CAUSE AND EFFECTS OF DELAY ON ROAD CONSTRUCTION PROJECTS IN ADDIS ABABA

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Cause and Effects of Delay on Road Construction Projects in Addis Ababa

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Acknowledgment

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Abstract

Delays of a construction project can be defined as the late completion of works as compared to the planned schedule or contract schedule. Delays on the construction projects are the most common and frequent problem of the industry. Thus, the objective of this study was to identify the major causes of delays and the frequency of occurrence of effects of delays. This study was carried out based on literature review, questionnaire survey and document review of projects. A stratified sampling technique was used to select sample projects. Analysis techniques like relative importance index, Spearman correlation and 'T-test' were used to analyze the data collected so as to rank the factors causing delays, identify frequency of effects of delay and to show the degree of agreement between the different parties (clients, consultants and contractors).The results of the analysis show that the main cause for delay of road construction projects in the Addis are consultants, external or environmental related factors and clients. The spearman correlation test results show that there is no as such a strong agreement between any two parties of the industry towards identifying the cause and of delay on the projects. And the most frequent occurring types of effect of delay were found to be time and cost overrun. This result have been found the same for all groups of respondents, which confirms that all parties have the same view towards the effects of delay. Finally the study has made a recommendation to the players of the industry to work hand in hand to achieve a common goal which is completing projects on time and budget.

Statement of Certification

This is to certify that Biruk Zegeye have carried out his project work on the topic ″ Cause and Effects of Delays on Road Construction Project in Addis Ababa″ under my supervision.

In my opinion, this work qualifies for submission in partial fulfillment of the requirements for the award of Degree of Masters of Business Administration.

Signature_____

Dr. Mehari Mekonnen
(Assistant Professor of Investment and Finance)
Project Advisor

Declaration

I the undersigned, declare that this study is my original work and has not been presented for a degree in any other university, and sources of materials used for the study have been duly acknowledged.

Declared by:
Name Biruk Zegeye

Signature_____

Date_____

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The construction industry plays an important role in a nations' social, economical, and political development. This industry involved in many types of civil work physical infrastructures such as buildings, communication and energy related construction works, water supply and sewerage civil works are some of the major projects (program) in the construction industry (Wubishet Jakele, 2004). Construction is not only the major sector of the economy but also, it is the one that accounts from 12% to 25% of the GNP of both developed and developing countries (Netsanet Tsegaw, as stated in Wubishet Jakele, 2004). It consumes the higher percentage of the annual budget of the country; specifically in Ethiopia, it covers about 40%-58% of the annual budget (Wubishet Jakele, 2004). The construction industry is also the main source of vacancies especially for those developing countries where the industry is labor intensive. This industry, which is the backbone of the social, economical and political development of a country deals with scares resources as other industries. Therefore, any industry with a limited resource needs a proper management. More over the construction industry is full of uncertainty and no two projects of this industry are alike. These futures make the industry unique (Netsanet Tsegaw, as stated in Wubishet Jakele, 2004). There fore it requires a special management technique. Construction management is part of the broad field management, which deals with the management of the construction industry. This field is distinguished from the general management by the mission-oriented behavior of the construction projects (W.N Unnally, fifth Edition, 2002).

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Every construction project has a pre-determined time and budget. To maintain these stipulated factors (issues) proper management is required (Richard Fellows, 1983).

Therefore, time is one of the resources that the construction industry is using. Each project has a predetermined duration with defined beginning and completion time (date). A project, which is not completed with in the contract time (the time gap between the commencement date and the completion date specified in the contract) is called a delayed project. Delays could occur due to so many uncertainties of the future. Delay on construction projects is a universal phenomenon. They are usually accompanied by cost and time overruns. Construction project delays have a debilitating effect on all parties (owner, contractor, and consultant) to a contract in terms of; growth in adversarial relationships, distrust, litigation, arbitration, cash-flow problems, and a general feeling of apprehension towards each other (R.Fisk, 2002).

This study will try to identify the main factors and sources that cause delay and the effect of the delays on the stakeholders of the industry.

1.2 Statement of the problem

Managing uncertainty is one of the difficult tasks of a manager at any level. Construction project is a project that is bounded by limited time, physical resources, budget and uncertainty. So carefully managing these resources to the successful completion of the project is a crucial one. Many projects are not completed with in the specified time on the contract, even if the completion date is stated on agreement and signed by all the parties involved (client, contractor, consultant etc…) in a project. For a developing country like Ethiopia, having a standardized road is one variable to measure the degree of development. Moreover, Addis being a capital city and residence of the African union it is a must to have all the basic infrastructure,

road being the one and the most important. Even tough currently the city administration and the government are undertaking a radical change on the movement of implementing the newly revised master plan of Addis, and as a result they have been launching too many road projects starting from 1996 to date. Of all completed projects almost 75% of the projects are completed out of their initially proposed time and budget (Abdu, 2006). Out of these projects, local contractors hold more than 50% of them.

This study is aimed at answering the following questions

- What are the factors causing delay?
- What kinds of effects of delay are occurring more frequently?

1.3 Background of the Surveyor

This project was conceived for the partial fulfillment of the requirements for the degree of Masters of Business Administration. I have a bachelor degree in construction technology from Adama University on 2001 and more than 6 years experience on the construction industry.

1.4 Objective of the study

It has been repeatedly said that the construction industry is the main backbone of the construction industry. Having this in mind for a nation development, and for the players of the industry to stay and grow in the business and to be internationally competent enough, the industry need to have a way to manage its' resources properly. Currently many international contractors are entering the country to work in competition wit the local one. These foreign contractors are showing a grate performance by completing projects on time and with the best quality. Therefore for the local contractors to be competent enough and use the two most important resources of the industry (time and budget), it is vital to identify the main causes and effects of delay of projects. Therefore, this project will identify the principal causes

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of delay in the construction industry and most frequently occurring type of effects setting the following objectives.

- To identify the factors that are the main causes of delays of the road construction projects in Addis Ababa
- To identify the effect of delay on the construction industry and the country
- Identify which effect occurs frequently
- To investigate how strong is the agreement between any two steak holders of the industry towards identifying the main causes of delay and effects of delay on the road construction projects.
- To give recommendation on how to minimize the prevailing problems resulted from project delays

1.5 Scope of the project

The construction industry as mentioned in the introduction part of this chapter is one of the broadest industries, which involve many kinds of projects under it. So investigating the industry as a whole will be costly and time consuming. Due to this, the project focuses only on those road projects in Addis Ababa, which are held by local contractors of grade 2 and above.

1.6 Limitation of the study

There are some problems encountered while undertaking this project. The first is problems on data collection, which most respondents do not return the questioner on time. The second is frequent power failure, which was not taken in to account at the beginning of the project. The last but not the least is the Hawthorne effect (Benti et al, 2004), that reduces strength of the data collected, i.e. some contractors and consultants were not willing to provide exact information on delayed projects.

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1.7 Methodology

1.7.1 Data Collection Methods

Since the study is a survey type of research, information and data must be collected from various sources. To undertake this fieldwork, two kinds of techniques of data collection are used.

- Questionnaires: - A questionnaires has been designed and distributed to the selected samples of the population. The questioner has four different parts, which consists of the following.
- Document analysis (structured record reviews): - Recorded data are one of the major sources of resources of information about the past. Progress reports of different periods specially that of the recent period of the projects in consideration have been analyzed and reviewed to extract some data of each projects.

1.7.2 Sampling Techniques and Procedures

I. Sampling Techniques

It is not possible or feasible to make direct investigation to the whole population (all contractors, consultants and clients) involved on road construction in the city due to time and budget constraints. Therefore, the population of the study is restricted to those contractors, consultants and clients, which are involved only on projects in Addis Ababa

A stratified sampling is used to select the projects that are to be investigated for this study out of the population. To do so it is important to quantify the total number of projects, which are under construction in the city of Addis Ababa.

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According to the contract administration office of the Addis Ababa City Road Authority (AACRA), there are 31 projects, which are dully signed and awarded to contractors, but currently only 25 of them have started the real construction work. To make the conclusion of the study concrete and more realistic it is vital to consider only those projects, which have accomplished more than 50% of the total contract amount, which will reduce our proposed samples to 14 projects.

By stratified sampling, the proposed samples are divided in two groups, one by their contract amount and the other by their contract time given to accomplish the projects. From each group two projects the two extreme ends of the list are taken into consideration from each stratum. Two projects whose costs are the highest and the least and the other two whose contract times are the longest and the shortest are taken as representative samples. Accordingly, all parties involved on these four projects (Contractors, Client and consultants) are considered for the study.

Sample Size

It is quite clear that the more the sample size is the more accurate and concrete the conclusion of a study will be. There are three different parties evolved in each project, which are the contractor, client and the consultant so it is necessary to select the respondents form each party. So here on the study 46 sample are chosen from all parties involved in the selected projects with the following allocation to each party.

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RESPNDTS TABLE			
Party Description	No of sample taken from each project	No of projects in consideration	No sample from each party
Contractor	5	4	20
Consultant	4	4	16
Client	2	4	8
Client	-	2	2
The Total No of Samples			46

Table 1.1 Sample Selections

Since the questioner designed is too technical and needs some analytical skills the targeted respondents are comprised of, counterparties and follow up teams of the Addis Ababa road authority and project managers, site engineers, surveyors, material engineers, resident engineers and --- of contractors and the consultants.

1.7.3   Data Analysis Technique

The procedure used in analyzing of data aimed at establishing the relative importance of the various factors that contribute to causes of delays and relative degree of occurrence of effects of delays. There are three steps used in analyzing the data: calculating the relative importance index; ranking of factors in each category based on their relative importance index, adjusting of the ranks with equal relative important index and determining degree of correlation on ranking the factors among groups. Microsoft office XL and statistical software called SPSS are used to undertake the calculations.

