Factors Affecting Time Overrun On Building Construction Projects Under Addis Ababa City Administration: The Case Of Koye Feche Housing Project Akaki Site

A Thesis Submitted to the School of Graduate Studies of Jimma University in Partial Fulfillment of the Requirements for the Award of the degree of Masters of Project Management and Finance [MA]

By

YESEM DEREJE

Under the Supervision of

KENENISA LEMI (Ph.D.)

And

Mr. GANFURE TAREKEGN

Jimma University

College of Business and Economics

Department of Accounting and Finance

Addis Ababa, Ethiopia

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ABSTRACT

The construction industry has an important role in improving the socio-economic growth of a country. Specially for the developing countries, the construction industry is the major input for growth, employment, and infrastructure expansion. However, it has not contributed to the growth of the countries as anticipated due to limitations, drawbacks, and the various problems it has faced. Among those problems, the impact of delay in a construction project is the most significant and common. The same trend follows for Ethiopia as well. Most construction projects in Ethiopia are exposed to time overrun. It has become difficult to complete construction projects in the allocated time, cost, and quality. Therefore, this research aimed at investigating information on the factors that causes time overrun on building construction projects in Addis Ababa City administration (with a specific emphasis on the Koye Feche Akaki site) in the views of building construction stakeholders. To achieve the objective of the study a close-ended questionnaire which was designed based on the 15 factors identified from the literature review was prepared and distributed to stakeholders that have direct relation to the project considered in order to collect primary data. And secondary data was collected through office document review. After the data collection step is completed the collected data was analyzed and ranked using relative importance index. The findings from the study identified that, material shortage at the local market, contractors' financial difficulties, inadequate/ deficiency in planning, scheduling & coordination, and payment delay for contractors were the top most delay contributory factors for the projects. While unexpected engineering problems and incomplete design at the time of tender were identified as the least contributory delay factors. And based on the results few recommendation were drawn. Some of the recommendations are as follows: the client is mostly the responsible party for financing of the project. And should be able to fulfill contractual obligations. Moreover, more attention should be given during the design phase from the consultant side to minimize the probability of change orders and avoid errors and confusions. In addition to that, contractors should plan their schedule and resource properly and avoid taking jobs in which they do not have sufficient expertise.

Key words: Building construction project, causes of delay, delay, relative importance index, time overrun

DECLARATION

I declare that the research Report entitled "**FACTORS AFFECTING TIME OVERRUN ON BUILDING CONSTRUCTION PROJECTS UNDER ADDIS ABABA CITY ADMINISTRATION: THE CASE OF KOYE FECHE HOUSING PROJECT AKAKI SITE" submitted** to Research and Postgraduate Studies' Office of Business and Economics College is original and it has not been submitted previously in part or full to any university.

Signiture: _____

Date: _____

CERTIFICATE

We certify that the Research Report entitled "**FACTORS AFFECTING TIME OVERRUN ON BUILDING CONSTRUCTION PROJECTS UNDER ADDIS ABABA CITY ADMINISTRATION: THE CASE OF KOYE FECHE HOUSING PROJECT AKAKI SITE"** was done by Ms. YESEM DEREJE for the partial fulfilment of Masters Degree under our Supervision.

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(Main Advisor) (Co-Advisor)

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CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The construction industry has become a major role player and is vital for the economic development of any country particularly for the developing countries. This industry, especially in developing countries, suffers from a number of problems that affect the time, cost, and quality performances. Successful completion of building construction projects within the specified schedule has become a challenging task. It is uncommon to hear that a project is completed well within the estimated time, budget, and desired quality these days. Good management of construction time is an important task for the successful completion of a project. Most of the time, it is difficult to achieve good time management, and the project experience a huge amount of time and cost overruns. According to Fetene (2008) effective time planning relates the design of buildings to their cost and quality while taking full consideration of changes, risks, utility, and appearance, the time of a project is planned to be within the economic limits of the expenditure.

The performance and successful completion of projects are measured by the triple project constraints (Cost, time, and quality). Project success is measured by completing the project on time within the estimated cost and desired quality. Because the industry is full of project activities, tasks, and constraints, it requires additional time and budget. According to Faridi and El-sayegh, (2006) delays have an impact on the success of a project in its cost, time, safety, and quality. The consequences of delay are not restricted to the construction industry only, but also impact the whole country's economy. According to Rajakumar (2016), cost and time overruns are common in developing countries and the impact is more severe for developing countries than it is for the developed ones. Ethiopia is among the developing country where its construction sector is affected by cost and time overrun. Building construction projects in Ethiopian are victims of this problem. Although, building projects requires a huge amount of capital, it contributes to the total economy by creating job opportunities and have a great effect on other business activities. There are many causes that are accountable for delays in the industry, so attention should be given to such factors as they cause additional costs than the initially estimated.

Time overrun is also known as time increase (schedule overrun), it involves unexpected and unplanned delays. And this delay can be beyond the scheduled amount due to an underestimation of the actual schedule during the contracting phase or due to changes in design during the construction phase (Sambasivan and Soon 2007).

Changes are facts of the construction process. It is issued to respond to new (recent) developments. Wide and poorly managed changes may have undesirable impacts on project time, cost, and quality performances. The major problem the construction industry facing is project delay; resulting in cost overruns and low performance. In today's extremely competitive construction industry, the need for completing construction projects within the estimated cost, time frame, and expected performance expectations is becoming increasingly the ultimate goal (Melaku 2017).

To know how to address time overruns in construction projects, it's important to understand the root of the problems that causes the project overrun. Most of the time overruns hint at deeper root issues in project management and from schedules and budgets being set improperly from the very beginning of the project. Although extreme weather or forces beyond human control can also have an impact on schedules, in most cases, a project's overrun is a result of inaccurate analysis (estimation) or planning before building even starts.

Therefore, the aim of this study is to assess the factors that causes time overrun in building construction projects. And tries to identify the major factors that contribute to the overrun of time in building projects and hopes to indicate the possible solutions in order to solve the problems.

1.2. Background of the study area

Urbanization is a development phenomenon that comes with the development of a country's economy in general and industrialization in particular. It follows that the urbanization rate is seen as one of the measures of the economic growth of a nation. The urbanization rates are directly linked to housing demand. It is expected that as a country becomes more urban, more houses are needed to accommodate the increasing population in urban centers. The practice, however, does not support this in that the acceleration in urbanization is not accompanied by the provision of adequate housing (UN-Habitat, 2009).

In Ethiopia, urbanization is mainly accelerated by rural-urban migration which is starting to impose high pressure on the holding capacity of cities. This acceleration of urbanization needs to go hand in hand with the growth of various services, which are essential for the well-being of society. Ethiopian cities lack the basic needs and services that are essential for residents. One of the major problems facing urban centers is the lack of appropriate housing (Azeb, 2007).

The rapid growth of the population in Addis Ababa exerts extraordinary pressure on the existing housing policy and the entire infrastructure like- water, electrical power supply, drainage, and roads. The capital has been unable to provide sufficient as well as adequate housing, particularly for its low income residents. The Ethiopian Federal Democratic Government has made significant efforts to improve housing conditions in Addis Ababa by maintaining various housing programs such as 10/90, 20/80, and 40/60.

In Ethiopia, since the introduction of condominium housing construction about a decade ago, the dominant housing design has changed from single to multi-story buildings to maintain the population density of the capital city and other major towns, particularly in Addis Ababa where the site of multi-story condominium buildings has become common inorder to satisfy the high housing need of the population. Due to the increasing number of public housing construction projects in Addis Ababa, the housing projects are exposed to different factors that lead to time overruns, budget overruns and poor quality works.

Although housing is the basic necessity of people in many parts of the world, its construction is a major challenge for both city dwellers and municipalities. With varying degrees, the problem exists in both developed and developing countries (Nesru, 2007). In a developing country like Ethiopia, satisfying the large demand for housing with scarce financial resources is the biggest challenge. Resulting in insufficient housing delivery and consumption.

The aim of this study is to assess the factors that affect time overrun in building projects. This research tries to identify the major factors that contribute to the overrun of time in building projects and hopes to indicate the possible solutions in order to solve the problems.

1.3. Statement of the problem

The construction sector is one of the key economic sectors and is the main force in motivating the economic development of a nation (Mahamid, 2013). According to Majid (2006), a

construction project is commonly acknowledged as successful when it is completed on time, within budget, in accordance with the owner's specification, and to stakeholders' satisfaction.

The failure to complete projects on time and within budget continues to be a vital challenge around the world and is getting worse every day. According to Ahmed (2002), time and cost overruns on construction projects are a worldwide challenge. Azhar, Farooqui and Ahmed (2008) states that the trend of time and cost overruns is common worldwide and that it is more severe in developing countries. Delay is when the allocated schedule which is initially estimated do not meet with the actual duration due to different unforeseeable factors that rose from involved parties, from the initial stage, up to the execution of the projects, which means, all need to be eliminated or mitigated to ensure the accomplishment of the projects on the allocated time. Different kinds of literature have proven that building projects are entrapped by various types of causes, some are inadequate or inefficient planning and scheduling, shortages of materials at the local market, inadequate manpower, (e.g., in terms of numbers, poor training, lack of training, etc), delayed payment to contractors, subcontractors and/or suppliers, rework required due to poor work or the wrong materials used by contractors, change of work scope and/or changes in material specifications, poor communication among stakeholders (e.g., slow responses to site queries, late receipt of drawings, etc), disputes among the parties involved in the project (clients, contractors, consultants), high inflation, insurance, and interest rates, contractor's workload, bureaucracy, site accidents E.T.C (Alinaitwe, Mwakali, & Hansson (2007), Bubshait & Al-Juwait (2002), Frimpong, Oluwoye & Crawford (2003), Kaliba, Muya & Mumba (2008), Kouskili & Kartan (2004)).

