods



2.3. Synthesis

From literature review, it was found that several studies conducted in different countries to identify the delay factors. The following is a summarized literature review.

Table 2.1 Summary of delay factors

No	Source	Causes of delay
1	Indonesia (Kaming et al., 1997)	<ol style="list-style-type: none"> 1. Design changes 2. Poor labor Productivity 3. Inadequate planning 4. Location restriction of the project 5. Skilled labor shortage 6. Equipment shortage 7. Materials shortage 8. Inaccurate prediction of equipment production rate 9. Inaccurate prediction of craftsmen production rate 10. Inaccuracy of materials estimate
2	Saudi Arabia (Sadi & Al-Hejji 2006)	<ol style="list-style-type: none"> 1. Change orders by the owner during construction 2. Delays in progress payments 3. Ineffective planning and scheduling by the contractor 4. Poor site management and supervision by the contractor 5. Shortage of manpower 6. Difficulties in financing by the contractor 7. Changes in government regulations 8. Traffic control and restrictions at site 9. Effect of social and cultural factors 10. Accidents during construction
3	Hong Kong Chan & (Kumaraswamy 1994)	<ol style="list-style-type: none"> 1. Poor site management 2. Unforeseen ground conditions 3. Delays in design information 4. Lack of communication between consultant and contractor 5. Inadequate contractor experience 6. Low speed of decision making involving all project teams

		<ul style="list-style-type: none"> 7. Client oriented Variations 8. Necessary variations of works 9. Delays in subcontractor s“ Work 10. Improper control over site resource allocation
4	Kuwait (Aibinu & Jagboro 2002)	<ul style="list-style-type: none"> 1. Change orders 2. Financial constraints 3. Lack of experience in construction 4. Contractor and material Problems
5	Jordanian (Odeh & Battaineh 2002)	<ul style="list-style-type: none"> 1, Financial difficulties faced by contractors. 2. Change orders from the owner. 3. Poor planning and scheduling of the project by the contractor. 4. External factors.
6	Nigeria (Aibinu & Jagboro 2002)	<ul style="list-style-type: none"> 1. Contractors“ difficulties in receiving interim payments from public agencies 2. Contractors“ financial difficulties 3. Inadequate public agencies“ budgets 4. Deficiencies in contractors“ organizations 5. Deficiencies in planning and scheduling 6. Frequent variation/changed orders 7. Difficulties in obtaining construction materials 8. Deficiencies in public agencies“
7	Thailand (Ogunlana et al., 1996)	<ul style="list-style-type: none"> 1. Materials procurement 2. Waiting for information 3. Poor contractor management 4. Laborers shortage 5. Waiting for information 6. Design delays 7. Planning and scheduling deficiencies 8. Construction plant shortages 9. Changed orders 10. Contract

2.4. Conceptual Framework

According to (C.R. Kothari 2008), conceptual frameworks are organized from groups of broad ideas and theories that help to properly identify the problem they are analyzing findings from reviewed literature. A Conceptual framework for the researcher, clarifies the research questions and aim. Furthermore, it demonstrates different variables, both dependent and independent, by establishing a link between the causes of delays and project delay.