Step 1: Calculating relative importance index

Odeh and Battaineh (2002), to determine the ranking of factors from the viewpoint of respondents', Relative importance index is used. Therefore, the

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relative index of each factor rated by clients, contractors and consultant is calculated by the following formula.

$$I = \frac{\sum\limits_{i=1}^{5} W_i\, x_i}{\sum\limits_{i=1}^{5} x_i}$$

Equation 1 Relative Importance Index

Where:

I = Relative important index = 1,2,3,4, and 5 for: (Section B: Very high, High, Medium, Low, and Very low contributing, respectively.); and (Section C: Always, Mostly, Sometimes, Seldom, and sometimes, respectively)

W_i = the weight assigned to **Error! Bookmark not defined.** i_{th} response = 1, 2, 3, 4, 5, respectively.

x_i = frequency of the i_{th} response given as percentage of the total responses for each factor.

On the cases where the relative important index of two or more factors are equal the ranking is made by taking the average of the ranks to be assigned, if the values were not equal and the ranking will continue from the next value. To find out the average rank of each factor from the viewpoints of all respondents mean of each relative importance index is calculated. For ranking of the aggregate index and rank of categories of the factors, the average relative important index is obtained by calculating the mean of the mean of the relative important index.

Step 2: Calculating the Spearman's rank correlation coefficient

The Spearman's Rank correlation coefficient is a measure of association, in this case between three groups of respondents and the variables were measured in ordinal scale (Sheskin, 2004).

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In order to determine weather there is significant correlation of the ranking of factors that causes delays and frequency of occurrence of effects of delays construction delays between the different groups of the respondents, the Spearman's Rank correlation coefficient is used. It is computed as:

$$r_s = 1 - \frac{6\sum d^2}{N(N^2 - 1)}$$

Equation 2 spearman correlation coefficient

Where:

r_s = Spearman's rank correlation coefficient;

d = the difference in ranking between client, contractors and consultants; and

N = the number of variables, respectively.

Step 3: Hypothesis testing of degree of agreement between groups of respondents

In order to know the degree of agreement between the three groups on weighting and ranking factors, a test of hypothesis is needed.

> **Null hypothesis Ho:** This hypothesis assumes that there is no significant agreement in rankings between two groups.
>
> **Alternative hypothesis H1**: There is an agreement in rankings between the two groups

The association between the ranking of client, contractors and consultants is verified by a hypothesis testing at 95% significance where:

$$Z = r_s = \sqrt{N - 1}$$

Equation 3 significance hypothesis testing

From the Z table on the appendix A-1 the **Zo** value for a 95% confidence is 1.64. So by initially setting that there is no relation ship between any two

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groups that is by accepting Ho, the calculated **Zo** value is going to be compared with Z_o (1.64) , if it is less than or equal the null hypothesis is accepted which implies there is no significance agreement between the parties. If the calculated value is greater than 1.64 then, the alternative hypothesis is accepted which, confirms there is a strong agreement between parties.

i.e

If **Z_o** value ≤ 1.64, accept H_o --------------------------- No significant Agreement

If **Z_o** value > 1.64   Reject H_o and accept H_a -------------Strong Agreement

After the computing, the above equations the results will be presented by tables and figures and will be discussed thoroughly under each facto group.

1.8 Project Charter

The project is organized in such a way that it has four chapters. The first chapter which is the introduction part consists of eight sub-chapters including back ground of the project, statement of the problem, objectives, limitation, scope, methodology and project charter, . The second chapter is the literature review part, which includes discussions of the general aspects of construction projects and previous studies on related topics of delay of construction projects. The third chapter is the main part of the project, which is the analysis of the data collected through questioners and document review. The last chapter is the conclusion and recommendation, which tries to summarize the findings of the project and propose some points on how to resolve or at least minimize the delays on the road construction project in particular and to the construction projects as a whole.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

This part of the project presents a brief summary of previous studies, which are related to the subject under study. It also briefs the terms and points used throughout the project.

2.1 Construction Project

Construction Projects are those projects, which are intended to undertake the construction of buildings, infrastructures, and special purpose facilities. Projects are classically defined by the need to complete a task on time, to budget, and with appropriate technical performance/quality (Antil and Woodhead, 1990).

2.1.1 Construction project Categories

Construction projects are broadly classified based on the purpose they are intended to. The most common one are,

Building Construction Projects: - Those projects, which are involved only on construction of residential, commercial complexes, educational, recreational facilities, hotels, warehouses and marketing facilities. Such projects constitute the largest portion of the construction industry. It serves humankind by providing shelter and service for its habitation, education, health social and recreational purpose. Usually these projects are labor intensive.

Infrastructure Projects: - These projects are highly capital intensive and heavy equipment and machinery oriented. It involve movement of large quantity of bulk materials like natural and crushed earth material, steel,

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concrete etc---. These projects are includes dams and canals, high ways roads, rail ways, airport terminals, hydro electric stations, water treatment and supply line, sewage disposal networks, telephone and electric line laying, dumps, and any construction activities which build infrastructures which are going to be the backbone for the growth of economy of a country. The government or aids and loans to the government mostly finance such projects.

Industrial projects: - these are projects, which are engaged in the construction of manufacturing and processing plants like steel mills, textile industries, oil refineries, and the like. They projects need heavy investment and are highly specialized. The government, public, and private, finances them.

Special purpose projects: - projects, which are intended to come up with a special purpose these, include Satellite stations, nuclear station and the like (Antil and Woodhead, 1990).

2.1.2 Participants of construction Project

As any industries, there are different players, which are involved in these industries. In addition, the following are common participants for all type of projects in the construction industry.

1. Client: Those parties, which are funding the project and are going to sometimes supply material and equipment and be the owner of the project after completion.

2. Contractor: - The one who is responsible for undertaking the actual construction of projects. Based on the contract type, it could be responsible furnishing of the material, equipment and labor necessary for the successful completion of the project or some of them.

3. Consultant: These are parties, which are going to control and support the execution of the project on the behalf of the owner weather the contractor is

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doing his level best to accomplish the work of the project in the predefined quality, time and method. It also serves as an arbiter between the contractor and the client in case of disputes.

4. Designer: - it is the party, which converts the idea of the owner to the real world project (blue print). It is responsible for the execution of the initial design of the project. The design includes both the architectural, structural, sanitary and electrical parts of the project.

2.1.3 Contract

As any contract, the contract of construction project is made between the client and all of the parties other than itself. The contract of the construction project is bounded both in time and on budget with some contingencies made on the budget only. The contract usually has a legal status according to the law of contract of a country.

2.2 Delay

Delays of a construction project can be defined as the late completion of works as compared to the planned schedule or contract schedule. Delay is generally acknowledged as the most common, costly, complex and risky problem encountered in construction projects. Because of overriding importance of time and money for both the owner (client) in terms of performance and the contractor in terms of money, it is the source of frequent dispute and claims leading lawsuits. Delays occur in every construction projects and the magnitude of these delays varies considerably from project to projects. Some projects are only a few days behind schedule; some are delayed by over a year. Therefore, it is essential to define the actual causes of delay in order to minimize and avoid delay in any construction project. (Ahemed et al, 2003)

2.2.1 Types of delays

Delays can be grouped in to four broad categories according to compensability (salman and seid, 2003). These are non-excusable delays, excusable–non compensable delays, excusable-compensable delays and concurrent delays.

I. **Non-Excusable Delays:** on-excusable delays are delays, which the contractor either causes or assumes the risk for it. It is non-justifiable delay, in which the construction company is liable for compensating the owner. These delays might be the results of inadequate scheduling or mismanagement, construction mistakes, weather, equipment breakdowns, or staffing problems. Such delays are inherently the contractor's responsibility. These delays are within the control of the contractor or are foreseeable; however, it is not necessary that they be both to be considered as non-excusable delays.

II. **Excusable-Non Compensable Delays:** When delay is caused by factors that are not foreseeable, beyond the contractor's reasonable control and not attributable to the contractor's fault or negligence, it may be "excusable". This term has the implied meaning that neither party is at fault under the terms of the contract and has agreed to share the risk and consequences when excusable events occur. The contractor will not receive compensation for the cost of delay, but he will be entitled for an additional time to complete his work and is relieved from any contractually imposed liquidated damages for the period of delay. Force majored cause of delay such as civil war is categorized under excusable-non compensable delays.

III. **Excusable-Compensable Delays:** These are types of delays that are justifiable both for extension of time and monetary compensations. In addition to the compensable delays that result from contract changes, there are compensable delays that can arise in other ways. Such

compensable delays include suspensions, or interruptions to all or part of the work caused by an act or failure to act by the owner resulting from owner's breach of an obligation, in the contract. If the delay is compensable, then the contractor is entitled not only to an extension of time but also to an adjustment for any increase in costs caused by the delay. Work variations cause directly or indirectly an increase or decrease in the cost, or the time required for the performance of any part of the work. In such changes, an equitable adjustment shall be made and the contract will be modified accordingly. Excusable and compensable causes of delays such as differences in site condition and suspensions by the client also affect completion time of construction projects.

IV. **Concurrent Delays:** Concurrent delays occur when both owner and the contractor are responsible for the delay. Generally, if the delays are inextricably intertwined, neither the contractor can be held responsible for the delay (forced to accelerate, or be liable for liquidated damages) nor can he recover the delay damages from the owner. Until the development of CPM schedule analysis, there was, no reliable method to differentiate the impact of contractor caused delays from owner caused delays. With the sophisticated computerized techniques now available, however, it has become possible to segregate the impacts of apparently concurrent owner and contractor delays (Antil and Woodhead, 1990).

In analyzing concurrent delays, each delay is assessed separately and its impact on other activities and the project duration is calculated. The following guidelines for classifying these kinds of concurrent delays:

- If excusable and non-excusable delays occur concurrently, only a time extension is granted to the contractor;

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- If excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to time extension, but not to damages; and

- If two excusable with compensation delays occur concurrently, the contractor is entitled to both time extension and damages. An example of a concurrent delay would be if the client failed to supply detailed designs for specified machine installations (excusable delay with compensation) while at the same time, the contractor who would have installed those machines was on strike (excusable delay without compensation). In this scenario, since both excusable with compensation and excusable without compensation delays are present, the contractor would be entitled to a time extension, but not to damages.