According to Haseeb, Xinhai-Lu, AneesaBibi, Maloof-ud-Dyian, and Rabbani, (2011) the most significant and top ranked delay causes in the construction industry of Pakistan is incorrect time estimation. But in another study, (Mahamid, 2013), the most important and highly frequent cause of delay is the financial status of the contractor. Aibinu and Odeyinka, (2006) identified financial difficulties, conflict and disputes among involved the parties, planning and scheduling problems, material and equipment shortages, and shortage of manpower as main contributors to this category of delay factors. Hence, from the above facts, we can establish that factors of delay could be different from one country to another and from situation to situation.

This research investigates the factors affecting the schedule of construction projects in Addis Ababa to help assist owners, consultants, and contractors to overcome time overrun challenges of building construction projects. The initiation for the study of this research topic is mainly due to personal observation of the poor performance (in terms of schedule) of building construction projects in Addis Ababa city. As discussed above construction project is commonly recognized as successful when it is completed on the planned time, within the estimated budget, and with the desired quality. However, different challenges have been encountered by projects that affect their successful completion.

The ultimate value of this paper is to provide the construction industry professionals with the most significant delay factors. And to help them take proper preventive or corrective actions to reduce delays. Although many studies were done concerning time overrun in Ethiopia; it is necessary to study the factors that cause delays in the city because delay factors are different from places to places, from time to time and from situation to situation. Therefore, this specific research aims to deliver the delay factors that exist in the city by identifying the most significant and frequently happening delay factors in the study area. The research will also enable stakeholders of the construction industry to be aware of the causative factors and take preventive action to keep the project on schedule. And the study also intends to contribute knowledge in the area of the construction industry in the case of Ethiopia.

1.4. Objective of the study

1.4.1. General objective

The general objective of this research is to identify the most significant and frequent factors of time overrun in the building construction projects of Addis Ababa with a specific emphasis on Koye Feche Akaki site.

1.4.2. Specific objectives

This study will address the following specific objectives

- ✓ Identify the factors that contributed to the delay in the projects.
- ✓ Identify the frequency of occurrence of the factors that contributed to the delay in the projects.
- ✓ Evaluate the amount of time overrun on the projects based on the contractual agreement.

1.5. Research questions

1. What are the most contributory factors that cause time overrun in building construction projects in the city with respect to their frequency of occurrence?
2. How long do the projects delayed from the contractual schedule?

1.6. Significance of the study

This study believed to be relevant to:

- ✓ Since the causes for delay are different from country to country, this study will be important to identify the most significant causes of time overrun in building construction projects in Addis Ababa.
- ✓ It helps to identify the most frequently happening delay factors in the building construction projects in Addis Ababa.
- ✓ Encourages all involved parties or practitioners to look for more effective solutions for the identified root causes of time overrun.
- ✓ Finally, the study will have valuable importance for future studies as it will help to assist or detect areas of further research and also will serve as a framework for further study; and add a new idea to the existing knowledge of the building construction industry. And at last, this research will be submitted to the Addis Ababa housing Agency Koye Feche site bureau as it will help to eliminate such problems for further construction.

1.7. Scope of the study

This study will mainly focus on the factors that drive time overrun on the building construction projects and also assesses the frequency of occurrence of the factors that caused the project to fall behind the schedule.

Even though there are many building construction projects around Addis Ababa, due to constraints of finance, time, and the researcher's ability, the study would only be bounded to the Koye Feche housing project, Akaki site. This site is purposively selected because it has currently both ongoing and completed projects, and it also has the largest project sites (in terms of numbers of blocks) than any other project site of the Addis Ababa Housing Agency. And also the researcher believed this site would represent a good set of contractors as the site is consists of more than a hundred contractors participating in the project.

This study was conducted by referring literetures (previous studies) conducted between the year 2001 to 2017.

1.8. Organization of the study

This study is organized into five consequential chapters. The first chapter deals with the introduction part of the paper comprising the background of the study, statement of the problem, objectives of the study, and other relevant introductory issues. The second chapter focuses on literature review. An eye bird view on all of the relevant literatures concerning with the topic under discussion was made. An overview of the research methodology used to investigate the research problem is presented under chapter three. This chapter covers the research design, approaches used throughout the data collection, and analysis process. And the fourth chapter discusses the results and findings obtained through data collection and analysis. The fifth and last chapter draws conclusions based on the result and findings obtained in the previous chapter and also gives a brief suggestion and recommendation to each involved stakeholders of the project.

CHAPTER TWO

LITERATURE REVIEW

2.1. Chapter Review

This chapter deals with different literatures which were conducted on the area time overrun on building construction projects. Most of the literatures discussed here are conducted in different countries and situations to determine the delay factors in different countries and situations. The purpose of this chapter is to refer it and integrate with the finding of this study. The review highlights the definition of time overrun and its main causes.

The construction industry is necessary for every country to provide physical developments that help in improving the social and economic needs of the country (Abedi, Mohamad, & Fathi, 2011). Likewise, the Ethiopian construction industry trend in the past 10 years shows a yearly growth rate of 12.43% and this shows a share of 5.3% of the country's GDP (ECIDP, 2014). Hence, the construction industry has been growing rapidly worldwide. General construction focuses on residential and non-residential constructions and also general civil engineering works, like metal works, electrical works, plumbing, sewerage, and sanitary works, refrigeration and air-conditioning work, painting work, carpentry, tiling and flooring work, and glasswork. Likewise, housing construction projects, (Flyvbjerg, Holm, & Buhl 2003) in their global study concluded that time overrun is a major problem in the construction industry, where 9 of 10 projects are faced by these overrun which commonly range between 50 to 100%. (Olawale & Sun, 2010) In the developed countries like the US, Netherlands, UK and many other country’s construction industry is also affected by this problem. And according to (Jackson, 2002) nearly one-third of the clients complain that their projects generally overrun the allocated budget and schedule.

The review has two sections. Section 1 presents a review of the theory of the main causes of time overrun in building construction projects in summary. Section 2 presents a review of the relevant empirical evidences on the cause of time overrun on the construction industry.

2.2. Theoretical Review

2.2.1. Time overrun

In construction, a time overrun can be described as the delay either beyond the date of completion stated on a contract document or beyond the date agreed upon by the involved parties

to deliver a project (Assaf & Al-Hejji, 2006). It is a project falling behind its planned schedule and is considered a common problem in construction projects.

In construction, the word "delay'' refers to something that occurs at a later time than anticipated, intended, specified in a contract or beyond the date decided upon by the parties for the project delivery (Pickavance, 2005). Lo, Fung, and Tung (2006) describe delay as the deceleration of work without fully stopping building (constructing) and that may lead to delay of the projects beyond the contract date.

Azhar, et al., (2008) classify delays into four categories. Namely, non-excusable delays, excusable non-compensable delays, excusable compensable delays, and concurrent delays. Non-excusable delays are delays, for which the contractor is either responsible or bears the risk. Excusable non-compensable delays are delays caused by unforeseeable causes, and they are beyond the contractor's control and not due to the contractor's fault or negligence. Compensable excusable delays are excusable delays, holdups, or disruptions to all or part of the work initiated (caused) by any act or failure to act by the owner or resulting from the owner's breach of an obligation specified on the contract. Hence, concurrent delays occur when both the owner and the contractor are responsible for the delay.

Fetene (2008) concluded that it is common to see construction projects failing to achieve its goal of creating facilities within the specified budget and schedule. This implies again the extent to which projects fail to meet their plan or requirement. Hardly few projects get completed on time and within budget, since construction projects are exposed to uncertain environments because of such factors as complex nature of construction projects; the presence of various interest groups such as the project owners, end-users, consultants, contractors, financiers, materials, equipment, project funding, climatic environment, the economic and political environment, and legal regulations.

The delay in the completion of construction projects is a worldwide problem (Haseeb, & Xinhai, 2011). This statement again states how a delay in construction projects is common even globally.

For the owner, construction delay refers to the loss of income, dependency on existing facilities, lack of rentable facilities, lack of efficiency, etc. for the contractor, construction delay refers to the higher costs, additional work duration, greater (additional) labor cost, higher material and

equipment cost, etc... The completion of a construction project on the specified time or on the time agreed among the contracting parties indicates the work and construction efficiency.

According to Abbas (2006), the deviation found when the completed work (project) compared against the planned schedule or the contract schedule is what is known as a delay. Delay occurs when the progress of a project falls behind its scheduled program. It may be caused by any party to the contract and maybe a direct result of one or more circumstances. A contract delay has severe impacts on both the owner and contractor (either in the form of lost incomes or additional expense) and it often raises the disputatious issue of delay responsibility, which may result in conflicts that frequently reach the courts (Apolot, Alinaitwe & Tindiwensi, 2011).

According to Majid (2006), a construction project is commonly recognized as successful when it is completed on time, within the estimated budget, in accordance with the clients' quality specifications, and to stakeholders' satisfaction. In the construction industry, contractors tend to maximize profit to increase market share. To achieve this aim, it is vital for contractors to cautiously identify the factors that affect the success of a project and estimate their effects before the bid.