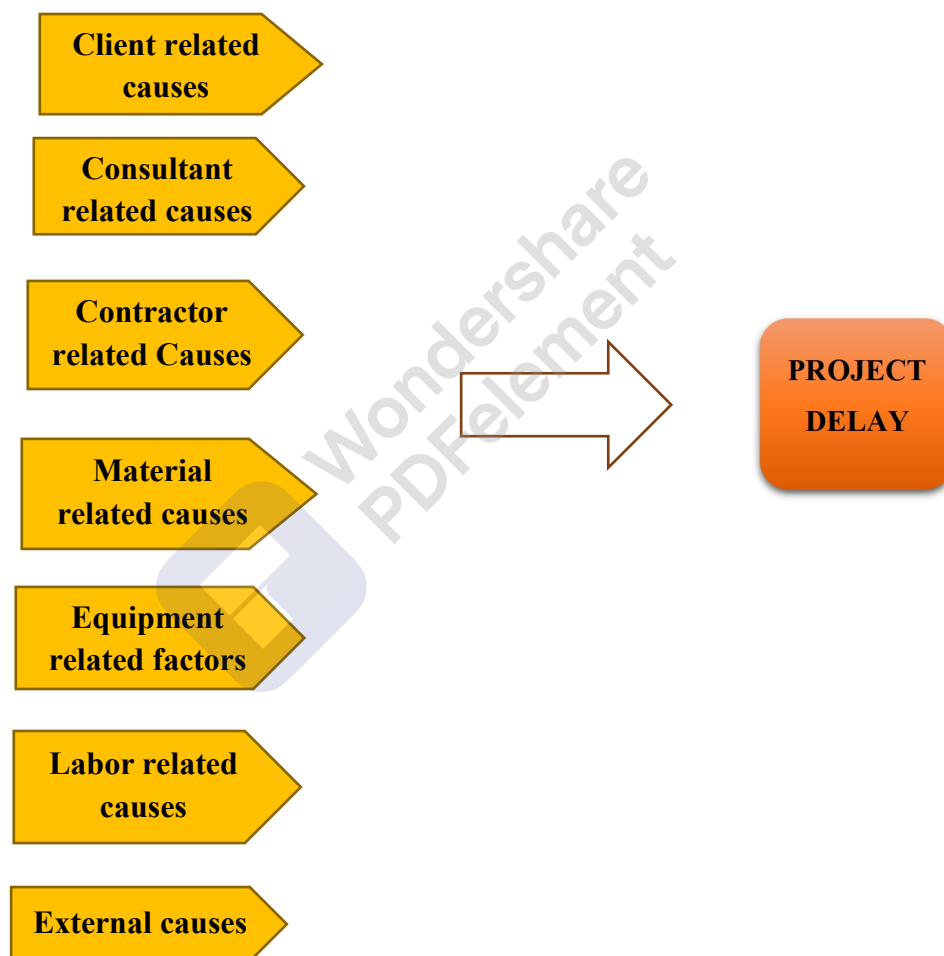


Figure 2.1: Conceptual framework

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

According to (Kothari *et al.* 2004), research methodology is a way of systematically solving a research problem. Methodology of the study will include research design and approach, population and sampling techniques, source of data, collection techniques and data analysis method that will be used to conduct the study.

3.1 Research Design and Approach

Research design is defined as a preparation on collecting and analyzing data in a manner that aims to combine relevance to the research purpose and meet the objective (Babbie, 2007). This research had an intention to identify most important causes of project delay in grade one contractors in Addis Ababa. For the objective of the study, descriptive survey design was adopted with a view to come up with descriptions regarding the causes of project delay. Descriptive research answers the “what” questions in statistical form. A descriptive study attempts to describe a subject, often by creating a profile of a group of problem, people or events, through collections of data and the tabulation of frequencies on research valuables and the research reveals who, what, when, where or how much (Serakan, 2010).

The research has adopted quantitative method to collect all relevant data using questioner survey. For this purpose, a questionnaire was developed to assess the perceptions of clients, contractors and consultants on the relative importance of causes of delays in construction projects owned by grade one contractors in Addis Ababa. Quantitative data were obtained through questionnaire. The data collected through these methods will be analyzed and the results will be presented. Qualitative data was collected through interview on mitigation measures of project delay to provide ways of minimizing project delay in construction projects.

3.2. Population of the Study

By definition, population is a set of elements, services, people, groups, or things that are well characterized and being examined in the study. There should exist a clear characteristic in the population which the researchers will summarize the result on (Mbachu, 2004). On this specific study the researcher focus on grade one contractors which have projects in Addis Ababa. There are one hundred and thirty-three level one contractors in Ethiopia. Only one hundred and nineteen are registered being in Addis Ababa. Contractors who are in Addis Ababa but not having ongoing project are excluded due to the need of recent and contemporary data. Thus the target population are those currently having ongoing projects in Addis Ababa.

3.2.1. Sampling Techniques and Procedures

Stratified random sampling procedure were used for the research. Stratification was based on longer period of experience and having ongoing projects on hand of the contractor. This technique will insure the homogeneity of the sample. Then simple random sampling is applied to select contractors. Core construction project stakeholders, which are client, consultant and contractor are included in the survey.

3.2.2. Method of Sample Size Determination

To determine the appropriate sample size, this study uses Yamane's (1967) simplified formula, giving level of confidence of 95% and a margin of error of 7% of the population. Seventy contractors who have projects in Addis Ababa are targets of the study. By using formula, it can be stated as:

$$n = \frac{N}{1 + N(e)^2}$$

where, n is the desired sample size, N is the population size and e is the level of precision

Therefore,

$$n = \frac{225}{1 + 25(0.07)^2}$$

$$n = \frac{225}{2.10}$$

$$n = 107.8$$

$$n = \sim 108$$

Table 3.1. list of Sample Population Included in the Research

Stakeholders	Number of respondents from group of stakeholders
Contractor	36
Client	36
Consultant	36

3.3. Methods of Data Collection

Primary data were collected through structured questioner survey and structured one to one interview. Questioners were distributed for targeted respondents to identify causes of construction project delay. Open-ended questions were used for triangulation purposes. Interview questions were used for fifteen respondents on mitigation measures of project delay.

3.3.1. Questionnaires Design

A questionnaire survey was conducted with stakeholders on the basis of literature review of selected causes of project delay. Questionnaires were used because of their convenience and time effectiveness. The questionnaire was prepared in clear and simple grammar to be understood by stakeholders so that it is easy to read and responses are easy to fill in. Closed ended questions were selected because it is easier to assess and help them answer considering how busy the respondents can be. Besides, open-ended questions were used for triangulation purposes. The questionnaires are all classified into two parts as follows. The first part of the questioner the researcher includes questions about background information about the respondents. The second part includes thirty-nine causes of delay grouped in to five major delay causing agents which are structured in table form in the questionnaire. The questionnaire based on Likert scale of five ordinal measure from one (1) to five (5) according to level of significance. Each scale represents the following rating;

- Five (5) = Strongly agree
- Four (4) = Agree

- Three (3) = Neutral
- Two (2) = Disagree
- One (1) = Strongly disagree

3.3.2. Interview

A one to one structured interview was conducted between researcher and participants on mitigation methods of project delay. The respondents of interview were from major contracting parties from consultant (5 respondents), contractor (8 respondents) and client (2 respondents) who participated at different responsibility levels in the construction of projects. Interview participants were drawn from those who filled the questionnaire. Interview questions were focused on mitigation measures that should be implemented to minimize effects of construction project delay.