2.2.2 Prior studies on causes and effects of delay

Many scholars have studied the causes of construction project delay for the past few years and have identified some factors as the main causes of delay. Many of them have dealt with the effect of the delay and few on the causes of the delay. The following are some of prior studies on cause and effects of delay.

A. Studies on Causes of Delay

Researchers have studied the causes of delay and have tried to identify the root factors that cause delay on different kinds of projects in the construction industry (road, building, railway and hydro projects). Even though such projects could differ by their nature and scope, the result of almost all the studies have showed that the so called the root factors are common to all kind of projects. There are two kinds of causes for delay in construction projects.

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I. **Internal Causes:** Such causes include the cause arising from one or many of the parties, which are involved in the project.

II. **External causes:** These are causes, which do not arise from the four parties, and are based on some external factors like Government, materials, suppliers or weather. (Ahemed et al, 2003)

Many factors have contributed to causes of delays on construction projects to date. These range from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment.

Assaf, et. al.(1995) studied the causes of delays in large building construction projects in Saudi Arabia. The most important causes of delay identified includes, late approval of shop drawings; delays in payment to contractors and the resulting cash problems during construction; design changes; conflicts in work schedules of subcontractors; slow decision making and executive bureaucracy in owners organizations; design errors; labor shortage and inadequate labor skills.

Ogunlana, et al. (1996) studied the delays in building project in Thailand, as an example of developing economies. They concluded that the problems of the construction industry in developing economies could be nested in three layers: problem of shortages or inadequacies in industry infrastructure, supply of resources; problems caused by clients and consultants; and problems caused by incompetence of contractors. They have classified source and causes of delays into six groups:

- Owners related factors include change orders and slow decision making;
- Designers related factors include incomplete drawings and low response;

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- CM or inspector related factors include deficiencies in organization, deficiencies in coordination; and uncompromising attitude;
- Contractors related factors include materials management problem, deficiencies in organization, coordination deficiencies, planning and scheduling problems, equipment allocation problems, financial difficulties, and inadequacy of site inspection;
- Resources suppliers related factors include shortage of construction materials, late delivery, price escalation, low quality of materials, shortage of site workers, shortage of technical personnel, insufficient numbers of equipment, and frequent equipment breakdown; and
- Others factors include confined site, problems with neighbors, and slow permits by Government agencies.

Mezher and Tawil (1998) conducted a survey of the causes of delays in the construction industry in Lebanon from the viewpoint of owners, contractors and architectural/engineering firms. It was found that owners had more concerns with regard to financial issues; contractors regarded contractual relationship the most important, while consultants considered project management issues to be the most important causes of delays.

Chan and Kumaraswamy (1996) surveyed the causes of construction delays in Hong Kong as seen by clients, contractor and consultants, and examined the factors affecting productivity. The results of their research indicate that the five principal and common causes of delays are poor site management and supervision; unforeseen ground condition; low speed of decision making involving all projects team; client initiated variations; and necessary variation of works. These causes were categorized into the following into eight groups:

- Project-related factors include project characteristics, necessary variations, communication among the various parties, speed of decision making involving all project teams, and ground conditions;

- Client-related factors include those concerned with client characteristics, project financing, their variations and requirements, and interim payments to contractor;
- Design team-related factors include design team experience, project design complexity, and mistakes and delays in (producing) design documents;
- Contractor-related factors include contractor experience in planning and controlling the projects, site management and supervisions, degree of subcontracting, and their cash-flow;
- Materials related factors include shortages, materials changes, procurement programming, and proportion of off-site prefabrication;
- Labor factors related include labor shortages, low skill levels, weak motivation, and low productivity;
- Plant/Equipment related factors include shortages, low efficiency, breakdowns, and wrong selection; and
- External factors include waiting time for approval of drawings and test samples of materials and environmental concerns and restrictions.

Abd. Majid and McCaffer (1998) studied the factors of non-excusable delays that influence contractor's performance. They classified the main causes of non-excusable delays according to the source of occurrence, and then identified the factor contributing to those causes. It is assumed that the client has more control over the compensable delays and can take action to prevent them. The contractor is expected to have control over the non-excusable delays and, presumably, do more to prevent them. They classified the factor of causes of non-excusable delays into twelve groups: material-related delays; labor-related delays; equipment-related delays; financial-related delays; improper planning lack of control; subcontractor-related delays; poor coordination; inadequate supervision; improper construction

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methods; technical personnel shortages; and poor communication. The following are a brief description of these factor categories:

- Material-related delays factors include late delivery, unreliable supplier, damaged materials, poor quality, poor materials planning, poor monitoring and control, and inefficient communication;
- Labor-related delays factors includes low mobilization, unreliable subcontractor, poor labor planning, strikes, poor workmanship, low morale/motivation, absenteeism, poor monitoring and control, and inefficient communication;
- Equipment-related delays factors include poor equipment planning, late delivery, equipment breakdown, improper equipment, unreliable supplier, poor monitoring and control, and inefficient communication;
- Improper planning factors include attitude, inappropriate practices/procedures, lack of facilities, and lack of experience;
- Financial-related delays factors include delay payment to supplier and/or subcontractor, inadequate fund allocation, poor monitoring and control, and poor financial planning;
- Lack of control factors include lack of experience, attitude, shortages of personnel, inappropriate practices/procedures, low morale or motivation, and deficient contract;
- Poor coordination factors include inappropriate practices/procedures, shortages of personnel, and lack of experience;
- Inadequate supervision factors include too many responsibilities, shortages of personnel, shortages of personnel, absenteeism, inappropriate practices/procedures, poor quality, and poor labor planning;
- Improper construction methods factors include wrong methods statement, lack of experience, inadequate fund allocation, inappropriate practices/procedures, and un availability of proper resources;

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- Technical personnel shortages factors include strike, absenteeism, lack of experience, poor planning, and slow mobilization; and
- Poor communication factors include lack of facilities, lack of experience, and inappropriate practice/procedures.

Al-Momani (2000) conducted a quantitative analysis of construction delays by examining the records of 130 public building projects constructed in Jordan during period of 1990-1997. The researcher presented regression models of the relationship between actual and planned project duration for different causes of delays. The researcher concluded that the main causes of delays in construction projects relate to designers, user change, weather, site conditions, late deliveries, economic conditions, and increase in quantities.

Odeh and Battaineh (2002) studied causes of construction delay in Jordan. In their study presents, results of the survey indicate that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision-making, improper planning, and subcontractors are among the top ten most important factors. They classified the causes of delays into the following eight major groups:

- Client related factors include finance and payments of completed work, owner interference, slow decision-making by owners, and unrealistic imposed contract duration;
- Contractor related factor include subcontractors, site management, construction methods, improper planning, mistakes during construction, and inadequate contractor experience;
- Consultant related factor include contract management, preparation and approval of drawings, quality assurance/control, and waiting time for approval of test and inspections;

- Material related factor include quality of material and shortage in material;
- Labor and equipment related factor include labor supply, labor productivity, and equipment availability and failure;
- Contract related factor include change orders, mistakes and discrepancies in contract documents, contractual relationship related factor include, major disputes and negotiations, inappropriate average organizational structure linking all parties to the project, and lack of communication between the parties; and
- External factors include weather condition, regulatory changes and building code, problems with neighbors, and unforeseen ground conditions.

Frimpong, et al. (2003) revealed the main causes of delays in construction of ground water projects in Ghana included monthly payment difficulties from agencies, poor contract or management; material procurement, poor technical performances, and escalation of material prices.

Long, et al. (2004), studied the problems in large construction projects in developing countries, a case study from Vietnam. They revealed that the problems could be grouped under five major factors; incompetent designers/contractors; poor estimation and change management; social and technological issues; site related issues; and improper techniques and tools. All most all of the literatures sited above have identified only the causes of delay at the construction (execution) stage. But every project passes through five different stages namely; conceptual phase, planning phase, designing phase, tendering phase, execution phase and commissioning phase. Even if this project focuses on the finding of the causes of delays at execution and commissioning phase it is vital to know the causes of delays at

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all stage of the project life cycle. The following are causes of delays at the different stages:

a. Conceptual phase

This phase accounts for the scope and requirement of the project. Considerable time is required to set up the scope. Factors influencing delay in this phase include (Ramalingam, 2005).

1. Inadequate and incomplete scope of the project
2. Frequent changes in the concept, scope and requirements
3. Lack of planning and inadequate knowledge on the requirement
4. Lack of experience in a particular technology
5. Fear in deciding the scope
6. Inadequate executive support
7. Lack of owner's involvement and Scope of the project is wrongly defined
8. The life of the utility and the scope of its various facilities are not known
9. Changes in the requirements are considered due to late thinking
10. Project is conceptualized on critical / emergency situation
11. Quickly finalizing of the conceptual planning
12. Facilities and associated sub systems not thought of as a whole system
13. Flexible acceptance of changes, without examining the feasibility and cost effectiveness and introducing additional facilities at a later stage
14. Conventions are followed without examining alternatives. Alternatives may be cheaper, easier and better

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b. Design phase

The detailed specifications, drawings and work schedules are defined along with the cost details of the project. In these processes, the following factors contribute to delays at the design stage (Ramalingam, 2005).