Again Mohamid, (2013), Project success is measured by the planned time, cost, and quality as they have their proven importance as a prime measure for project success. As mentioned above project requirements are commonly assumed to be time, quality, and cost of a project. The success and failure of any project is measured based on these three requirements.

According to Faridi et.al (2006), delays have a significant impact on project success in terms of time, budget, quality, and safety. The impact of construction time overrun is not limited to the construction industry only; it also affects the overall economy of the country.

A major criticism of the Nigerian construction industry facing is the increasing rate of delays in construction project delivery (Aibinu, & Jagboro, 2002). Delay is a situation when the contractor or the project owner jointly or separately contribute to the time overrun. When projects are delayed, they are either accelerated to compensate for the delay and keep the project on track or have their duration extended beyond the scheduled completion date. And these cannot be done without some cost consequences.

The delays in construction projects happen because of various causes or reasons. These causes lead to the delay in construction completion, and this delay leads to some unfavorable effects on the construction projects.

In Ethiopia and Addis Ababa, it has become very common and usual for construction projects to be delayed beyond their completion date on the time specified or agreed upon. There are many projects in Addis Ababa which suffered delays or suspension and in some cases even total abandonment. And a number of studies have been conducted to identify important causes of delay in the construction industry which are common globally.

2.2.2. Causes of Delay in Building Construction Projects

Several studies have been conducted concerning delays in construction projects for decades with scholars identifying various factors (causes) that contribute to causing delays.

According to Assaf & Al-Hejji, (2006) the causes can be grouped into nine classes. Ranking of the classes associated with frequency of occurrence, degree of severity, and significance by owners, contractors, and consultants. According to this study, owners and consultants specify that labor, contractor, and project-related causes as a source of delay. From the owners' point of view, the most frequent causes of delays are related to both contractors and labor. The study shows that owners are realizing that awarding of projects to the lowest bidders is one of the highest frequent factors of delay. The idea here is the lowest bidders are unqualified contractors with a shortage of resources and low capabilities, which leads to low performance and which causes a delay in completion of the work. While contractors indicate that source of delay in construction projects are owners and consultants. The combined results presented in this study prevails that delay in construction projects is mostly originated by the owner, followed by contractors. Factors related to design change, labor, and consultant related factors are less important.

In another study, Haseeb, et al (2011), finance and payments, inaccurate time estimation, quality of material, delays to payments to suppliers and contractors, and poor site management are the five most important causes of delay for construction projects.

Haseeb, et al (2011), identified around 16 causes of delay for construction projects ranked in terms of frequency and importance to affect successful construction project accomplishments. As per this study, the financial power of contractors and progress payments made by owners to

contractors are ranked the top significant factors followed by the quality of materials used to accomplish construction projects. And the change in drawings, improper equipment, inaccurate cost estimation, change orders, organizational changes, and regulatory changes are taken as the five least important and less frequently happening factors of delay. And the rest six; i.e., old technology, natural disasters, unforeseen site conditions, shortage of material, and delay caused by contractors are proved to be important and frequent in b/n the two classifications mentioned above as most and less important factors for the delay. But in the previous study, most of these averagely taken factors have been proved most important and frequently happening factors for a project delay.

The top three ranking factors of delay for construction projects from contractors' views in Palestine are Labors, materials and equipment, and owner related factors (Mahamid, 2013). According to Mahamid, (2013), the three least important and less frequent factors in the same country are consultant, design, and project related factors. The study discussed why the above three important and frequently happening factors are taken as important factors of delay for construction projects in Palestine. The political situation in the west bank is also another factor as it was described in the study as unstable; because of the conflict between the Palestinian and Israel. This situation leads to a shortage of materials, shortage in equipment, limitations on imported material, and limitation on movement which leads to time overrun.

Mahamid, (2013) included progress payments as a top contributory factor. Because of its high importance to contractors in order to fulfill the high daily expense. Due to the delay of payments by the owner, work progress can be delayed because there is inadequate cash flow to support construction expense especially for those contractors who are not financially sound.

As the researcher stated above, factors for delay can be different in different countries and situations. According to Chan & Kumar (2007), the core sources of delay for construction projects in Hong Kong are poor supervision and management, inadequate planning, variations by clients, slow-decisions for changes, variations of work, and unpredictable site conditions,. Whereas according to Masfield, (2002), the main causes of delay for construction projects in Nigeria are finance and payments, poor handling of the contract, shortage of materials and equipment, inaccurate estimations and fluctuations in price.

Long, Lee, and Jun Yong Lee (2008), they conducted questionnaires and interviewing survey on 78 Vietnams experts, they investigated 21 main causes of cost and time overrun construction projects in Vietnams were inferred and the top five causes of time overrun in large construction projects are financial difficulties of the contractor, design changes, poor site management and supervision, poor project planning, and financial difficulties of owners.

Agaba (2009) identified delay causes in construction projects to poor designs and specifications, and problems associated with management and supervision. In their study, El-Razek (2008) found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Sambasivan and Soon (2007) established inadequate supervisory skills of the contractor, poor site management and planning, labor supply, delayed payments, scarcity of material, unavailability equipment, and failure, poor communication between parties and rework due to mistakes, which were the most important causes of delays in the Malaysian Construction Industry.

Odeh and Battaineh (2002) found that contractors and consultants agreed that improper planning and subcontractors, labor productivity, owner interference, financing and payments, inadequate contractor experience, and slow decision making are among the top ten most significant factors of construction project delay in Jordan.

Asnaashari, Farahani, Hoseini, and Knight (2009) reported the result of their study into the core factors which trigger construction delay in Iran. The results reveal that most of the construction projects in Iran are subjected to delay. Cash constraints, limitation of resources, high inflation rate, delay in progress payments, and disputes are the top sources of delay in the Iranian construction industry.

A public sector project generally requires further adjustments, thus causing delays in the project implementation process. In general, the public sector owner is less involved in the project progress as compared to a private sector owner in pressing for project development. There is a lack of skill in monitoring construction progress. In all the procedures that a public sector project has to go through bureaucracy, which further generates progress delay in the development of the project. When changes to a project occur a public sector owner has to work with many governmental departments. The public sector has to spend a considerable amount of time

communicating with many other governmental departments, which again produces project delays. (Wang, Fisher, & Wu, 2003)

Takim, Akintoye and Kelly (2004) found that many contractors often have various disputes with subcontractors and materials suppliers, which can cause major delays. In fact, such disputes are considered a major cause of a project delay. Other causes, such as the contractor's inadequate financial resources, errors in making decisions on progress control, and the overall inability.

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, Wang, Fisher, and Wu, (2003) identified delays in design work and inadequate site inspection as the main causes of consultant related delays. Wang, Fisher, and Wu, (2003) also stated progress delay can happen if monitoring measures are not implemented properly. Assaf and Al-Hejji, (2006) identified delay factors as 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 the consultant. Assaf & Al-Hejji, (2006) also identified design errors made by designers, changes in types, and specifications during construction, insufficient communication between owner and consultant during the design stage as critical.

El-Razek, Bassioni, and Mobarak, (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) acknowledged changes in drawings, slow preparation and approval of drawings, specifications, and/or documents, and incomplete drawings as factors of consultant related delays. Gündüz, Nielsen, and Özdemir, (2013) reported delay in performing inspection and testing, inadequate communication and co-ordination with other parties, and disputes between consultant and design engineer as the most significant in causing delays.

Aibinu and Odeyinka, (2006) identified lack of trained manpower, planning and scheduling problems, financial difficulties, equipment breakdown and maintenance problems, and material and equipment shortages as major contributors to this category of delay factors. Al-Kharashi and Skitmore, (2009) observed that financing and cash flow challenges, poor project management, and inadequate manpower were key considerations. Sambasivan and Soon (2007) observed that

inadequate supply of materials and contractor's financial difficulties were the main causes of delay. Assaf and Al-Hejji, (2006) identified contractor related delay factors as; difficulties in financing project by the contractor, conflicts in sub-contractors' schedule in the execution of a project, rework due to errors during construction, conflicts between the contractor and other parties (consultant and owner), poor site management and supervision by contractor, poor communication and coordination by the contractor with other parties, ineffective planning and scheduling of project by the contractor, shortage of manpower, slow delivery of materials and errors committed during construction works affected delivery of the projects. According to Sambasivan and Soon (2007) shortage of materials in the market as a factor causing a delay, poor quality of materials, escalation of material prices and late delivery of materials are material related factors that cause delays. Assaf and Al-Hejji, (2006) identified the material related delay factors as; shortage of construction materials in the market, changes in material types and specifications during construction, delay in material delivery, damage of sorted material while they are needed urgently.

Aibinu and Odeyinka, (2006) concluded that Clients' cash flow problems, variation orders, and slow decision making were critical. In a separate study, Hemanta, Anil, Iyer, and Sameer, (2012) observed that slow decisions from owners and lack of incentive for contractors for an early finish were critical for the time overrun of a project. Al-Kharashi and Skitmore, (2009) identified lack of finance to complete the works and slow decision making by the owner as having the greatest impacts on delays. According to Faridi, and El-Sayegh, (2006) delay in progress payments to the contractor and frequent change orders were client-related delay factors that had the greatest effect on the project. Faridi and El-Sayegh, (2006) also stated 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.