3.4. Methods of Data Analysis

This data analysis was determined by SPSS and interpreted by establishing mean and relative importance of the various factors that causes of project delays. Qualitative data is analyzed using framework analysis by conceptualizing, coding and categorizing.

Two steps will be followed to analyze the data

- 1) Calculating the Relative Importance index (RII),
- 2) Ranking of factors in each category based on the Relative Importance Index (RII).

Relative Importance Index

Relative importance index was used to rank the results of data analysis (Odeh and Battaineh 2002). The five-point ordinal scale is used and transformed to relative importance index (RII) for each factor selected from the literature review for analysis purposes.

Thus,

$$RII = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{A * N}$$

$$A * N$$

Where,

RII = Relative Importance Index,

n_1, n_2, n_3, n_4, n_5 = Number of respondents answer each factor

1, 2, 3, 4, 5 = Weight given for each factor,

A = Highest weight,

N = Total number of respondents

3.5. Validity and Reliability of the Instrument

The researcher uses simple terms to minimize the possibility of the respondents not understanding the terminology and layout of the questions. To establish the validity of the questioner, the research instruments was given to respondents for pilot study. The research questionnaire adequately addresses prospects of the issues under study. A reliability test was conducted to measure the consistency of the data collection instrument. Cronbach's alpha value ranging from 0 to 1 according to the correlation between the item and a value above 0.7 are considered acceptable in most social studies (Keith Tabler 2017).

Table 3.2 Reliability statistics for group of factors

Groups of variables	Cronbach's Alpha
Client causing	0.784
Contractor causing	0.906
Consultant causing	0.853
Material causing	0.823
Labor causing	0.915
Equipment causing	0.958
External causes	0.876

3.6. Research Ethics

This research observed to the ethical standards in accordance to voluntary nature of participation and the right to withdraw by individual respondents from the process. The research has maintained the confidentiality of data provided by individuals or identifiable participants. Data collected and information was consumed for only the purpose of this academic work.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND PRESENTATION

Introduction

This chapter presents data analysis results and discussions based on the questionnaire survey made on the causes of construction project delays.

A total of one hundred eight survey questionnaire were distributed to the sample respondents in order to identify the most important construction project delay causing factors. The survey questionnaires were distributed to clients, the consultants'/ site supervisors and contractors'/project managers, site engineers who take part in the project implementation of those projects undertaken by sample grade one contractors in Addis Ababa.

Table 4.1: number of questionnaire distributed and responded

Respondent group	Questionnaire distributed	Number of questionnaires collected or returned	Percentage of number of responses
Client	36	20	55.5 %
Consultant	36	29	80.5 %
Contractor	36	33	91.7 %
Total	108	82	75.9 %

A total of one hundred eight survey questionnaire were distributed and eighty-two were responded and used for the data analysis. 75.9 % of the questioners were collected which are 55.5 % of client, 80.5 % of consultant and 91.7 % of contractor. Out of 108 questionnaires, 26 questionnaires are not filled and filled incompletely. From the eighty-two respondents 24% are client, 35% are consultant and 41% are contractor.

4.1. Demographic Characteristics of Respondents

Demographic characteristics of the respondents in this research are characterized and characterized causing project stakeholder type, educational level, working positions on the project and level of experience at the current projects.

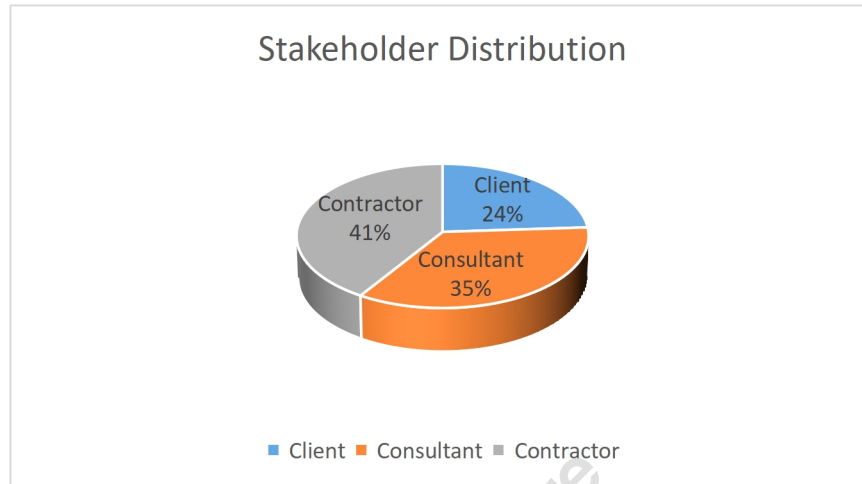


Figure 4.1: Stakeholder distribution of respondents

Table 4.2 Demographic data

Education level	Number of respondents	Percentage of number of respondents
Diploma	0	0 %
BSc	59	72 %
MSc	23	28 %
PHD	0	0%
Total	82	100%
Working positions	Number of respondents	Percentage of number of respondents
Project manager	16	19.5%
Site engineer	17	20.5%
Site supervisor	29	35%
Client representative	20	25%
Total	82	100%
Years of experience	Number of respondents	Percentage of number of respondents

0-3 years	11	14 %
4-7 years	42	51 %
8-10 years	12	14 %
>10 years	17	20 %
Total	82	100 %

According to the objective of the study delay causing factors of project delay are identified from literature review for survey questioner. Relative Importance Index (RII) from the viewpoint of stakeholders are analyzed and ranked.