1. Different groups in the organizational structure have different attitude towards the project
2. Conventional methods are followed in designing
3. Inadequate knowledge of advanced technology and availability of systems
4. Inaccurate cost data of materials, labor and equipments
5. Adequate and accurate site data are not available for planning and design
6. Specifications, designs and scheduling are poorly drafted causing ambiguity in contract
7. Inadequate information on unique problems of the project & Shortage of experts in certain areas of the projects cause delays.
8. Reference to regulatory requirements, environmental clearance, local clearance etc. is not taken on time
9. Poor expertise in the design group, not having complete knowledge of the full system results in poor design
10. Defective design due to inadequate / wrong site data is accepted
11. Non-involvement of users at the design stage
12. Designers are different from executors and users
13. Changes in the project team midway

c. Tendering Phase

The cost overrun takes root at the tendering phase and some of the factors adding time and cost to the project include:

1. Poor response to tender notification due to non-publishing of Notice Inviting Tender (NIT) in newspapers, and not widely publishing due to cost of press publications
2. Unclear terms in press notification about deciding parameters for qualifying bidders. The schedule, specification, terms, and conditions of contract in the tender document contain inadequate and ambiguous terms
3. Presentation of Illegible documents on drawing, specifications and schedules in tender documents. Obsolete specifications and unavailable materials are mentioned
4. No time conscience in framing document and processing tender
5. Incomplete tender documents with incomplete designs and scopes are used
6. Influences and interference from different bidders at the time of tender evaluation
7. English terms in the tender are often interpreted to violate the intentions
8. Interference and influence from higher ups are entertained
9. Delay in award due to mishandling of tender process at tender opening, in evaluation and at final decision-making process
10. Bidders always intend to have dialogue with owners and hence keep terms ambiguous in their offers. Keep details incomplete and delay tender processing by creating unethical influence from external sources
11. Too many decision makers in hierarchy, having different priorities and objectives, are involved in deciding the tender process
12. Decisions are reversed at an advanced stage of tender finalization due to procedural changes

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d. Execution Phase

The impact on quality, cost and time is felt more at the execution stage of the project. The main contractor, after award of the work, searches for sub-contractors who can supply materials at cheaper rates. In this process of identifying the cheap vendor, the time and quality are compromised (Ramalingam, 2005).

The factors normally encountered during construction phase include:

1. Delay in site clearance and handing over the site to the contractor after the award
2. Contract Analysis to understand the intention of the contract terms and conditions clearly is not made. Programmed schedule for execution is not done in the beginning
3. Execution time schedule for all activities and their inter-relations are not decided
4. Sub-contractors are not identified in time. Sub-contractors specifications are not checked with the contract specifications
5. Delay in approval of drawings by the consultant. Delay in Inspection schedule by the contractor. Delay in the accepted inspection schedule by the consultant
6. Delay in inspection clearance due to non-adherence to specifications, and delay in manufacturers program
7. Supervision and site coordination are not done by the contractor during execution at site
8. Obsolete construction methods with labor-intensive activity are used which contribute to loss of time and poor quality of construction
9. Non-use of automated machines to ensure quality and increased daily turnover
10. Poor initial funding of the project by the contractor and weekly wage payments are uncertain.

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11. Lack of timely resources of materials, machineries and workforce and their management
12. Delay in measurements of works executed by the consultants / owners
13. Delay in preparation of bills by the consultant
14. Delay in payment of bills by the owner
15. Delay in final testing of system due to little enthusiasm by the main contractor
16. No concern about settlement of final bills, on contract closing
17. Poor site storage conditions for construction materials, difficulties in finding skilled manpower, absenteeism, temperamental job supervisors and all cause expensive delays in job completion
18. Minor associated works are not included in the contract
19. Incompetent project managers mishandle the project
20. Quality and experienced project managers avoid project execution responsibility by shear fear of vigilance and audits
21. Concentrating only on the main cost by the client, which causes delay while deciding on the contingencies during execution

e. Commissioning Phase

At the commissioning phase, most projects are usually completed in a hurry to declare the system is functional (Ramalingam, 2005). All team members work to 'somehow commission the project' on the politically declared date of completion, ignoring many factors. These shortcomings cause functional problems at a later stage. The lessons learnt are not analyzed and documented for improvement in future projects. The major factors, which depict a poor picture of the project in reference to cost and time overruns include Poor documentation, Failure of sub-system components during pre-commissioning, non-availability of standby components for replacement, rectification of defects is ignored. Taking over by operation staff is delayed,

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no system of documentation is followed on in-built systems layout and drawings, Supervisors and executors are transferred before finalization of work and so on (Ramalingam, 2005).

B. Studies on Effects of Delay

Aibinu and Jagboro (2002) studied the effects of construction delays on project delivery in Nigerian construction industry. The six effects of delay identified were time overrun, cost overrun, dispute, arbitration, total abandonment, and litigation as shown in Table 2.1. By a questionnaire evaluates and through empirical method assesses the effects of construction delays, and the findings showed that time and cost overruns were the frequent effects of delay. The following table presents the effects of delay in ranking order according to their frequency of occurrence.

Effects of Delay	Rank
Time overrun	1
Cost overrun	2
Dispute	3
Arbitration	4
Litigation	5
Total Abandonment	6

Table 2.1 Effects of Delay
Source: Aibinu and Jagboro (2002)

Manavazhia and Adhikarib, (2002) conducted a survey to investigate material and equipment procurement delays in highway projects in Nepal. Delay in the delivery of materials and equipment to construction sites is often a contributory cause to cost overruns in construction projects in developing countries. An assessment of the causes of the delays and the magnitude of their impact on project costs were also made. The survey method was used in conducting this research involving 22 highway projects.

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The main causes of material and equipment procurement delays were found to be (in rank order) organizational weaknesses, suppliers defaults, governmental regulations and transportation delay. However, the actual impact of these delays on project costs was found to be on average, only about 0.5% of the total budgeted cost of the projects. Among materials, delays in the supply of aggregates and equipment were found to occur most frequently.

C. Studies on relationship between cause and effect of delay

Based on the above studies, it can be inferred that the earlier studies concentrated on either the causes or the effects separately. However, some studies have alluded to the probable link between the causes and effects of delays without a systematic analysis. Manavizha and Adhikarib (2002) linked the material-related causes to the probable cost overruns in construction projects in Nepal. Assaf and Al-Hejji (2006) linked the contractor-related and labor-related causes to the probable time overruns in construction projects in Saudi Arabia. Odeh and Battaineh (2002), linked the contract-linked causes to the probable disputes occurring in construction projects in Jordan. Chan and Kumaraswamy (1997) linked the consultant- related and client-related causes to the probable time overruns in construction projects in Hong Kong. Murali and YauWen, (2007), have studied both the causes and effects of delay on Malaysian construction industry and identified six major effects. These are, time overrun which mainly arise from client and contractor factors of cause of delay, cost overrun mostly from contractor related cause, disputes which arise from contract relation related, client and external factor related, arbitration from client and contract relation factors, litigation which arise from client, labor, contract and external factor related and total abandonment. Construction cost overrun is a common problem in the construction industry. It is believed that construction projects experience an

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increase in cost of about 33% on average (Hartley and Okamoto, 1997). Over the past few years, state transportation agencies have experienced an increasing trend of construction cost overrun. To illustrate the problem, in a survey of 102 recently completed projects with initial budget USD 302.7 million conducted by the Florida Department of Transportation, the construction cost overruns were found to be USD 28.6 million (9.5%). Over half of this amount (USD 15.6 million or 5.2% of the budget) was classified as avoidable costs, and the remaining amount was considered unavoidable. About USD 4.2 million (1.4% of the budget) in avoidable cost overruns did not add value for citizens and represent wasted money. In general, steps need to be taken to minimize cost overruns.

CHAPTER THREE

ANALYSIS AND PRESENTATION

Introduction

This chapter presents the analysis and discussion of the data collected through questioners and the documents reviewed. The data is analyzed by the techniques analyzed earlier and presented in tabular and graph forms for simplicity. The questioners were distributed to contractors, clients and consultants of selected projects. A total of 46 questionnaires were distributed out of which 42 are collected from volunteer respondents. Table 3.1 shows number and rate of responses by major stockholders.

No	Participants	Distributed in Number	Returned in Number	Response Rate %
1.	Contractors	20	20	100
2.	Consultants	16	12	75
3.	Clients	10	10	100
	Total	**46**	**42**	**91.3**

Table 3.1 Respondent Rate

As it can be seen from, the tables above almost 91% respondents have returned the questioner except four consultants from different projects. The respondents are higher officials, project counter parties of the Addis Ababa road authority, technical staffs of the consultants and contractors (project managers, resident engineers, material engineers, site engineers and surveyors) of the selected projects.

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3.1 Analysis of Data

a) Analysis technique

The analysis of data was done using the techniques described on the methodology part of the previous chapter. The relative importance index is calculated using the equation **Eq. 1**(page 7) all factors hypothesized on the questioners and they are ranked according to their relative value of importance index. For those factors which have an equal relative important index average rank have been given by taking the average of the consecutive ranks. The spearman correlation test have been made to all possible combinations of respondents and for each category of factors using the equations **Eq. 2** (page 8) and **Eq. 3** (page 9) discussed on methodology part. The detail analysis is presented as follows starting from the analysis of causes of delay, which is the second part of the questioner.

b) Characteristics of data

According to the data collected from the respondents through questioners and the review of the latest report of the projects prepared by the consultants the profiles of the respondent, company and project is as follows **Respondent profile**

- 92.8% of the respondents are male and are aged between 25-56 years and 7.2% female age between 32-40 years.
- All respondents have at least a collage diploma and out of all 4.8% have postgraduate degree, 85.7% have first degree and the left 9.5% have collage diploma in civil engineering and related fields.
- Only seven of the respondents have an experience, which is less than 5 years. Out of these, four of them are working at the client side and the other three for contractors.

- 28.5% of the respondents work for consultants, 47.6% for contractors and 23.8% for client part.
- Only 11.9% of the respondents have been involved on more than four road construction projects. Out of these 58% are working for consultants.
- Around 67% of the respondents have participated on the full life cycle of at least two projects and around 18% on only single project.

Company Profile

- Since the Addis Ababa road authority is the one responsible for the road sector of the city, it is the only client included under the study. Four consultants and three contractors have been investigated for the survey. One contractor investigated twice, for involving on two projects simultaneously.
- Only one contractor has an experience below 5 years on the construction industry.
- Except the client, all the companies have been involved in less than 10 road projects. Moreover, two of the contractors have been involved on less than five road projects.
- Only the client was willing to declare that currently the company has 28 projects functional, the others are not willing to give the information about in how many projects they are currently engaged in for known reasons.

Projects Profile

- The cost of all projects under consideration is between 150 and 300 million birr.
- All the contractors, client, and consultant of the projects are local except one consultant, which is working in joint venture with a foreign company.