Assaf and Al-Hejji, (2006) identified the owner related delay factors as; change orders by the owner during construction, delay in progress payments by the owner, delay to furnish and deliver the site to the contractor by the owner, late in revising and approving design documents by the owner, delay in approving drawings and sample materials, inadequate communication and coordination by the owner and other parties, conflicts between joint-ownership of the project, suspension of work by the owner, unavailability of incentives for the contractor for finishing ahead of schedule, and slowness in decision-making process by the owner were identified as the

main causes under the client related category. Gündüz, et al, (2013) identified delays in site delivery, slowness in decision making, and change orders as the most significant factors under this category. In a separate study, Hemanta, et al (2012) identified an unrealistic schedule imposed in the contract and slow decision from the owner as causes of delay related to the client. Sambasivan and Soon (2007) identified the factors of unrealistic contract durations imposed by the client, inadequate client's finance and payments for completed works, slow decision making, owner interference, and client initiated variations as critical causes of delays under the client-related category.

As we can see in the above paragraphs, all the researchers found and outlined their own factors of delay in construction industries in their respective countries. The idea here is, it is difficult to expect common causes of delay in construction projects due to its special nature, characteristic, and level of complexity. The parties and stakeholders to participate in the construction process are different in different countries and this fact can contribute to the heterogeneity of causes of delay factors in different countries.

2.3. Empirical Literature

Construction project delays represent a constant source of concern for project stakeholders and numerous researches have been established in order to identify factors of time overrun worldwide. In light of the large number of variables involved, it is difficult to keep full control over the performance of civil projects. Deep knowledge and understanding of the significant causes that lead to delays, would help in the establishment of actions that minimize the unfavorable effects that can lead to conflict and disputes that lead to lawsuits or even total abandonment of the project, Enshassi, Mohamed, and Abushaban (2009).

The scientific literature reports delay as a common happening and problem worldwide. A study conducted in India, over 40% of construction projects are facing time overrun Iyer, and Jha, (2006). In another study in Ghana for groundwater construction projects, it was reported that 75% of the projects have deviations in cost and time (Frimpong et al. 2003). The average of time overrun in building construction projects in Saudi Arabia is between 10% and 30% of the original duration (Assaf and Al-Hejji, 2006). For international projects, a research conducted by Ahsan, and Gunawan (2010) found that real duration exceeds overall planned on average of 33.37%.

Olatunji, (2008) found that in Nigeria 55% of the 137 projects analyzed had faced overruns. According to Olawale, and Sun, (2010) Gaza Strip, a region with a complex political situation and limited resources, faced similar problems reported on other countries and on the other hand, developed countries, such as USA, United Kingdom, Netherland, Sweden, and so many others also failed to meet time and cost requirements. Finally, Memon, and Rahman, (2014) established that developing countries face a substantially higher time overrun when compared to the developed countries.

According to a study on Indonesian construction projects, it was found that only 54.5 percent of the construction projects are completed on time, Iyer, and Jha (2006). From a study in Bosnia and Herzegovina of 177 building structures, it was found out that the contracted schedule and price were not met in 41.23% of the structures Zhu and Lin, (2004). In another study, Jackson & Steven (2001) studied the problem of time overrun by investigating 15 projects and it was found that 73.7% of the projects have faced time overrun. A study in Malaysia (Khamidi, Khan, & Idrus 2011) showed that completion of an electrified double-track project resulted in a time overrun of 56% of the project duration.

Through 61 cases studies, Aibinu & Jagboro (2002) found that the projects had a mean percentage time overrun of 17.34%. Later on, an investigation of 137 construction projects showed that 55% of the projects were facing time overrun problem. Faridi and El-Sayegh, (2006) reported in their study 50% of the construction projects in the United Arab Emirates (UAE) encountered construction delay. A study conducted in the US consisting of 8,000 projects presented that only 16% of the projects satisfied the three success criteria: time, estimated budget, and quality specifications Chang, (2002).

Odeck, (2004) studied the performance of construction projects controlled by the Norwegian Public Roads Administration. He found out that time and cost overrun was a severe problem and the extent of the overruns ranged from 59% to 183%.

Azhar et al. (2008) stated that cost and time overrun was a common problem in construction projects. The minimum range of time overrun experienced was found as near around 10% of the total duration of the project. In large construction firms, these overrun ranged up to about 40% while in medium-size firms this percentage increased up to nearly about 60% of the original project duration.

A study conducted by Fetene (2008), from 70 public construction projects in Ethiopia, it was revealed that 67 out of 70, (95.7%) of public building projects suffer from time and cost overruns in the execution phase of the projects.

Ethiopia is one of the fastest-growing developing country. The construction industry is the major input for growth, employment, and infrastructure expansion. Yet, it has not contributed to the growth of the country as anticipated due to limitations, drawbacks, and the various problems it has faced. Among those problems, the impact of delay in a construction project is the most significant and common. Various researchers had been studying to identify the causes of delays in construction projects all over the world and in our country as well. The variables studied in different countries with different scholars is different, it is because causes of delay differs from one country to another, or even from one project to another.

Therefore, this research also tried to identify the significant causes of delay in building construction projects in Addis Ababa city administration.

Unfortunately, there are not enough studies conducted in Addis Ababa city administration to outline the causes of delay for construction projects. The above articles indicate the fact that the factors are different from places to places. Moreover, all the causes of delay are related to the owner, the contractor, or the consultant and slightly with external or natural environments. Nevertheless, all the delay factors can be categorized into these three parties or stakeholders of the construction industry.

2.4. Conceptual framework

Conceptual frameworks are abstract representations, connected to the research's goal that directs the collection and analysis of data (Moharana 2013). Moharana (2013) had described conceptual framework as a fundamental model which could be argued to reflect the outcome of the discussion.

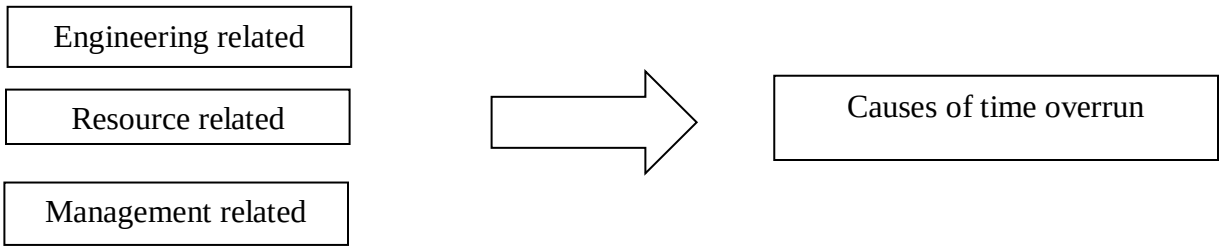

Figure 1 Conceptual framework

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1. Research Design

The purpose of this chapter is to describe the choice of an appropriate research method for the study so that the study objective is met. Research design is specific research methodology philosophies and techniques used to achieve the objective of the study.

For the purpose of this study, research is defined as a practical investigation or exploration to find out new facts or assemble old facts by scientific ways for the purpose of its application in real life problems. Research can either be a theory based (deductive), or a problem initiated for theory contribution (inductive), or a mixed approach. This research has an inductive approach as it was initiated from the observation of existing problems in the city.

This research was developed from observation on the poor performance (in terms of time management) of building construction projects in Addis Ababa city. The research questions are oriented to investigate the main cause of time overrun and the frequency of occurrence of the delay causes on the project's lifecycle. So the research design will help to integrate different components of the research coherently and logically. For this research, the research design is assumed to be descriptive. Because the research mainly focuses on practical projects to realize the reasons behind the time overrun through identifying the rate of the occurrence, the main variables (causes) of time overrun and it will also show the difference between the completion date agreed upon on the contract and the actual time at completion.

3.2. Data source and collection method

The research process included a wide range of survey of published literature in diverse areas of construction management, causes of delay, critical success factors, etc… but mainly primary data collection method were used in order to collect useful data.

Since quantitative approach is used to gather factual data and to study relationships between facts and how such facts and relationships accord with theories and the findings any research executed previously; this research has adopted this approach in order to achieve the objective of the study.

Primarily data were collected by distributing close ended questionnaires to clients, contractors, and consultants. The respondents were asked to provide information on building projects they were assigned on. The questionnaire had three sections. The first section was aimed at gathering the general information of the respondents like education level and experience of the respondent etc… the second and third section of the questionnaire consists of 15 factors for each section. The factors influencing the time overrun in the construction projects were determined from various literature reviews and studies conducted around different parts of the world. 15 most contributory factors were selected based on their existence and frequency in our country. In this selection process, the researcher has consulted four Civil engineers who each has more than 20 years of experience and two engineers from the Addis Ababa Housing Agency as they have much knowledge on the project itself. And the factors were then categorized into three (3) major groups based on their nature of occurrence, each category composed of 5 sub factors. And respondents were asked to rank each of these factors based on the five point Likert's scale (1 to 5) provided for them. where 1 being not significant and 5 being extremely significant for the questions related to the cause factors and for the questions related to the frequency of occurrence the weight was assigned as 1 being not frequent and 5 being extremely frequent.

After the preparation of the questionnaire, a pilot survey test was done to test the validity and reliability of the questionnaire. The pilot test was done by randomly selecting three respondents from each stakeholder (client, consultant, contractor) and it was then analyzed with spss. Reliability was checked by calculating the Cronbach alpha coefficient. Validity was checked by comparing the calculated Pearson value with the r-value obtained from the table and the questionnaire proved to be both valid and reliable.