4.2. Correlates of project delay

The following is a brief description of the results from data analysis on these factors in each group. The most preferred causes of delay are chosen when the RII result is between **0.8** and **1**.

Table 4.3: Results of client related delay factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Insufficient funding/ financial constraints	0.6	7	0.71	4	0.86	2	0.76	3.78	5
Award project to lowest bid price	0.86	1	0.8	1	0.76	5	0.80	3.99	2
Unrealistic contract duration	0.7	4	0.7	5	0.75	6	0.72	3.59	6
Slowness in decision making process by the owner	0.74	3	0.77	2	0.83	3	0.79	3.94	3
Progress payment delay by owners	0.67	5	0.77	2	0.93	1	0.81	4.04	1
Interference of owner	0.65	6	0.68	6	0.75	6	0.70	3.51	7
Change orders by owner during construction	0.77	2	0.76	3	0.78	4	0.77	3.85	4

From the table above it is observed “progress payment delay by owner” is the most important factor that contributing to project delay with a relative importance index value of (RII=0.81) based on the results. “Award project to the lowest bid price “by the owner ranked second with the relative importance index value of (RII=0.80) by

all three parties. “Slowness in decision making process by the owner” with the relative importance index value of (RII=0.79) ranked third from client causing project delay factors.

Table 4.4: Results of contractor related delay factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Inadequate planning and scheduling	0.82	1	0.81	1	0.84	1	0.82	4.12	1
Inadequate contractor experience	0.61	8	0.75	2	0.76	3	0.72	3.60	4
Poor communication	0.69	4	0.73	3	0.75		0.73	3.65	3
Poor site management and supervision	0.78	2	0.72	4	0.78	2	0.76	3.79	2
Frequent change of sub-contractors	0.7	3	0.69	6	0.72	4	0.70	3.51	6
Incompetent project team	0.66	5	0.73	3	0.72	4	0.71	3.55	5
Inappropriate technical methodology	0.65	6	0.70	5	0.76	3	0.71	3.57	5
Faulty work needing rework	0.63	7	0.61	7	0.71	5	0.65	3.27	7

From the above table it is observed that “inadequate planning and scheduling” is the most important delay causing factor that contribute for project delay caused by contractor with the relative importance index value of (RII=0.82). “Poor site management and supervision” ranked second with the relative importance index value of (RII=0.76). With the relative importance index value of (RII=0.73), “Poor communication” ranked third from contractor causing delay factors.

Table 4.5: Results of consultant related delay factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Poor contract management	0.65	5	0.66	4	0.74	6	0.69	3.44	5
Inadequate experience of consultant	0.72	4	0.61	5	0.77	4	0.70	3.51	4
Insufficient data collection and survey before design	0.8	3	0.72	1	0.81	3	0.77	3.87	3
Late preparation and	0.82	2	0.66	4	0.85	1	0.78	3.88	2

delivery of drawings									
Poor qualification of consultant engineer's staff	0.72	4	0.60	6	0.76	5	0.69	3.46	5
Inadequate design specifications	0.72	4	0.68	3	0.72	7	0.70	3.52	4
Longer waiting period for approval and supervision	0.86	1	0.69	2	0.85	2	0.80	3.99	1

From the table above it is observed that “Longer waiting period for approval and supervision” is the most important delay causing factor that are caused by consultants with the relative importance index value of (RII=0.80). “Late preparation and delivery of drawings” rank second from consultant causing delay factors with the relative importance index value of (RII=0.78) according to the three parties. With the relative importance index value of (RII=0.77), “Insufficient data collection and survey before design” ranks second of delay causing factors due to consultants.

Table 4.6: Results of material related delay causing factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Shortage of material in the market	0.85	1	0.83	1	0.90	1	0.86	4.30	1
Low quality materials	0.62	5	0.66	3	0.75	4	0.71	3.35	4
Changes in materials specifications during construction	0.68	4	0.55	4	0.71	5	0.65	3.23	5
Delay in materials delivery	0.81	2	0.77	2	0.84	3	0.81	4.04	3
Rises in the price of materials	0.8	3	0.83	1	0.87	2	0.84	4.21	2

From the table above it is observed that “Shortage of material in the market” ranks first as most important delay causing factor with the relative importance index value of (RII=0.86). “Rises in the price of materials/ price escalation” ranks second with the relative importance index value of (RII=0.84). “Delay in materials delivery”

ranked third from material causing delay factors with the relative importance index value of (RII=0.81).