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- All the projects have accomplished more than 50% of the total contract amount.
- The percentage of delay of the projects in time ranges between 17-53% of the contract time.

3.2 Analysis of Causes of Delay

3.2.1Analysis of factors causing delay under each category

All the hypothesized causes of delays of the eight categories were analyzed and the results of each category are presented one by one below.

I. **Factors of material related cause of delay**.

Material related factors are one of the categories that are causes of delay for the road construction projects. Under this category, seven factors were found as main cause for the project delay. These factors were ranked by the respondents according to the degree of each factor have to the project delay. Table 3.1.1 presents the result of the analysis of the factors under this category by each group of respondents (client, contractor and client). According to the result escalation of material price, shortage of construction material and late delivery of materials for the clients, the shortage of construction material, escalation of material price and unreliable supplier for contractors and shortage of construction material, imported construction material and late delivery of material for consultants are the top three factors that contributes the most for road project delays. It can be inferred from the table that escalation of material price is the highly weighted factor king by all groups of respondents with an average relative index of 4.00. This is because the current inflation taking place in the country and the deflation of dollar on the world market.

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Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Shortage of Construction Materials	3.5	2	4.6	1	3.42	4	3.84	2
2. Poor Quality of Construction Materials	2.4	5	1.7	7	2.83	7	2.31	7
3. Poor Procurement of Material	2.2	7	2.6	4.5	3.18	5	2.66	6
4. Imported Construction Material	2.3	6	2.5	6	3.8	2	2.87	5
5. Escalation of Material Prices	4.1	1	3.6	2	4.3	1	4.00	1
6. Late Delivery of Materials	3.4	3	2.6	4.5	3.58	3	3.19	3
7. Unreliable Supplier	2.7	4	3.4	3	3.08	6	3.06	4
Mean Relative index	2.94		3.00		3.46		3.13	

Table 3.1.1 Results of material related factors

Table 3.1.2 below presents the results of spearman rank correlation and the significance test to show how well the ranking of two group of respondent agree with each other and how strong is their agreement. According to the result found, only the clients and the contractors have a strong agreement on ranking the material related factors, whereas "client and consultant" and "contractor and consultants" do not. It implies that the consultants are not involved in the purchase of the materials, where as clients provide some materials to the contractor and contractors obviously engaged in the processes of material purchase.

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Relation Between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept H$_O$ If Zo<= Error! Bookmark not defined.1.64 accept Else Reject
Client &Contractor	0.7232	1.7715	Reject
Client & Consultant	0.4286	1.0498	Accept
Contractor & Consultant	0.3304	0.8092	Accept

Table 3.1.2 Spearman correlation and significance test results of material related causes
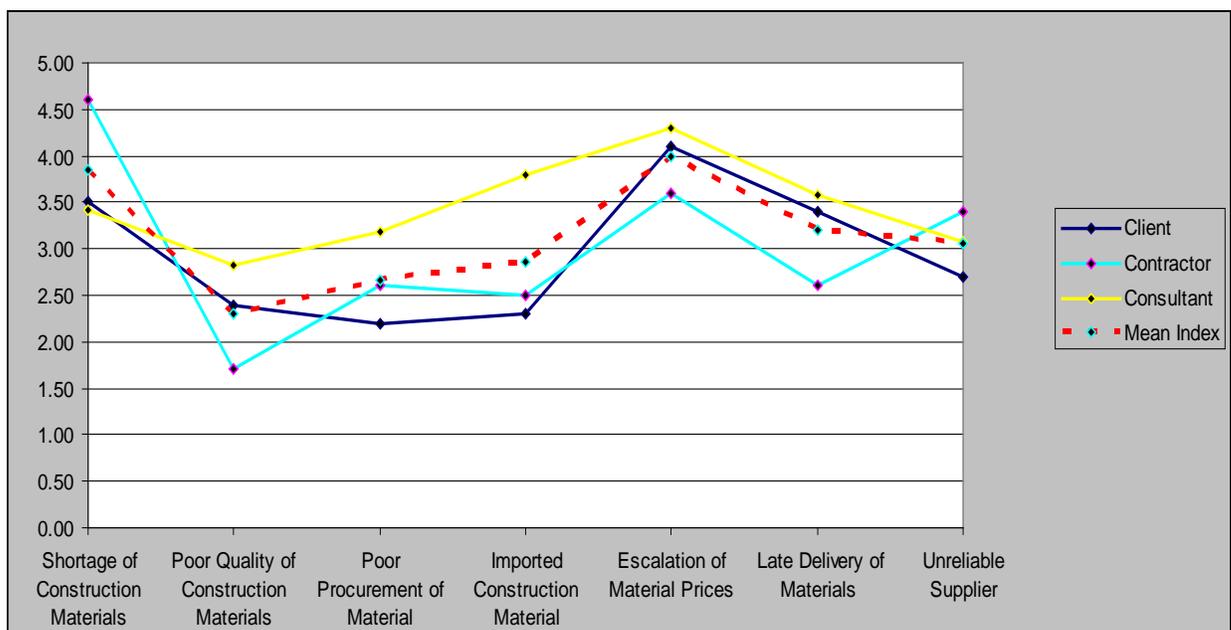
Fig 3.1.1 Scores of material related factors of each group and the relative mean score of all

As it can be seen on the above graph, the consultants have weighted the factors relatively higher than the other groups and the inverse is true for the contractor's side. The deviation of the weights and the similarity of the ranking between the contractors and the clients can be clearly seen on the above graph.

II. Factors of Labor related cause of delay

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The Seven factors of labor related causes of delays are given weights and ranked by the respondents and the results are presented on table 3.1.3 below. The result of the analysis shows that shortage of skilled labor is the first factor with the views of the client and consultants and the second factor for the contractor. According to the contractors low motivation/ morale, shortage of the skilled labor and labor productivity are the top three factors that most contribute for project delay. Since road construction projects are highly need skilled labor and the existence of too many road projects in the country, shortage of skilled labor become the first factor from this category while considering the average weights given. The low motivation and morale of the workers which is ranked second on the average index is the first factor for the contractor side.

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Slow Mobilization of Labor	3.2	4	2.3	4	3.42	2.5	2.97	4
2. Shortage of Skill Labor	3.8	1	2.9	2	4.0	1	3.57	1
3. Labor Productivity	3.7	2	2.4	3	3.42	2.5	3.17	3
4. Labor Supply	3.0	5.5	1.7	5	2.16	6	2.29	5
5. Absenteeism	3.0	5.5	1.5	6	2.75	5	2.42	6
6. Strike	1.2	7	1.4	7	2.0	7	1.53	7
7.Low Motivation/Morale	3.6	3	3.0	1	3.25	4	3.28	2
Mean Relative index	3.07		2.17		3.00		2.75	

Table 3.1.3 Results of labor related factors

While ranking this category, all groups of respondents have agreed with 95% level of confidence. As it can be shown on, the table 3.1.4 below all the calculated z value (the degree of significance of agreement) of the pairs of the groups of respondents is greater than 1.64. However, the degree of agreement is much higher on the case of the "client and consultants". This could be because both parties are not involved in managing the day to day

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management of labors working on the projects better than the contractor which usually hiring and firing of contract labors which are meant for the specific project only.

Relation between	Spearman Correlation(rs)	Significance Value Z_o value with 95% confidence	Accept/ Reject H_o If $Z_o <= 1.64$ accept Else Reject
Client &Contractor	0.8839	2.1652	Reject
Client & Consultant	0.9286	2.2745	Reject
Contractor & Consultant	0.7411	1.8152	Reject

Table 3.1.4 Spearman correlation and significance test results of labor related causes
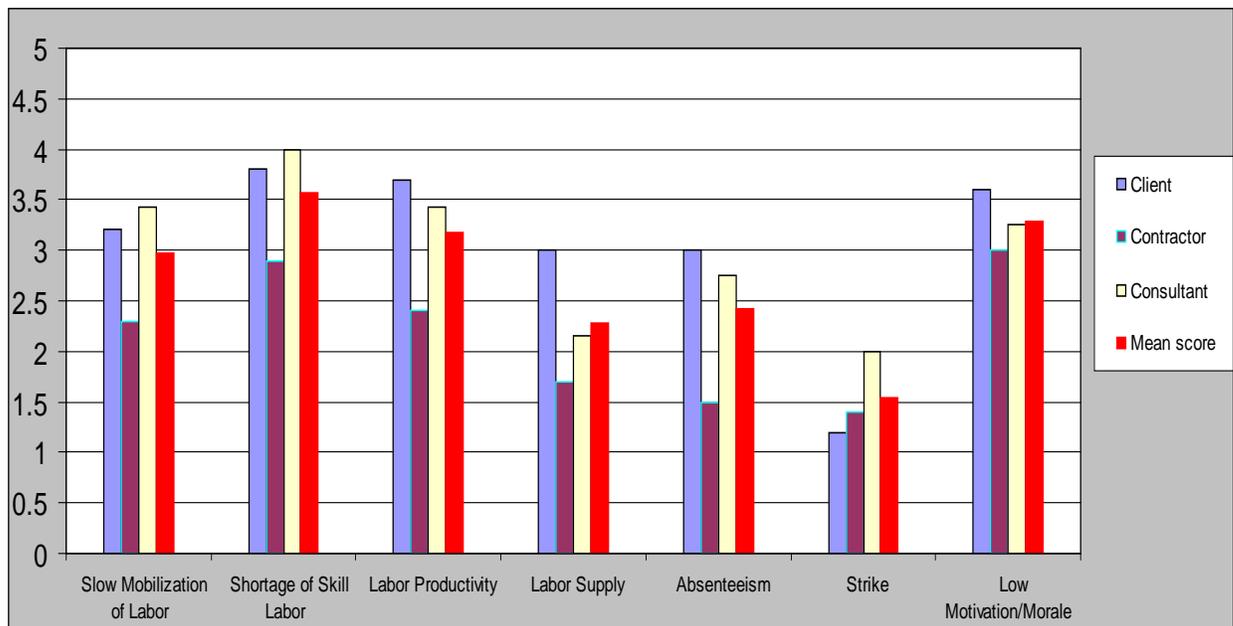
Fig 3.1.2 relative important index of labor related causes

According to the graph above shortage, skilled labor has the highest weight by all groups, which makes it the critical factor for causing delay on projects.