In addition to the close-ended questionnaires, document review was used as secondary data sources. One of the reasons the researcher chose the study area is that the koye feche site has both ongoing and completed projects. The primary data was collected from the ongoing projects while the secondary data was gathered from the completed projects. Contract documents from completed projects at the site were gathered and used as secondary data, which was used to compare the contractual schedule against the actual schedule at the time of completion.

3.3. Sampling design

3.3.1. Target population

The population of the study comprises the stakeholders of building construction projects such as client (owner), consultants and contractors who are involved in the construction process of the Koye Feche housing project Akaki site to get possible reasons for the time overrun. The questionnaire was prepared and distributed for engineers who are working (participating) on the project. The total population for the study at the Koye Feche, Akaki site was found to be 133 engineers.

3.3.2. Sample size

There are 110 contractors, 3 consulting firms with a total of 15 office engineers, and 8 office engineers from the owner's (Client's) side that are participating on the Akaki project site.

For the purpose of calculating sample size, an assumption was made that the margin of error is 5% and the level of confidence is 95%.

The sample size that represents the targeted population was determined from the following equation that was used by researchers like (Fetene 2008, Sambasivan and Soon 2007)

$$n = \frac{n'}{1+\frac{n'}{N}} \text{ ....} Equation 1$$

$$n' = s^2 v^2 \text{ ....} \textit{Equation 2}$$

Where; n′: is the sample size from infinite population

N: is the total population

V: Standard error of the sample population equal 0.05 for the confidence level 95%=1.96.
S: Standard error variance of population elements, where $S^2 = (1-P)$; maximum at $P = 0.5$

Based on the above assumption and calculation the sample size was calculated to be 53.
Therefore, a total of 70 questionnaires were distributed for the data collection and 61 were retrieved which made the response rate to be 87.2%.

3.3.3. Sampling method

The Addis Ababa Housing Agency has currently 22 housing program projects which are being implemented in the entire 10 sub-cities of Addis Ababa. Out of which 7 projects are found under the Koye Feche project site, making the site the biggest project site of all the rest of the projects

the housing program has. The Koye Feche site includes Akaki, project11, project12, project16, project17, project 18, and Addis Ketema project sites.

The Koye feche housing project leads all the rest housing projects with 1071 blocks. Of the 1071 blocks the Koye Feche housing project has, the 340 blocks are being constructed under the Akaki site.

Purposive and random sampling techniques were used to select the respondents for the data collection process (from owners, consultants, and contractors). According to William (2006), purposive sampling is a useful sampling method that allows a researcher to get information from a sample of the population that one thinks knows most about the subject matter. Therefore, the researcher believed respondents with an engineering background have a better knowledge on the subject matter and would be able to provide accurate and valuable information. Since the number of engineers involved in the project from the client and the consultant side were small in number; all the engineers were asked to fill the questionnaire unless the employee was unwilling to fill the questionnaire or unavailable at the time of the data collection period. As for the contractor side, the sample size was calculated and random sampling techniques were used to select between the respondents.

3.4. Method of data analysis

This chapter deals with the analysis and presentation of the data collected through questionnaires and document reviews. It covers the main causes of time overrun and the rate of occurrences of the variables (causes) of time overrun on the building projects.

As introduced in the previous section, to achieve the objectives of the study descriptive method was employed for the data analysis.

First, important factors (causes) of time overrun were collected through literature review and grouped based on their nature of cause (occurrence). This resulted in 15 significant factors to be recognized from studies conducted around different parts of the world. (Assaf and Al-Hejji (2006), Faridi, and El-Sayegh, (2006), El-Razek et al. (2008) and Fong, Wong L.Y and Wong L.T (2006), Frimpong et al. (2003), Kaliba, Muya and Mumba (2008), Le-Hoai, L; Lee, Y. D

and Lee J. Y (2008),Long et al (2004), Odeh and Battaineh (2002), Mahamid, (2013) Hameed, Ismail and Ade, (2011).)

Using these 15 causes (factors) a closed-ended questionnaire was prepared and tested for validity and reliability by conducting a pilot survey. 70 questionnaires were prepared and distributed among the three stakeholders of the construction industry i.e. the client, consultant, and contractor. 7 respondents from the client, 13 respondents from the consultant, and 41 respondents from the contractor has participated in the data collection process. The expert respondents were asked to rank each factor based on the five point Likert's scale 1 being (not significant) to 5 (Extremely significant) according to their opinions. The response from the respondents showed which factors where the most significant and contributory for the delay of the project.

Hameed, et al (2011), Mahamid, (2013), Sambasivan and Soon (2007), and many previously conducted literatures on this topic used the RII method to determine the relative importance of the various causes of delays for construction projects. Therefore, the researcher adopted the same method for this study as well. The relative importance index method is valuable in identifying and ranking factors (variables). RII shows the relative importance of the variables among the listed time overrun factors, which have caused delay on projects. Thus the researcher believed that the relative importance index method was useful in achieving the objectives of this research paper.

The data received from the questionnaire was then analyzed by the Relative Importance Index (RII) method to determine the relative importance of the factors causing the time overrun on the projects as identified by the literature review survey.

$$RII = \frac{\Sigma W}{AxN} \qquad \text{or}$$

RII = Sum of weights (importance) (W1 + W2 + W3 + ……+ Wn) / A x N

where W = weights given to each factor by the respondents and will ranges from 1 to 5 where '1' is not significant and '5' is extremely significant.

A = highest weight (i.e. 5 in this case), and

N = total number of respondents.

The RII values have a range of 0 to 1 ($0 \leq RII \leq 1$); the higher the RII, the more important the cause of delay is. After the RII values were computed, the factors were ranked based on the RII value. These rankings made it possible to cross compare the relative importance of the factors as

perceived by the three parties of respondents. The RII values and their ranks are shown by using tables.

The frequency index (FI) formula was used to rank the frequency of occurrence of the factors that cause delays on the projects based on the views of the experts from the survey.

$$FI = \frac{\Sigma W}{AxN} \qquad \text{or}$$

FI = Sum of weights (frequecy) (W1 + W2 + W3 + ……+ Wn) / A x N

where W = weights given to each factor by the respondents and will ranges from 1 to 5 where '1' is not frequent and '5' is extremely frequent.

A = highest weight (i.e. 5 in this case), and

N = total number of respondents.

Spearman's rank correlation coefficient was used to compare the agreements of perceptions among the responding parties. The Spearman's correlation coefficient r is used to measure and compare the association between the rankings of two parties for all the factors causing time overrun while ignoring the third party. Spearman's rank correlation factor is usually used to check the accurateness and precision of data. Spearman's rank correlation test is a non-parametric test. It does not require the normality of distribution or the homogeneity of the data which is considered as a big advantage over other approaches. Spearman's correlation measures the strength of the relationship between different parties regarding different attributes. The Spearman's rank correlation coefficient was used to test the agreement among the respondents on ranking the delay factors.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. Introduction

This part of the thesis deals with the analysis and discussion of the data gathered from the questionnaires and data review. The analysis of the questionnaire survey covers the main causes of time overrun, rate of occurrences of the variables of time overrun on the project, and the level of agreement among the responding parties.

As clearly specified on the methodology part, the procedures used in analyzing the questionnaire survey result were aimed to establish the significance importance of each factor on the time overrun in the studied area.

4.2. Data characteristics

A total of 70 questionnaires were distributed for the primary data collection process and 61 were retrieved which made the response rate to be 87.2%. From the client office 7 respondents filled the questionnaire, from the consultant office 13 respondents responded for the questionnaire and 41 respondents from the contractor office responded for the questionnaire. Therefore 12% of the questionnaire was filled by client engineers, 21% of the questionnaire was filled by the consultant office and the rest 67% of the questionnaire was filled by the contractors.

Most of the respondents involved in the survey had several years of experience in handling projects. More than half of the total respondents have 5 years and above experience in the construction sector and have participated in more than 5 building projects throughout their career life. This implies that the respondents have adequate knowledge and experience to give reliable information about the study matter. Table 1 shows a summary of respondents based on experience.

Table 1 Summary of respondents based on experience.

Experience	Client	Consultant	Contractor	Total %
0-3years	0	2	4	10
3-5years	2	6	16	39
Above 5 years	5	5	21	51
Total Sum	7	13	41	100

4.3. Data analysis

The analysis was done by using Statistic Package for Social Science (SPSS) and Ms Excel where the scores given to each factor by the respondents were entered and consequently the responses from the 61 questionnaires were subjected to statistical analysis for further insight. The contribution of each of the factors to overall delays was examined and the ranking of the attributes in terms of their criticality as perceived by the respondents was done by use of Relative Importance Index (RII). While the frequency of occurrence of the factors was examined and ranked using Frequency Index. The tables shown below summarizes the importance and frequency indexes and their respective rank.

4.3.1. Factors that cause time overrun

In this section, 15 delay factors, which have caused time overrun on the construction projects were analyzed and calculation was made for relative importance index based on the scores given by the respondents.