Table 4.7: Results on labor related delay factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Seasonal labor access fluctuation	0.73	1	0.63	3	0.76	2	0.70	3.52	3
Lower labor productivity	0.68	2	0.70	1	0.75	3	0.71	3.57	2
Shortage of skilled labor	0.66	3	0.69	2	0.78	1	0.72	3.60	1

From the table above it is observed that “Shortage of skilled labor” ranks first with the relative importance index value of (RII=0.72). With the relative importance index value of (RII=0.71), “Lower labor productivity “ranked second from delay causing factors due to labor. “Seasonal labor access fluctuation (inadequate labor)” with the relative importance index value of (RII=0.70) ranks third.

Table 4.8. Results of equipment related delay causing factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Insufficient numbers of equipment	0.67	2	0.79	2	0.78	1	0.76	3.79	2
Frequent equipment breakdown	0.66	3	0.74	4	0.72	3	0.71	3.56	4
Low productivity and efficiency of equipment	0.67	2	0.75	3	0.75	2	0.73	3.65	3
Lack of high-technology mechanical equipment	0.72	1	0.81	1	0.75	2	0.77	3.87	1

From the above table it is observed that the most important delay causing factor from equipment causing factor be “Lack of high-technology mechanical equipment” with the relative importance index value of (RII=0.77). “Insufficient numbers of equipment ranks second with the relative importance index value of (RII=0.76) and “Low productivity and efficiency of equipment “ranks third with the relative importance index value of (RII=0.73) from delay causing factors due to equipment.

Table 4.9 Result on External delay related factors

Delay causing factor	Client		Consultant		Contractor		Total		
	RII	Rank	RII	Rank	RII	Rank	RII	Mean	Rank
Unfavorable weather condition	0.56	5	0.64	3	0.69	3	0.64	3.21	3
Change in policies and regulations	0.65	3	0.59	4	0.61	4	0.61	3.07	4
Delay in providing services from utilities	0.69	1	0.77	1	0.74	2	0.74	3.68	1
Political situation, conflict, war, and public enemy	0.62	4	0.64	3	0.79	1	0.72	3.49	2
Unforeseen site conditions	0.67	2	0.76	2	0.73	3	0.72	3.62	2

From the above table it is observed that “Delay in providing services from utilities (such as water, electricity)” ranks first from delay causing factors with the relative importance index value of (RII=0.74) based on the three parties of respondents. With the relative importance index value of (RII=0.72) “Political situation, conflict, war, and public enemy” and “Unforeseen site conditions” ranks second from delay caused by external factor based on the results of survey.

4.3. Discussion

The most important delay causing factors chosen based on the Relative Importance Index (RII) values from data analysis results. From thirty-nine delay causing factors six of the factors are chosen for discussion due to the RII results ranging between 0.8 and 1.

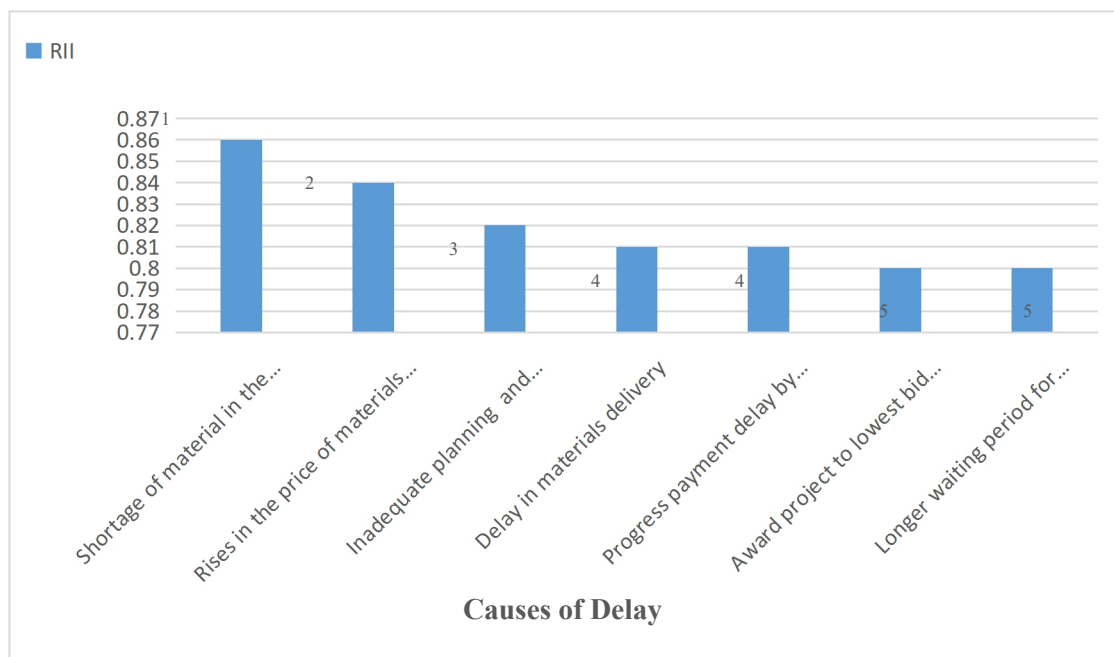


Figure 4.2: Most important delay causing factors

Shortage of material in the market (RII=0.86): Different materials are used in the construction industry based on the design. The study of (Odeh *et al* 2002), shows that unavailability of materials will increase additional expenditures with increase the cost of the construction project as a result.