III. **Factors of equipment related causes of delay**.

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The clients believes that not having modern equipments which have a better output and little break down time and not allocating the right equipment at the right time for the right purpose are the most delay causing factors with equal weight, while the contractors on their side rank the shortage of equipment parts first and frequent equipment breakdown second. Here contractors rise the breakdown time of the equipments is by large high because the parts of the equipments are not easily found on local market. On their side consultants claim that out of all factors, insufficient number of equipments, which are assigned for projects by the contractor, frequent break down of equipments and not having equipments which are of current technology are the top three causes from this category. Table3.1.5 shows all the results of the analysis below. According to the average rank computed by taking the average of relative index of each factor by all group of respondent, the two main cause of delay are not having enough number of equipments and equipment allocation problem, which are the result of lack of management knowledge by the contractor.

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Insufficient Numbers of Equipment	3.6	4	2.4	3	3.8	1	3.27	1
2. Frequent Equipment Breakdown	2.6	6	2.7	2	3.67	2.5	2.99	6
3. Shortages of Equipment Parts	3.0	5	2.9	1	3.58	4	3.16	3.5
4. Improper Equipment	2.6	6	1.9	6	3.25	7	2.58	7
5. Slow Mobilization of Equipment	4.0	3	2.2	4.5	3.30	6	3.17	5
6. Equipment Allocation Problems	4.1	1.5	2.2	4.5	3.42	5	3.24	2
7. Not having Modern Equipment	4.1	1.5	1.7	7	3.67	2.5	3.16	3.5

Mean Relative index	3.43	2.29	3.53	3.08

Table 3.1.5 Results of equipment related factors

The equipment related causes of delay have shown a clear difference of rank among all groups of respondents, because all the spearman correlation test and significance test have ended up accepting the null hypothesis which proves there is no strong agreement between them.

Relation Between	Spearman Correlation (rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H_O If Zo <= 1.64 accept Else Reject
Client &Contractor	-0.3304	-0.8092	Accept
Client & Consultant	0.1875	0.4593	Accept
Contractor & Consultant	0.3393	0.8311	Accept

Table 3.1.6 correlation test of equipment related factors

As it is indicated on the table 3.1.6 above both the value of the spearman correlation coefficient and significance value p is negative for the "client and the contractor" correlation test, it indicates that there is a high degree of disagreement on ranking factors of this group. The wide gap on the figure below between the two bold lines that links the weighted values of factors of the client and the contractor shows, how significant is their difference in weighting the factors.
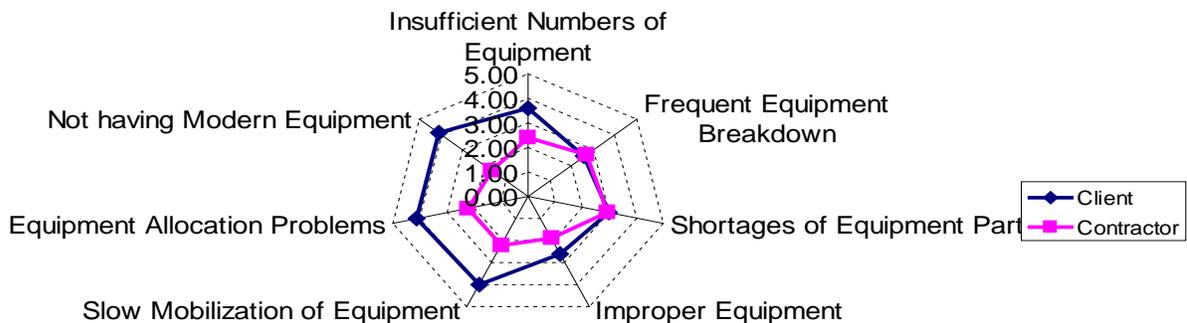
Fig 3.1.3 Relative important index of clients and contractors

IV. Factors of finance related cause of delay.

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Both clients and consultants weighted this group higher with a mean relative index of 3.53 and 3.44 respectively, which is much higher than the contractor that equals 2.67. According to the result of the analysis on table below, contractors' claims delay of requested payments contributes the most for delay of the road projects. This is either due to the consultants take much time while checking and approving the payment or while the clients fail to effect the payment timely. In this category, contractor's financial difficulty which is related with the contractors ability of managing its' financial resources have been found to be the first out of all others on the average ranking and the second for individual ranking of clients and consultants. This is because most contractors assign the financial resource of a project to other projects or settle depts. Moreover, even if they are using it to the specific project they do not manage it properly. The client side financial difficulties like inadequate fund allocation which is under estimating the budget for a particular project and delay of effecting payment have also been found high contributor for project delays

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Inadequate Fund Allocation	4.5	1	2.3	6	3.33	4	3.38	2.5
2. High Interest Rate	2.7	7	2.0	7	3.0	7	2.57	7
3. Contractor's Financial Difficulties	4.4	2	2.8	4.5	3.5	2.5	3.57	1
4. Client's Financial Difficulties	2.9	5	2.9	2	3.5	2.5	3.10	6
5. Unreasonable Constraints to Client	2.8	6	2.8	4.5	4.16	1	3.25	4.5
6. Delay Payment to Supplier/Subcontractor	3.8	3	3.0	1	3.33	4	3.38	2.5
7. Monthly Payment Difficulties	3.6	4	2.9	2	3.25	6	3.25	4.5

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| Mean Relative index | 3.53 | 2.67 | 3.44 | 3.21 |

Table 3.1.7 Results of finance related factors

Even though the null hypothesis is accepted according to the correlation test made between all groups of respondents as shown on table 3.1.8, it is clear that their correlation coefficient and calculated Z value are similar for the "client and consultants" and "contractors and consultants", this indicates that the difference of the ranks between the parties are some how equal.

Relation between	Spearman Correlation(rs)	Significance Value of Zo value with 95% confidence	Accept/ Reject H_0 If Zo <= 1.64 accept Else Reject
Client &Contractor	0.0982	0.2406	Accept
Client & Consultant	0.1875	0.4593	Accept
Contractor & Consultant	0.1875	0.4593	Accept

Table 3.1.8 Spearman correlation and significance test results of finance related causes

According to figure 3.1.4 below, even though almost 50% of the factors are related to the clients but they are the one who have weighted factors of this category relative to contractors and the consultants. On the contrary the contractors are the one who give the least weights to this category.
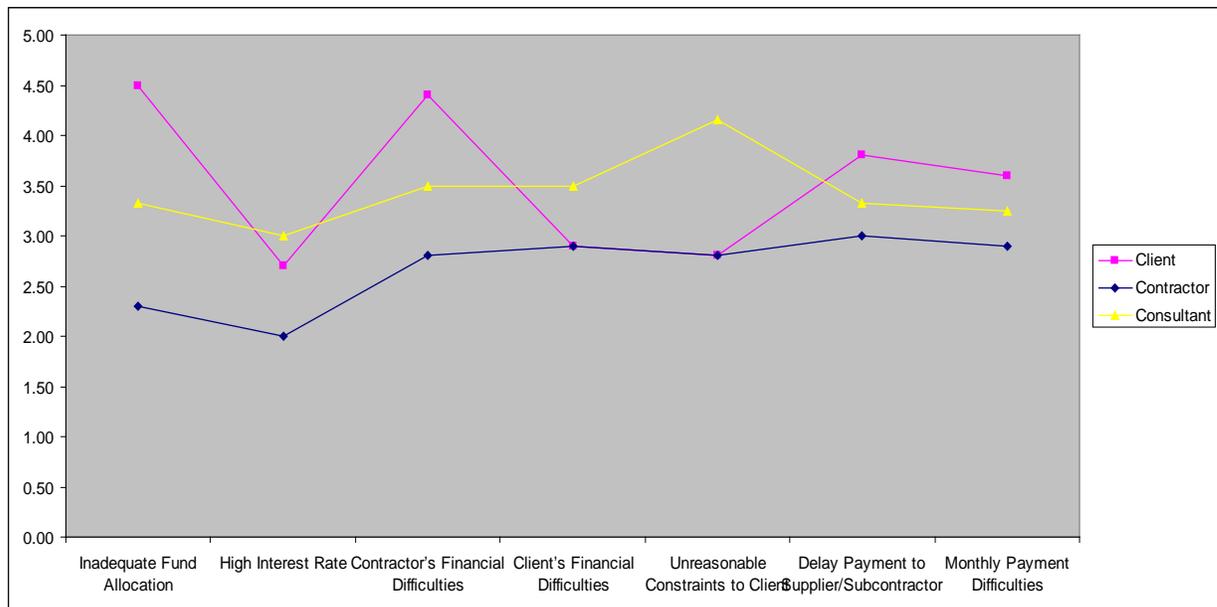
Fig 3.1.4 Relative index of finance related factors

V. Factors of Contractor Related cause of delay.

All the nine factors have a relative important index, which is above 3.0, which shows that all the contractor related factors are concerns of all respondents. In spite the fact that all contractors except one considered on the survey have more than 5 years experience, contractors themselves confess that poor site management and lack of experience on contribute the most for project delays. It can also be noticed that clients and consultants are more concerned on the management related problem of the contractors (improper project planning & scheduling, and poor site management--) while contractors give weight to the technical factors like project time estimation and using of obsolete technology and the like.