Table 2 RII computed from the client's response

ID	Hypothesized causes of Time overrun	RII	RANK
1	Material shortage in the local market	0.86	1
2	Inadequate / deficiency in planning, scheduling & coordination	0.80	2
3	Payment delay for contractors	0.80	2
4	Contractors financial difficulties	0.77	4
5	Owner's / executor financial difficulties	0.66	5
6	Design change	0.63	6
7	Conflict between contractors & other parties (consultant and owner)	0.63	6
8	Lack of timely decisions	0.63	6
9	Bureaucratic procedures	0.63	6
10	Delay preparation & approval of drawing	0.63	6
11	Failure to update schedules on time	0.60	11
12	Rework due to wrong work	0.57	12
13	Unexpected engineering problems (eg. sub soil conditions)	0.57	12
14	Lack of experienced (skilled) labor at the project location	0.54	14
15	Incomplete design at the time of tender	0.46	15

Material shortage at the local market ranked as the top most cause of delay according to the responders from the client side with a relative importance index of 0.86. Payment delay for contractors and inadequate/deficiency in planning, scheduling & coordination took the second place with RII of 0.8. Contractors financial difficulties followed with RII of 0.77. While lack of experienced labor at the project location and incomplete design at the time of tender ranked the last with the least relative importance indexes 0.54 and 0.46 respectively.

Table 3 RII computed from the consultant's response

ID	Hypothesized causes of Time overrun	RII	RANK
1	Material shortage in the local market	0.91	1
2	Contractors financial difficulties	0.83	2
3	Payment delay for contractors	0.75	3
4	Inadequate / deficiency in planning, scheduling & coordination	0.74	4
5	Conflict between contractors & other parties (consultant and owner)	0.74	4
6	Delay preparation & approval of drawing	0.72	6
7	Design change	0.68	7
8	Bureaucratic procedures	0.68	7
9	Owner's / executor financial difficulties	0.66	9
10	Lack of timely decisions	0.66	9
11	Unexpected engineering problems (eg. sub soil conditions)	0.63	11
12	Rework due to wrong work	0.62	12
13	Failure to update schedules on time	0.60	13
14	Incomplete design at the time of tender	0.59	14
15	Lack of experienced (skilled) labor at the project location	0.54	15

Based on the responses made by respondents from the consultant office material shortage at the local market scored the highest relative importance index again with relative importance index 0.91. Contractors financial difficulties, payment delay for contractors, inadequate / deficiency in planning, scheduling & coordination, conflict between contractors & other parties (consultant and owner), and delay preparation & approval of drawing ranked from number 2 to 6 with relative importance indexes 0.83, 0.75, 0.74, 0.74, 0.72 respectively. And once again incomplete design at the time of tender and lack of experienced (skilled) labor at the project location ranked the least with relative importance index 0.59 and 0.54 respectively.

Table 4 RII computed from the contractor's response

ID	Hypothesized causes of Time overrun	RII	RANK
1	Material shortage in the local market	0.91	1
2	Contractors financial difficulties	0.84	2
3	Inadequate / deficiency in planning, scheduling & coordination	0.81	3
4	Payment delay for contractors	0.80	4
5	Design change	0.77	5
6	Delay preparation & approval of drawing	0.76	6
7	Lack of timely decisions	0.75	7
8	Conflict between contractors & other parties (consultant and owner)	0.74	8
9	Bureaucratic procedures	0.73	9
10	Owner's / executor financial difficulties	0.72	10
11	Lack of experienced (skilled) labor at the project location	0.69	11
12	Failure to update schedules on time	0.68	12
13	Rework due to wrong work	0.67	13
14	Unexpected engineering problems (eg. sub soil conditions)	0.63	14
15	Incomplete design at the time of tender	0.62	15

As it can be observed from table 4 material shortage in the local market is the top critical factor among the rest of the factors that were listed on the questionnaire. Material shortage in the local market scored a relative importance index of 0.91 from the perception of the contractor respondents. Contractors' financial difficulties and Inadequate / deficiency in planning, scheduling & coordination, and payment delay for contractors remained to be key factors that contribute the most to the time overrun. While lack of experienced (skilled) labor at the project location and incomplete design at the time of tender remained the least contributory factors for the delay of the projects.

Table 5 Overall RII and their rank

ID	Hypothesized causes of Time overrun	RII	RANK
1	Material shortage in the local market	0.90	1
2	Contractors financial difficulties	0.83	2
3	Inadequate / deficiency in planning, scheduling & coordination	0.79	3
4	Payment delay for contractors	0.79	4
5	Delay preparation & approval of drawing	0.74	5
6	Design change	0.73	6
7	Conflict between contractors & other parties (consultant and owner)	0.72	7
8	Lack of timely decisions	0.718	8
9	Bureaucratic procedures	0.708	9
10	Owner's / executor financial difficulties	0.70	10
11	Failure to update schedules on time	0.67	11
12	Rework due to wrong work	0.65	12
13	Lack of experienced (skilled) labor at the project location	0.64	13
14	Unexpected engineering problems (eg. sub soil conditions)	0.62	14
15	Incomplete design at the time of tender	0.59	15

Table 5 shows the overall relative importance index and ranking of the factors based on the responses from all the parties. Material shortage in the local market came out to be the most important success factor. This might be an indication of a problem in the purchasing process of materials for the projects. Which is mostly carried out by the client. Haseeb, et al (2011), ranked this factor as the third most important factor under material related causes of delay. Contractors' financial difficulty is another important factor that contributes to a delay in finishing the project successfully. The construction industry in developing countries is still growing. Therefore, it is normal to think that the contractors' may not be strong financially to complete the project in time with the agreed specifications. Mahamid, (2013), ranked "difficulties in financing projects by contractors" first in causing delays on construction projects. Inadequate / deficiency in planning, scheduling & coordination came out to be the third important factor according to the responders. It is clear that better planning, scheduling, and coordination of projects will lead to success. This demonstrates how important it is to plan a project properly, evaluate possible alternative courses of action, and take appropriate corrective actions to get back on track and finish successfully. Frimpong et al., 2003 ranked ineffective planning and scheduling as the second critical delay

factor affecting construction time in Ghana. while Assaf & Al-Hejji (2006) ranked ineffective planning and scheduling as the fourth important factor that causes delay in construction projects in Saudi Arabia. Payment delay for contractors is ranked the fourth most important factor for the successful completion of projects. This issue can be very critical where it may influence other causes such as contractor's financial difficulties, shortage of site workers, and ineffective planning and scheduling. Progress payment delay can add more pressure on the contractor's financial status which was ranked the second most important delay factor. Settling this issue may as well settle other issues simultaneously. Haseeb, et al (2011) ranked payment delay by the client first under client related delay factors. According to the responders' delay in preparation & approval of drawing and design change ranked the fifth and the sixth most important delay factor for the projects. Design change can happen at any stage of the construction phase. But the preparation and approval for the design change and drawing might cause delay on a project if not planned and executed effectively. The seventh important delay factor as perceived by the respondents is conflict among parties involved in the project. There are many parties involved in a project (client, consultant, contractor, sub-contractors, etc), the communication between the parties is very crucial for the success of the project. Proper communication channels between the various parties must be established during the planning and executing stages. Disputes can arise due to factors like; frequent owner interference, changing requirements, lack of communication, between various parties, etc… Any conflict among the parties can lead to severe misunderstanding and therefore, delays in the execution of the project occur as a result. In extreme cases, disputes can lead to total abandonment of the project. Sambasivan (2007) ranked conflict and proper communication among parties in ninth place as a factor that causes time overrun on building projects. Lack of timely decision, bureaucratic procedures ranked as the eighth and ninth important factor respectively. Bureaucratic procedures are common problems in governmental offices. Which can cause to add extra time on projects in cases of matters that need critical decisions or approvals. Responders ranked owner's financial difficulties as the tenth important factor. Construction works involve huge amounts of money and if the client's financial ability cannot meet the required amount of cost delays can occur. The owner's financial difficulties can cause late progress payments to contractors, delay in supplying materials for the project which consequently cause delay on the overall project.

According to the respondents' view failure to update schedules on time ranked the eleventh important factor. Project schedule plays a very important role in the success of any project. Schedule related problems can be associated to cash flow and financial difficulties faced by contractors, deficiency and inefficiency of site workers, inadequate contractor experience, contractor's poor site management, lack of proper communication among construction parties, etc. Schedules can cause significant delay therefore appropriate corrective measures should be taken to keep the project on track. Rework due to wrong work ranked the 12th important delay factor among all the hypothesized delay factors listed. Mistakes during the construction stage can be due to many factors like; accidents, inadequate planning, work done by an unskilled person, or miscommunication among parties. Due to these mistakes, a redo (rework) of work can be used as a corrective measure. Consequently, these redo of work can have an impact on the progress and cost of the project. Sambasivan (2007) ranked Mistakes and rework during the construction stage the tenth most important factor for delays.

However, lack of experienced (skilled) labor at the project location, incomplete design at the time of tender, and unexpected engineering problems were ranked as the least important factor by the responding parties.

4.3.2. Frequency of occurrence of the causes of time overrun

Table 6 Overall RII frequency of occurrence and their rank

ID	Frequency of occurrence of the causes of Time overrun	RII	RANK
1	Material shortage in the local market	0.90	1
2	Delay preparation & approval of drawing	0.82	2
3	Bureaucratic procedures	0.79	3
4	Inadequate / deficiency in planning, scheduling & coordination	0.78	4
5	Owner's / executor financial difficulties	0.72	5
6	Lack of timely decisions	0.71	6
7	Contractors financial difficulties	0.69	7
8	Failure to update schedules on time	0.68	8
9	Design change	0.68	8
10	Payment delay for contractors	0.67	10
11	Rework due to wrong work	0.65	11
12	Lack of experienced (skilled) labor at the project location	0.61	12
13	Incomplete design at the time of tender	0.60	13
14	Unexpected engineering problems (eg. sub soil conditions)	0.58	14
15	Conflict between contractors & other parties (consultant and owner)	0.58	15

As per clients', consultants' and contractors' response from the questionnaire survey, the frequency of occurrence of the hypothesized factors that causes time overrun on the studied area were ranked based on the results of frequency index.