Rises in the price of materials/ price escalation(RII=0.84): the increase in price of construction industry has been hectic for those parties involved in the industry. Thus it become one of the leading causes of delay. The study of (Koshe & Jha 2016) in Ethiopia shows the same result that price escalation of construction materials is one of the major delay causing factors.

Inadequate planning and scheduling(RII=0.82): Inadequate planning by the contractor is one of the critical delay causing factor. In the planning process the contractor should plan detailed plan of material utilization, manpower schedule, equipment utilization and appropriate technical methodology. Project integration is also one of the important project implementation supports which shall be included on the planning stage of project. Not having adequate project implementation plan causes rework, late delivery of material, inappropriate technical methodology, communication gap and weak synergy, which lead to time overrun, cost overrun and poor quality output.

The study conducted in Jordan on public sector projects by (Ashraf and Ghanim 2016) put inadequate planning and control by the contractor as one of the top ten

factors causing delays. (Sambasiva *et el* 2007) conducted a study in Malaysian construction industry identifying the causes and effects of the project delays and reported inadequate planning is one of the leading factors that cause project delays.

Delay in materials delivery (RII=0.81): late delivery of construction material is also one of the leading delay causing factor according to the respondents. Outsourcing different materials locally and abroad is causing delays. Different unfortunate events especially when the material is from abroad. The study of (Zinabu Tebeje 2016), identified delay causing factors and late delivery of material is one of top five delay causing factors.

Progress payment delay by owners (RII=0.81): clients fail to pay to the contractor for completed project activities. Since the contract document is the governing document, client has responsibilities to pay accordingly. Failing to pay for finalized tasks or milestones causes both time and cost overrun due to claims following issued payments. (Odeh *et el* 2002), in their study mention that delayed payments are one of the major project delay causes.

Award project to lowest bid price(RII=0.80): it is a common methodology of procurement uses that the bidder presenting least price will be awarded to take the project. Thus once the project began contractor will be trapped with shortage of finance to finalize the project. This leads to project delay due to conflicts between contacting parties and lowest quality output. (Samarah *et el* 2016) on the study in public construction in Jordan mention using lowest bid affects project performance and is one of the major delay causing factors.

Longer waiting period for approval and supervision(RII=0.8): in the construction consultants take part as a supervisor approving tasks before further implementation. Consultants take longer time to approve a job being implemented for further progress which resulted in delays.

Mitigation Methods

Mitigation methods for client related factors of delay: - Client should be financially prepared to finalize the project and reduce delayed payments for completed works by the contractor. Understanding details of the project assisted by the consultant help decide on the bidding choices made by the client On the planning stages of the project client as a major stakeholder should involve to reduce change orders during construction. (Assaf *et el* 2006), suggested awarding for a

capable bidder will improve the problem of project delay. Client should deliver material on site on a timely manner to decrease delay happening due to late delivery of resources.

Mitigation methods for contractor related factors of delay: - As the contractor is the stakeholder who is responsible of project implementation, it should adequate planning of project methodology, resources, manpower and equipment with skilled project manager who is responsible enough to manage the project appropriately. (Majid et el 2006), mentioned proper planning and scheduling of project will decrease the risk of project delay. Proactive project manager who can coordinate and manage project team and subcontractors is important in reducing project delay. Contractor also should use up to date technologies of project methodology.

Mitigation methods for consultant related factors: - Consultant in a construction is the bridge between client and contractor who is expected to play a great role on the project. As a representative of client, consultant should create a smooth communication between consultant and contractor to reduce communication gaps that lead to project delay. Involvement and participation of all contracting parties in the planning stage to have common understanding on the terms of the project as a whole. As (Majid et el 2006) also recommended coordination between contracting parties will improve the problem of project delay. Contract documents are also prepared and managed by the consultant. As a result, adequate preparation exercises of contract document reduce project delays associated with contract document like terms of payments and penalties. Emphasis shall be given on the planning stage of the project.

Consultants are responsible on making detailed planning of the project on the planning process. Adequate preliminary project site survey is fundamental to minimize unforeseen site conditions like unfavorable underground cases by reducing time and cost overrun. Emphasis shall be given on the planning stage of the project. Adequate survey of the actual site conditions in order to reduce unforeseen site conditions. (Chan et el 1997) recommended that the minimization of time overrun would need organized and professional management teams, detailed and extensive investigation of site conditions during project planning. Having change management plan will guide through the changes happen due to external factors. Detailed risk management plan shall be prepared to reduce delays due to different unforeseen conditions. Consultants are mostly responsible for design errors

that is one of the leading causes of delay. Taking enough time during design and planning of projects will reduce the effects of inadequate planning and change orders. Projects face change order for different reason like un integrated structural, electrical and sanitary drawings which also cause rework. Implementation of and use of modern technology like building information modeling (BIM) technique to have integrated project system. Proper monitoring and evaluation is one of the main delay mitigation methods recommended by the interviewee being the consultants responsibility. Consistent and routine site management and supervision by the consultant is suggested by (Long et el 2008). Consultant is responsible to create routine meetings to discuss on project matters to understand current situation and for cast and minimize future obstacles.