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Inadequate Contractor Experience	3.83	7	2.7	2	3.83	3	3.45	3
2. Inappropriate	4.2	3.5	2.2	6	3.5	5.5	3.30	6

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Construction Methods								
3. Inaccurate Time Estimating	4.0	5.5	2.4	3.5	3.33	7	3.24	7
4. Inaccurate Cost Estimating	4.2	3.5	2.3	5	3.5	5.5	3.33	5
5. Poor Site Management & Supervision	4.5	2	1.9	8	4.08	1.5	3.49	2
6. Improper Project Planning & Scheduling	4.6	1	3.22	1	3.58	4	3.80	1
7. Incompetent Project Team	4.0	5.5	2.0	7	4.08	1.5	3.36	4
8. Unreliable Subcontractor	3.7	9	1.8	9	2.83	9	2.78	9
9. Obsolete Technology	3.78	8	2.4	3.5	3.08	8	3.09	8
Mean Relative index	4.09		2.32		3.53		3.31	

Table 3.1.9 Results of Contractor related factors

As shown on table 3.1.10 although the null hypothesis is accepted in all cases, the degree of agreement is almost strong between "clients and consultants" because the variation 0.03 is insignificant from the z value for 95% confidence.

Relation between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H_0 If Zo <= 1.64 accept Else Reject
Client &Contractor	0.2000	0.5657	Accept
Client & Consultant	0.5708	1.6146	Accept
Contractor & Consultant	0.0375	0.1061	Accept

Table 3.1.10 Spearman correlation and significance test results of contractor related causes

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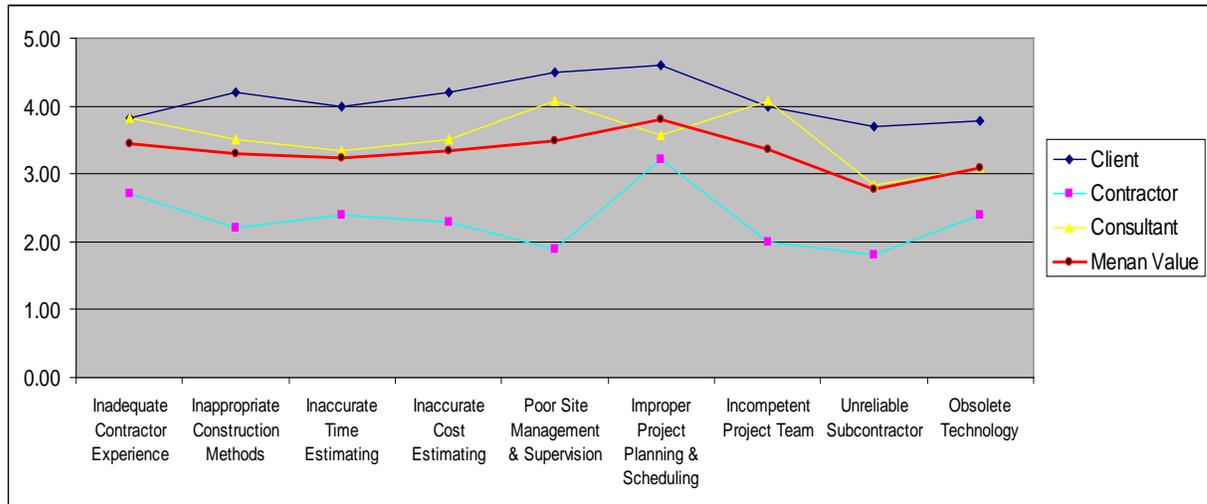
Figure3.1.5 Relative important index of contractor related causes

As it is can be shown on the figure 3.1.5 above, clients have weighted this category higher relative to the other groups. In addition, it is clear that from the graph, contractors are the one who rated these factors low. This shows that the contractors are showing their attitude that they are not the source for the cause of the road project delay. While considering the average relative index it is clear that project management related factors have found to be the most problems of the contractors.

VI. Factors of Client Related causes of delay

According to table 3.1.11 of analysis result, slow decision making by the clients is the most significant factor for project delay followed by change of order and improper feasibility study of projects. However, from the contractors point of view change of orders by the client is savvier factor causing delay. Considering the mean relative indexes on table below, it can be generalized that these category have been highly weighted by all groups of respondents. The slow decision making and the frequent change of orders by the clients is the top two factors that causes delay under this category from all respondents view.

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Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Slow Decision Making by Client	3.9	2	4.2	2	3.75	1	3.95	1
2. Lack of Experience of Client in Construction	3.1	5	3.2	7	3.42	5	3.24	6
3. Change Orders	3.6	3	4.45	1	3.5	3.5	3.85	2
4. Client's Interference	3.45	4	3.4	5	3.33	6	3.39	4
5. Lack of Capable of Client Representative	2.7	6.5	3.6	4	3.08	7	3.13	7
6. Lack of Communication/Coordination	2.7	6.5	3.7	3	3.5	3.5	3.30	5
7. Improper Project Feasibility Study	4.4	1	3.3	6	3.58	2	3.76	3
Mean Relative index	3.41		3.69		3.45		3.52	

Table 3.1.11 Results of Client related factors

Even if the client is the one with the lowest mean relative index the value is higher when compared with the other categories, this shows that they have admitted the hypothesized factors.

For the relation between "clients and contractors" the null hypothesis is rejected. Thus, the alternative hypothesis is accepted indicating there is a strong agreement between them. Both the other result of the correlation test ends up on accepting the null hypothesis assuring there is no agreement between the pairs.

Relation between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H_O If Zo <= 1.64 accept Else Reject
Client &Contractor	0.0625	0.1531	

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			Accept
Client & Consultant	0.7232	1.7715	Reject
Contractor & Consultant	0.3304	0.8092	Accept

Table 3.1.12 Spearman correlation and significance test results of Client related causes

It is easy to see how the difference of the weight given by the clients and the contractors is too insignificant on the following consecutive figures by comparing the percentage given to each relative index value.
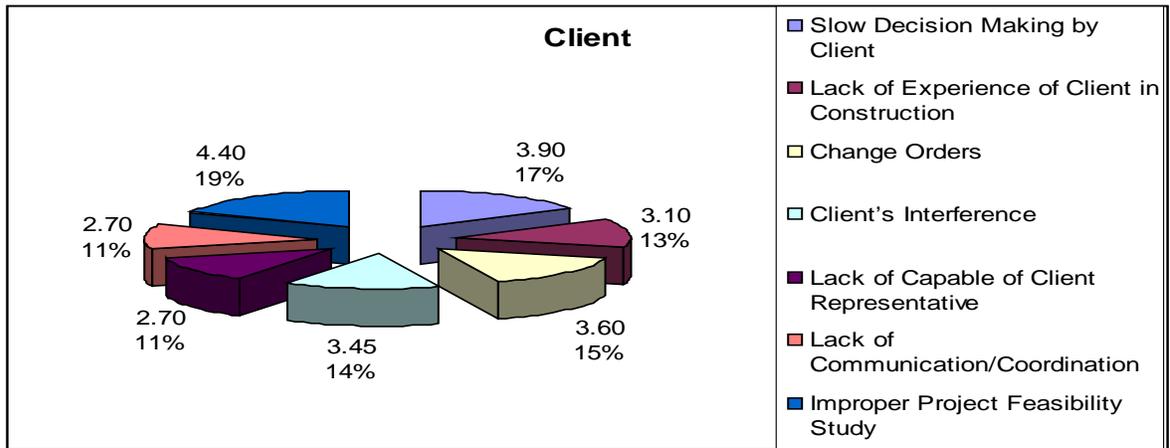
Figure 3.1.6 a Percentage of factors weighted by clients
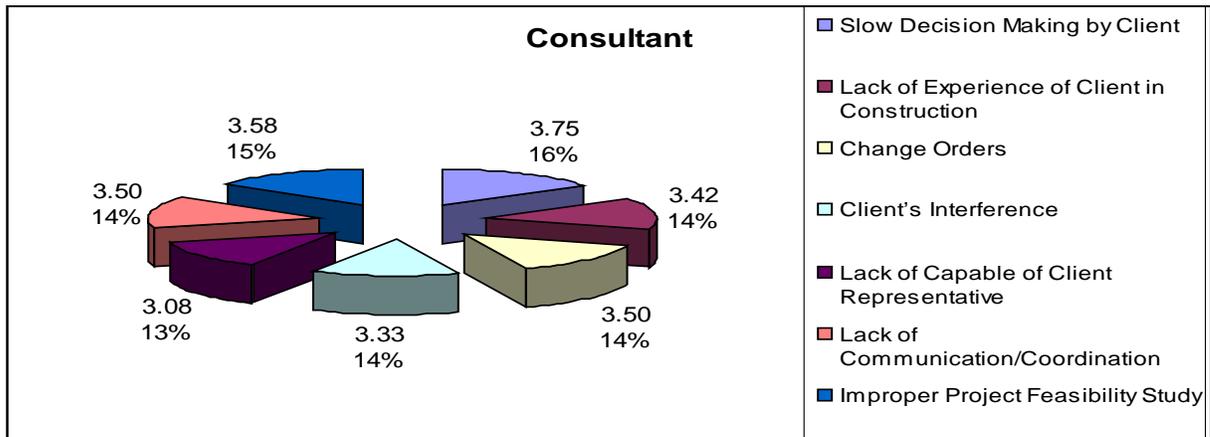
Figure 3.1.7 b Percentage of factors weighted by clients

VII. Consultant Related Factors

This is also one of the highest weighted categories. Out of all the factors those which are on the top three are delays which could occur at the design

phase of a project. This shows that consultants do not give attention for this phase of the project life cycle for some reasons.

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Inadequate Consultant Experience	3.9	5	3.9	1	2.83	6	3.54	5
2. Poor Design & Delays in Design	4.0	3.5	3.6	2	3.67	2	3.76	1
3. Inadequate Project Management Assistance	3.8	6	2.6	6	3.58	3	3.33	6
4. Slow Response and Poor Inspection	4.0	3.5	3.4	4	3.5	4	3.63	3
5. Incomplete Drawing/Details Design	4.2	1	3.5	3	3.42	5	3.71	2
6. Inaccurate Site Investigation	4.1	2	2.8	5	3.75	1	3.55	4
Mean Relative index	4.0		3.30		3.46		3.59	

Table 3.1.13 Results of Consultant related factors

In all of the correlation test between the groups of respondents, no significant agreement on ranking factors of consultant related causes of delay was found, especially between the "contractors and the consultants" the significance value is -0.5429 where the negative sign shows there is an inverse relationship between them.