The top most frequently occurring delay factor on the study area is material shortage in the local market with 0.90 of frequency index, Delay in preparation & approval of drawing ranked the next most frequently happening delay factor. Bureaucratic procedures ranked as the third frequently occurring factor. According to the respondents, inadequate / deficiency in planning, scheduling & coordination is the fourth most frequently occurring delay factor. Fetene (2008) ranked lack of planning and coordination as the fifth frequently occurring delay factor.

Owner's/executor financial difficulties, Lack of timely decision, and contractors' financial difficulties ranked fifth, sixth, and seventh frequently occurring factor as perceived by the responders. Failure to update schedules on time, design change, and payment delay for contractors were ranked eighth, ninth, and tenth most frequently occurring delay factors respectively. Fetene (2008) ranked progress payment delay for contractors as the eighth most frequently occurring delay factor.

However, rework due to wrong work, lack of experienced (skilled) labor at the project location, incomplete design at the time of tender, unexpected engineering problems, and conflict among parties ranked the least frequently occurring delay factor. Hennery, ruth, and Dan (2013) ranked incomplete tender document and conflict due to improper communication ninth and tenth frequently occurring delay factor respectively.

4.3.3. Spearman's correlation coefficient

Spearman's rank correlation factor is usually used to check the precision and accurateness of a data. It measures the strength of the relationship among different parties regarding different attributes. The correlation coefficient varies between +1 and −1, where +1 implies a perfect positive relationship (agreement), while −1 results from a perfect negative relationship (disagreement).

For this research, Spearman's correlation was used to measure the level of agreement (significant relationship) among the three parties. Therefore, three spearman's correlation tests were made to measure the agreement among the three responding parties in terms of their view to rank the hypothesized factors, which can contribute to time overrun on the understudied construction

projects. The tables shown below are summarized spearman's correlation coefficient results for Client versus consultant, client versus contractor, and consultant versus contractor tests.

Table 7 Client Vs Consultant Spearman correlation test

Correlations

			Client_RII	Consultant_RII
Spearman's rho	Client_RII	Correlation Coefficient	1.000	.898**
		Sig. (2-tailed)	.	.000
		N	15	15
	Consultant_RII	Correlation Coefficient	.898**	1.000
		Sig. (2-tailed)	.000	.
		N	15	15

A strong agreement on perceptions can be observed between clients and consultants. The spearman's rho calculated to be 0.898. The spearman rho is close to +1 which shows a strong positive agreement between the client and consultant respondents.

Table 8 Consultant Vs Contractor Spearman correlation test

Correlations

			Consultant_RII	Contractor_RII
Spearman's rho	Consultant_RII	Correlation Coefficient	1.000	.895**
		Sig. (2-tailed)	.	.000
		N	15	15
	Contractor_RII	Correlation Coefficient	.895**	1.000
		Sig. (2-tailed)	.000	.
		N	15	15

A strong positive correlation can be observed between the views of the respondents from the consultants' and the contractors' group. The calculated spearman's rho resulted to be 0.895. Which is again very much close to +1.

Table 9 Contractor Vs Client Spearman correlation test

Correlations

			Contractor_RII	Client_RII
Spearman's rho	Contractor_RII	Correlation Coefficient	1.000	.893**
		Sig. (2-tailed)	.	.000
		N	15	15
	Client_RII	Correlation Coefficient	.893**	1.000
		Sig. (2-tailed)	.000	.
		N	15	15

Clients and contractors also show a strong positive agreement on their perceptions. The calculated spearman's rho shows a 0.893 level of agreement between the respondents from the client and the contractor.

A strong correlation can be observed among all parties regarding the hypothesized time overrun factors. As all the rank coefficients are positive and close to 1, it shows that there is a strong agreement among perceptions of different parties.

4.4. Comparison between the contractual schedule and the actual schedule

Most of the housing projects in the study are facing the problem of time overrun. However, the degree of time overrun varies from one project to another. In this document review, the original contract document was compared with the revised contract document for the completed projects at the Koye Feche Akaki site.

The projects were named alphabetically for the purpose of this study.

Table 10 summaries of document review

ID	Project name	Starting date	Duration as agreed upon the contract	Date of completion	Delay
1	A	03-03-14	18 month	25-06-19	3.89 years
2	B	03-03-14	18 month	25-06-19	3.89 years
3	C	03-03-14	18 month	22-04-19	3.71 years
4	D	03-03-14	18 month	07-03-19	3.59 years
5	E	03-03-14	18 month	29-01-19	3.5 years

As it is clearly presented on the table, there is a significant difference between the planned and the actual performance of projects in terms of time requirements. As the researcher reviewed above, project efficiency is measured by its actual performance compared with what was planned

in terms of time, cost, and quality requirements. If any project failed to meet its planned requirement in terms of time, cost, and quality, that project will be assumed as inefficient.

The above summarized table shows that all the contractual documents submitted for the document review have faced time overrun. According to the contractual documents, all the projects of the Koye Feche housing project site started on March 3rd 2014 GC. with a contractual agreement to be completed after 18 months.

From the above table, it is revealed that 100% of the completed housing projects have faced time overrun in their project execution stage, as compared against the approved or the planned contractual project schedule. Generally, the time overrun ranges from one housing program to another. In the case of these document reviews, Project A delayed for three years and ten months while Project E delayed for three and half years.

It is possible to assume different causes/factors for the inefficiency of the above projects in terms of the time requirement. The researcher and the respondents believed the hypothesized factors were responsible for the time overrun.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. Summary

Delays are inevitable. However, they can be avoided or minimized when their causes are effectively identified and analyzed. The aim of this study is to identify the factors affecting time overrun on building construction projects under Addis Ababa City Administration: with a specific emphasis on the koye feche housing project akaki site as the case study. Questionnaire surveys and document reviews were undertaken to identify the existence, the factors, and their frequency of time overrun on the selected housing programs.

Based on the data collected, the researcher tried to investigate the causes of delay by identifying 15 factors. Respondents from each party were asked to rank the factors based on the five point likert scale. Then the score given by the respondents was analyzed by relative importance index and frequency index.

According to the rank given by the respondent material shortage at the local market, contractor's financial difficulties, Inadequate/deficiency in planning, scheduling & coordination, payment delay for contractors, and delay preparation & approval of drawing were identified as the top five delay causes. While, unexpected engineering problems, and incomplete design at the time of tender were identified as the least delay contributory factors.

The next section presents conclusions and recommendations based on the finding of the research. Results have been discussed in the previous chapter. This chapter gives a conclusion based on the results discussed in the last chapter. And also tries to suggest a recommendation for each involved parties as a way to help in minimizing and controlling the root causes of time overrun in public housing programs under the studied area.

5.2. Conclusion

From the results of the analysis of the respondents' response and the secondary data, the following conclusions were drawn.

Presentation of the existence and real extent of time overrun problem is important before identifying the factors contributing to time overrun. All the projects considered for this research were completed beyond their planned completion period. Therefore, the researcher concluded

that, time overrun on public housing projects at Addis Ababa city administration is a common problem.

From the research, it was found that all the involved parties are responsible for the problems of time overrun. (i.e. contractors, owner, and consultants).

Time overrun will have many unfavorable effects for the stakeholders of the construction industry like cost overrun, conflict and disputes among stakeholders and loss of reputation for professionals, loss of customers' faith and trust, poor quality of work, etc… It can be noted that owners, consultants, contractors, and even the economy of the city and the country are all affected by the problem of untimely delivery of these projects.

From the results of this thesis, 15 hypothesized factors for the causes of time overrun were ranked by the respondents. The causes of time overrun were analyzed based on the responses of the respondents. The most and the least contributory causes of time overrun were identified by the researcher based on the ranking of the delay factors by the respondents.

Accordingly, the researcher recognized that material shortage at the local market, contractors' financial difficulties, inadequate/ deficiency in planning, scheduling & coordination, and payment delay for contractors as the top most delay contributory factors. As these factors have the highest relative importance index RII≥0.75. The researcher labeled delay preparation & approval of drawing, design change, conflict among involved parties, lack of timely decision, bureaucratic procedures, and Owner's financial difficulties as the second most delay contributory factors with relative importance index of 0.75>RII≥0.7. Failure to update schedules on time, Rework due to wrong work was recognized as moderate contributory factors with RII 0.7>RII≥0.65. Lack of experienced (skilled) labor at the project location, Unexpected engineering problems, and Incomplete design at the time of tender were recognized as the least contributory factors with a relative importance index of RII<0.65.

Based on the frequency index obtained from the analyzed survey questionnaire, the researcher recognized that material shortage at the local market, contractors' financial difficulties, inadequate/ deficiency in planning, scheduling & coordination, and payment delay for contractors as the top most frequently occurring delay factors. As these factors have the highest frequency index of FI≥0.75. The researcher then labeled delay preparation & approval of drawing, design change, conflict among involved parties, lack of timely decision, bureaucratic procedures, and Owner's financial difficulties as the second most frequent cause of delay with

frequency index of 0.75>FI≥0.7. Failure to update schedules on time, Rework due to wrong work was recognized as moderately occurring delay factors with FI 0.7>FI≥0.65. Lack of experienced (skilled) labor at the project location, Unexpected engineering problems and Incomplete design at the time of tender were recognized as the least frequently occurring causes of delay on construction projects with a frequency index of FI<0.65.