Mitigation methods for material related factors: -material causing delays found to be the leading causes of delay on this study. Shortages of material is caused by different suppliers on the market in addition to economic conditions of the country. Thus government involvement on policy formation and enforcement will improve the situation. Delays in delivery of material shall be minimized by strong logistics performance of whoever is responsible of material delivery. Routine and proactive supervision will minimize late delivery of materials by following up and updating material schedules.

Mitigation methods for labor related factors: -having a routine training for labor workers will increase the low productivity of labor.

Mitigation methods for equipment related factors: - financially capable contractors has adequate and appropriate equipment for the job. Having technologically advanced equipment will increase efficiency in terms of time, cost and quality. The use of updated technology during project implementation will enhance effectiveness in terms of time and quality (Majid et el 2006).

Mitigation methods for external related factors: - developing a risk management plan and having contingency plan will minimize the risk of unforeseen conditions.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Construction project delay become one of the critical problems that lead to time and cost overrun and extreme situations like total project abandonment. Thus, this research aimed to identify the most important delay causing factors of project delay on projects under level one contractors in Addis Ababa. Variables of the study are chosen from literature review of different studies on the subject matter both in Ethiopia and other countries. Descriptive research design is used on the causes of delay. Qualitative method is used in the study using questionnaire survey. Stratified random sampling was used based on longer experiences and having ongoing projects currently to choose sample respondents of the. In this study major groups of delay variables were identified for survey questioners to be distributed for respondents. A total of thirty-nine delay causing factors were prepared for investigation grouped in to seven major delay causing agents which are client, consultant, contractor, material, equipment, labor and external causing. Interview was conducted with fifteen respondents on mitigation methods of construction project delay. One hundred and eight questioners were distributed and eighty-two of them are returned, filled properly and used as input for data analysis. All three major stakeholders which are client, consultant and contractors are involved in the survey.

Findings on causes of project delay

In this study thirty-nine construction delay causing factors were chosen and grouped as client causing, consultant causing, contractor causing, material causing, equipment related, labor related and external causing for the survey. From the survey conducted on the study, the most important factors that contribute construction project delay are found to be shortage of material in the market, rises in the price of materials/ price escalation, inadequate planning and scheduling, delay in

materials delivery, progress payment delay by owners, longer waiting period for approval and supervision and award project to lowest bid price.

Findings of mitigation methods of project delay

An interview was conducted with fifteen respondents on mitigation methods of construction project delays in Addis Ababa. As a mitigation methods of project delay, adequate project detailed planning during the planning stage was raised as a major delay minimizing measure. By reducing unforeseen site conditions, minimizing change orders during project implementation and developing contingency plan, adequate planning of a project will minimize possible project delay. Project monitoring and evaluation is suggested to reduce project delay by on time problem solving, reducing changes, reducing risky situation, updating schedules, managing changes and smooth communication between parties.

5.2 Conclusion

Construction project delay become a critical problem leading to as many effects that impact the construction industry and the nation as a whole. As the construction industry is one of the leading industries that contribute for the country's GDP, projects experiencing project delay are causing economical disadvantages to the nation. This makes project delay a problem that needs further study on the causes, the effects and possible mitigation measures. Various studies have found out as many factors based on the underlying conditions that the specific study is concerned both in Ethiopia and abroad.

This research specifically focuses on the construction projects owned by grade one contractors in Addis Ababa. The main objective of this research was to identify the most important delay causing factors that contribute to delay on grade one contractors in Addis Ababa. A descriptive research design was adopted for the study. The study uses quantitative data collection instrument. Questionnaire survey was used to identify the most important causes of project delay. Interview was conducted on mitigation measures of project delay. The three major stakeholders in the construction industry which are contractor, consultant and client are included in the survey. Collected data was analyzed and ranked using Relative Important Index (RII).

A total of thirty-nine delay causing factors of project delay are pointed out from literature review for survey questioner. From a sample size of one hundred and eight sample respondents eighty-two of them respond appropriately and are used as input for data analysis. As a result, shortage of material in the market, rises in the price of materials/ price escalation, inadequate planning and scheduling, delay in materials delivery, progress payment delay by owners, longer waiting period for approval and supervision and award project to lowest bid price are found out to be the most important delay causing factors. Three causes belonging to material causing factors, one factor associated with contractor, one factor related to consultant and two factors related with client are found.

Mitigation measures suggested by interviewees are adequate planning during the very first planning stage of the project and consistent project monitoring and evaluation through out the project implementation.

5.3 Recommendation

Based on the survey results the following recommendations are given.

- From the study material related factor which are shortage of construction material in the market, price escalation of materials and delayed delivery leading the causes of delays. Thus the party who is in charge of material either client or contractor shall be proactive about price escalation by consistent market follow-up and having materials on stock. Delayed delivery shall be managed by capable suppliers. Government also has to involve in the market to stabilize unavailability and price escalation of construction materials on the market.
- Clients shall award to a bidder both technically and financially capable for the project rather than using a list bidder system. The list bidder system of rewarding not only cause time delays and cost overrun but also poor quality output which is far from what is planned. Clients also have to be ready financially for project by which payments shall be performed according to the contract document for completed milestones for the contractor. This will also reduce disputes and claims that further cause delays and cost overrun.
- Contractors on the other hand have the responsibility for project implementation. Thus, project planning in terms of time schedule, material,

equipment and technical methodology shall be adequate. Project managers shall be proactive in project terms to minimize obstacles that lead to project delay and all the effects followed.

- Consultants, as agents that connect client and contractors, shall have detailed plan of the project. Engineers shall take adequate time planning the project technically when producing design drawings to reduce change orders. The use of building information modeling (**BIM**) highly recommended during project design since it is a very supportive tool during design and implementation of construction projects.
- Consultants also are responsible on preparing contract documents that govern throughout the project implementation. Disputes and claims shall be minimized by enforcing terms and clauses on contract documents. Consultants shall have consistent implementation of project monitoring and evaluation from the start of the project which enhance smooth communication between parties, improving progresses, revising schedules and preparation for future progress.

Finally, further research on causes and mitigation methods is suggested. Arranging meeting of discussion that assist stakeholders reduce waste of time and cost of projects. Special attentions shall be given for mitigation methods of construction project delays for further researches.

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Annex A: Questionnaire

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

This questionnaire is prepared to carry out a study in the partial fulfillment of a Master's Degree in Project management (MBA) program entitled with “**Causes Effects and Mitigation methods of construction project delay on Grade one contractors in Addis Ababa**” of ST. MARY'S UNIVERSITY. The information collected through this questionnaire will be treated confidentially and used for educational purposes only. There is no need to write your name or address and the accuracy, genuine and fairness of your response will have a great impact on the outcome of the research.

Thank you in advance for your participation in this endeavor.

If you have any question concerning the questionnaire, please contact me

Mobile Phone: +251946291097

Email; beakalgirma1@gmail.com

Part 1: General information

1) Company Name-----

2) Which organization do you represent? Please answer the following questions by using symbol in the boxes.

A) Client [Owner] B) Consultant C) Contractor Others

3) What is your education level?

A) Diploma B) BSc
C) MSc D) PHD

4) Respondent designation/title in the company

A) Client or client representative B)Project manager
C)Site engineer D)Site Supervisor

5) Work Experience in project

A) 1-3 years B)4-6 years C)7-10 years D)>10 years

Part 2 Factors Causing Project Delay

Please use the numbers to fill your answers as the five-point scale ranged from 1 to 5 represent.

1= Strongly Disagree 2= Disagree 3= Slightly Disagree 4= Agree 5= strongly agree

Delay Causing factor	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Client causing factors					
Insufficient funding/ financial constraints					
Unrealistic contract duration					
Slowness in decision making process by the owner					
Progress payment delay by owners					
Interference of owner					
Award project to lowest bid price					
Change orders by owner					

during construction					
Contractor Causing					
Inadequate planning and scheduling					
Inadequate contractor experience					
Poor communication					
Poor site management and supervision					
Frequent change of sub-contractors					
Incompetent project team					
Inappropriate technical methodology					
Faulty work needing rework					
Consultant Causing					
Poor contract management					
Inadequate experience of consultant					
Insufficient data collection and survey before design					
Late preparation and delivery of drawings					
Poor qualification of consultant engineer's staff					
Inadequate design specifications					
Longer waiting period for approval and supervision					
Material Causing					
Shortage of material in the market					
Low quality materials					
Changes in materials specifications during construction					
Delay in materials delivery					
Rises in the price of materials/ price escalation					
Labor causing					
Seasonal labor access fluctuation (inadequate labor)					
Lower labor productivity					

Shortage of skilled labor					
Equipment Causing					
Insufficient numbers of equipment					
Frequent equipment breakdown					
Low productivity and efficiency of equipment					
Lack of high-technology mechanical equipment					
External Causing					
Unfavorable weather condition					
Change in policies and regulations					
Delay in providing services from utilities (such as water, electricity)					
Political situation, conflict, war, and public enemy					
Unforeseen site conditions					

If there are any other factors you are experiencing or facing in your project implementation, _____ please _____ state

_____ **Thank you**

The following are interview questions for selected respondents on the mitigation methods of project delay.

1. For which organization you are working?
2. What is your position in the organization?
3. What are the project delay mitigation methods for client causing delay factors from your experience?
4. What are the project delay mitigation methods for client causing delay factors from your experience?
5. What are the project delay mitigation methods for contractor causing delay factors from your experience?
6. What are the project delay mitigation methods for construction causing delay factors from your experience?
7. What are the project delay mitigation methods for material causing delay factors from your experience?
8. What are the project delay mitigation methods for equipment causing delay factors from your experience?
9. What are the project delay mitigation methods for labor causing delay factors from your experience?
10. What are the project delay mitigation methods for external causing delay factors from your experience?