The factors for delay can be different in different countries and situations. Therefore, based on the results and findings of this study we can conclude that the factors that contributed the most for the time overrun of the housing projects are material shortage in the local market, contractors' financial difficulties, inadequate/ deficiency in planning, scheduling & coordination, and payment delay for contractors. These are the critical factor for the delay of the projects as they all ranked as the top contributory and frequent with the highest relative importance index and frequency index.

At the same time, unexpected engineering problems, and incomplete design at the time of tender were found to be the least contributory and frequent factors with the lowest relative importance index and frequency index.

5.3. Recommendations

According to the results and findings obtained through this study, the following recommendations can be made as ways to minimize and control delays in construction projects.

The suggestions are presented for each involved party separately.

i) Client

The owner is one of the most important parties who is involved in the projects, and the office plays a key role starting from the conception phase through construction up to the operation of the projects. The following recommendations are forwarded to the client as it was believed it would help minimize time overrun.

- Secure (import) materials that are not available in domestic markets ahead of time: As it will avoid shortage of materials at the time of construction.
- Fulfill contractual obligations, like progress payment for the projects as it weakens the contractors' ability to finance the work. The client should ensure that adequate funds are available before projects are started so that the contractors can be paid in accordance with

the contract agreement. The client also should supply all the necessary materials for the construction of the projects on time with the required quality and quantity.

- The owner should allow sufficient time to prepare project briefs, preparation and approval of drawings, and other feasibility studies as it will reduce the contribution of inaccurate time estimation and unforeseen site conditions for the untimely delivery.
- Clients must ensure that their demand for design changes during the construction period should have no adverse effects on critical activities to avoid causing delays. All change order demands must be evaluated to assess their impact on the quality of the envisioned work, scope and cost, possible claims, and disruption to work to avoid unnecessary disputes and litigation.
- Select suitable contractors not only on the basis of the least bidder but also on experience, financial capacity, overall capacity, and other technical requirements.
- Clients should make quick and timely decisions to solve any problem that arise during the execution.
- Avoid/minimize unnecessary and excessive bureaucratic procedures in the clients' organization.

ii) Consultant

The consultant is one of the key role player in construction projects. Consultants translate the client's (owner's) needs and ideas into plans and drawings and supervise the translation of these plans and drawings into visible physical structures. The following are recommendations forwarded for consultants in order to help minimize delays on construction projects.

- Consultants should ensure that adequate site investigations are carried out both during feasibility study and conceptual design: to ensure that appropriate measures have been taken during the detailed design so as to avoid interruption of works to address the design challenges during the construction phase.
- Avoid incomplete and unclear designs and drawings as it contributes to time overrun by creating confusion on the rest of the stakeholders involved in the project and requires extra time to complete the drawing respectively. All the specifications, criteria's and requirements must be clear and easily understandable for contractors and other participants.

- Consultants should prepare a very detailed analysis in the design and drawing stage to reduce and avoid all the uncertainties and mistakes which the construction participants would face on the construction phase. However, if design and specifications are not precisely analyzed and stated, it will create disagreement between owners and contractors.
- Consultants should cross-check designs and details to eliminate errors and reduce rework after completion of designs and plans.
- Consultants should develop clear and complete project scope to avoid frequent changes.
- Design errors must be rectified immediately to avoid delays in the progress of works.
- Consultants should respond more proactively to necessary changes on owner needs and requirements.
- Consultants should timely respond and facilitate contractors' critical requests, like: payments, request for approval of construction materials in terms of quantity and quality.
- The consultant should ensure timely, accurate, and adequate communication among all the involved stakeholders from the conception phase to the completion and handover of the project.
- The consultant should ensure that adequate contractor with the required capabilities is awarded for the project.

iii) Contractor

Contractors are one of the stakeholders who participate directly in the construction projects; accordingly, the following recommendations are forwarded for contractors to help minimize delay on construction projects.

- Employing effective alternatives to help in raising adequate funds ahead of time to have sufficient finance to complete the project as per the contractual agreement.
- Contractors should use the funds gained from advance and progress payment to finance the project. Avoid financing other projects based on other projects' resources.
- Ensure effective time management and supervision through proper resource planning, schedule development, monitoring, and controlling to avoid delay.
- Evaluate possible alternative courses of action and take appropriate corrective actions to keep critical activities on track and finish successfully.

- Purchase construction materials and other items ahead of time with the agreed quality and specification as it can reduce the impact of supply and quality of material on the timely delivery of the projects. And also to avoid shortage or lack of materials.
- Contractors are advised to set up stores for the essential construction materials, and particularly for scarce materials or material that are in limited quantity in the local markets to avoid time overrun.
- Resolve conflicts and disputes raised during project progress among involved parties and workers to avoid project delay and total abandonment.

5.4. Limitation of the study

Any research paper from its start to completion perhaps encounter a complication. Fortunately, there was not much difficulty that the researcher faced in the preparation of this research thesis. However, the unwillingness of the respondent to fill the questionnaire was the major problem encountered to finalized this research.

5.5. Future Research

Future research can be carried out to determine the impact of time overrun on building construction project which is not identified in this study. Any interested researcher can study to identify the most significant and frequent factors contributing to the time overrun on building construction projects at a country level.

Cost overrun is another chronic problem in the construction industry. Accordingly, other researchers can also focus to identify the factors contributing to cost overrun on building construction projects.

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APPENDIX

JIMMA UNIVERSITY

School of Graduates Studies

Masters of Project Management (MA)

Questionnaire to be filled by clients, consultants and contractors

Dear respondents

This questionnaire is prepared to conduct a study in the partial fulfillment of a Master's Degree in Project Management (MA) program entitled with "Factors Affecting Time Overrun Of Building Construction Projects Under Addis Ababa City Administration: The Case Of Koye Feche Housing Project Akaki Site''.

Hence, you are kindly requested to give the necessary information for the research questions. There is no need to write your name and address; the information that you provide will be kept confidential and will only be used for academic purposes. The accuracy, honesty, and fairness of your response will have a great impact on the outcome of the research. Your cooperation and prompt is highly appreciated.

The questionnaire has three sections. The first section (Section A) consists of questions aimed at collecting General information (profile and experience in construction) of the respondents. The second section (Section B) is aimed at finding out the causes of time overrun. While the last section (Section C) is focused on the frequency of occurrence of the causes of time overrun.

"Thank you very much in advance"

QUESTIONS

SECTION – A (General Information)

Q.1 Name of Organization (optional) ----------

Q.2 Gender

Male ☐ Female ☐

Q.3 Respondents designation

Client ☐ Consultant ☐ Contractor ☐

Q.4 Relevant work experience (Years)

Up to 3 years ☐ 3-5 years ☐ Above 5 years ☐

Q.5 Educational qualification

Diploma ☐ 1st Degree ☐ Masters ☐ PHD ☐

Q.6 Number of project(s) involved.

Up to 3 projects ☐ 3-5 projects ☐ Above 5 projects ☐

Please indicate the significance rate of each factor by ticking the appropriate box.

For section B

E.S. = extremely significant (**5**)

V.S. = very significant (**4**)

N = neutral (**3**)

S.S. = slightly significant (**2**)

N.S. = not significant (**1**)

For section C

E.F. = extremely frequent (**5**)

V.F. = very frequent (**4**)

N = neutral (**3**)

S.F. = slightly frequent (**2**)

N.F. = not frequent (**1**)

SECTION B: Q.7 FACTORS THAT CAUSES TIME OVERRUN OF BUILDING CONSTRUCTION PROJECTS IN KOYE FECHE HOUSING PROJECT AKAKI SITE.

No	Hypothesized Variables (causes) of Time overrun	ES	VS	N	SS	NS
1	**ENGINEERING RELATED**					
1	Delay preparation & approval of drawing					
2	Incomplete design at the time of tender					
3	Design change					
4	Rework due to wrong work					
5	Unexpected engineering problems (eg. sub soil conditions)					
2	**RESOURCE RELATED**					
1	Contractors financial difficulties					
2	Owner's / executor financial difficulties					
3	Payment delay for contractors					
4	Material shortage in the local market					
5	Lack of experienced (skilled) labor at the project location					
3	**MANAGEMENT RELATED**					
1	Lack of timely decisions					
2	Failure to update schedules on time					
3	Inadequate / deficiency in planning, scheduling & coordination					
4	Bureaucratic procedures					
5	Conflict between contractors & other parties (consultant and owner)					

SECTION C: Q.8 FREQUENCY OF OCCURRENCE OF THE CAUSES OF TIME OVERRUN OF BUILDING CONSTRUCTION PROJECTS IN KOYE FECHE HOUSING PROJECT AKAKI SITE.

No	Frequency of occurrence of the causes of Time overrun	EF	VF	N	SF	NF
1	**ENGINEERING RELATED**					
1	Delay preparation & approval of drawing					
2	Incomplete design at the time of tender					
3	Design change					
4	Rework due to wrong work					
5	Unexpected engineering problems (eg. sub soil conditions)					
2	**RESOURCE RELATED**					
1	Contractors financial difficulties					
2	Owner's / executor financial difficulties					
3	Payment delay for contractors					
4	Material shortage in the local market					
5	Lack of experienced (skilled) labor at the project location					
3	**MANAGEMENT RELATED**					
1	Lack of timely decisions					
2	Failure to update schedules on time					
3	Inadequate / deficiency in planning, scheduling & coordination					
4	Bureaucratic procedures					
5	Conflict between contractors & other parties (consultant and owner)					