Relation between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H$_0$ If Zo <= 1.64 accept Else Reject
Client &Contractor	0.1000	0.2236	Accept
Client & Consultant	0.1571	0.3514	Accept
Contractor & Consultant	-0.5429	-1.2139	Accept

Table 3.1.14 Spearman correlation and significance test results of Consultant related causes

VIII. External related delay

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The null hypothesis is rejected by all significant tests made between all groups of respondents except on the "client and consultant" correlation. The degree of agreement is much strong between "contractors and clients", which shows they both have almost the same view towards this group of factor. All groups of respondents almost equally weight all the seven factors. The factor war/conflict or public enemy is the least one for all groups of respondents, which shows that these factors are contributing the least project delay. From these seven factors, as it can be seen from table 3.1.15 below slow site, clearing (right off way clearance) is the first factor under this group of factors. This is because there are many external parties which are engaged in clearing the right off way of the roads to be constructed like the ETC, AWSA and ELPA. Unforeseen ground condition and inflation/ price fluctuation are also of the top three factors for the average ranking by all the respondents. These factors are beyond the control of all the parties involved in the road projects. They are sometimes called the act of GOD.

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank
1. Unforeseen Ground Condition	3.9	4	4.8	2	3.75	4.5	4.15	2
2. Unexpected Geological Condition	2.5	6	2.8	5.5	3.84	3	3.05	5
3. Inflation/Prices Fluctuation	4.0	3	3.6	3	4.33	1	3.98	3
4. Slow Site Clearing	4.7	1	4.9	1	4.25	2	4.62	1
5. Problem with Neighbors	4.1	2	3.5	4	3.75	4.5	3.78	4
6. Weather Condition	3.0	5	2.8	5.5	3.33	6	3.04	6
7. Conflict/War/Public Enemy	1.33	7	1	7	2	7	1.44	7
Mean Relative index	3.36		3.64		3.61		3.54	

Table 3.1.15 Results of External related factors

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While testing the correlation between the pairs of the groups, it has been found that there is no strong agreement only between the clients and the consultants. The other two tests were resulted in rejecting the null hypothesis and accepting the alternative hypothesis H1 that implies there is a strong agreement on weighting the factors. Especially the agreement between the client and the contractor regarding this category is very high.

Relation between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H_0 If Zo <= 1.64 accept Else Reject
Client &Contractor	0.8482	2.0777	Reject
Client & Consultant	0.6161	1.5091	Accept
Contractor & Consultant	0.6786	1.6622	Reject

Table 3.1 16 Spearman correlation and significance test results of external related causes

The factor conflict/ war/ public enemy is the one with the lowest relative index, as it can be seen on figure 3.1.8 above graph there is a big gap between these factor and the others. Therefore, it can be concluded that this factor is not contributing much for project delays.

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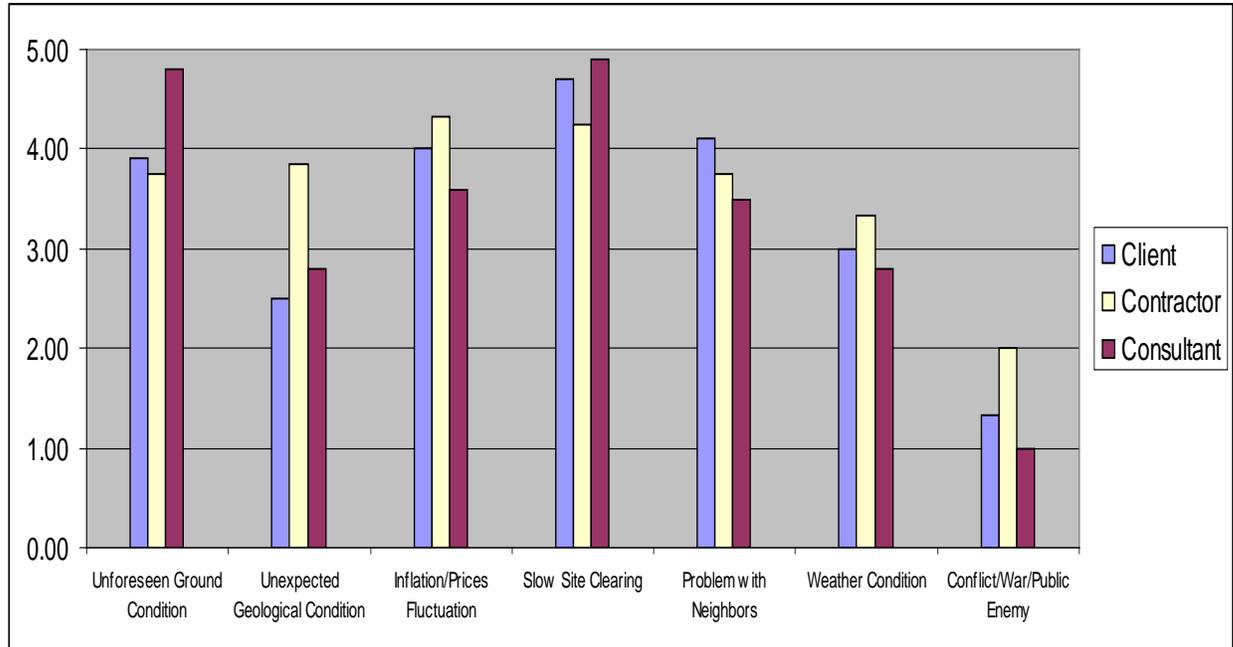
Figure 3.1.8 Relative important index of external/ environmental related factors

3.2.2 Analysis of General groups of causes of delay

On the previous section of this chapter, the analysis of each single factor under each category have been analyzed and presented. Now on this section of the project, the analysis of the cumulative effect of the each factor will be analyzed. To do so the relative mean index was calculated for each factors of the eight main categories as presented on table 3.1.1.1 below. Then each category is ranked according to the value of the mean index for each group of respondents.

Factor	Client		Contractor		Consultant	
	Relativ e index	Rank	Relativ e index	Rank	Relativ e index	Rank
1. Material-related	2.94	8	3.00	4	3.46	4.5
2. Labor-related	3.07	7	2.17	8	3.00	8
3. Equipment-related	3.43	4	2.29	7	3.53	2.5

4. Financial-related	3.53	3	2.67	5	3.44	7
5. Contractor-related	4.09	1	2.32	6	3.53	2.5
6. Client-related	3.41	5	3.69	1	3.45	6
7. Consultant-related	4.0	2	3.30	3	3.46	4.5
8.External Environment	3.36	6	3.64	2	3.61	1

Table 3.2.2.1Results of cumulative causes of delay

According to the above table, the first ranked category for the clients group is contractor related followed by consultant related and financial related factors. The client related factors which is the 6th factor for the consultants is the first concern of the contractors. For all groups labor related causes of delay are the least contributor for project delays.

On every test of spear correlation between pair of groups it has been found that, there is no significant agreement between all pairs; the null hypothesis is accepted for all. Table 3.1.1.2 presents the results of the correlation test. Even if the result shows there is no agreement between the parties, the degree of disagreement differs from one another. According to the p values of the relationship between clients and consultants is much stronger than the other two.

Relation between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H_O If Zo <= 1.64 accept Else Reject
Client &Contractor	0.1429	0.3780	Accept
Client & Consultant	0.5119	1.3544	Accept

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| Contractor & Consultant | 0.2381 | 0.6299 | Accept |

Table 3.2.2.2 Spearman correlation and significance test results of subgroups of each group of respondent
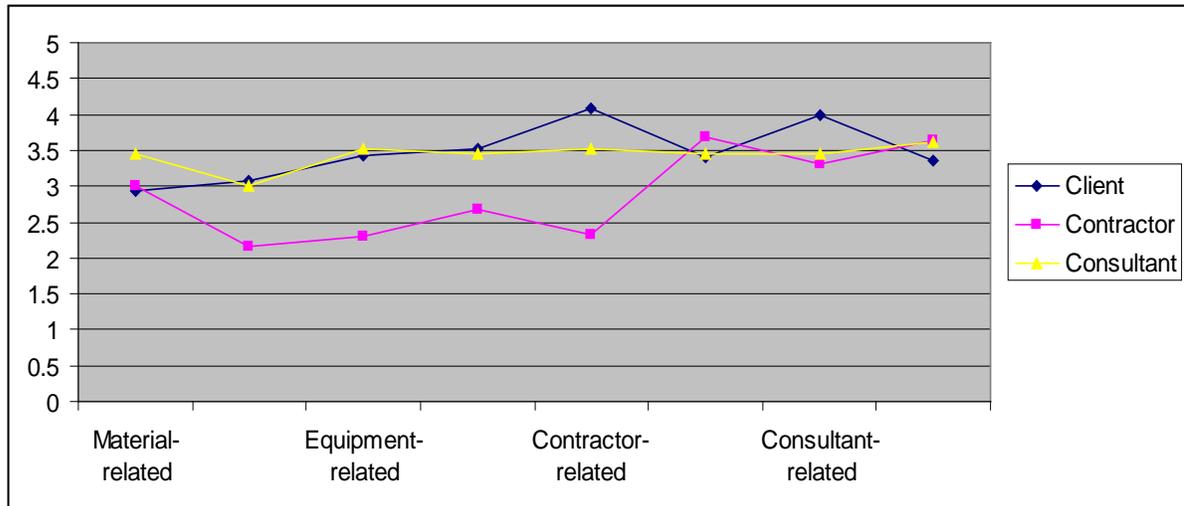
Figure 3.2.2.1 Cumulative relative important index of all groups of respondent to all factors

As it can be clearly seen from the graph above, the trend line of the consultants is almost straight line, which, implies that the clients have equally weighted all the categories. On the contrary, the contractors' judgment was different for all categories. The clients gave the pick weight for the contractor related category.

3.2.3 Average analysis of causes of delay

Under the following section the average analysis is done to rank, the categories of causes of delay fro the viewpoints the respondents as a whole. To come up with the results showed on the table below, the mean of the mean relative index of each category of every group is calculated and ranked according to the value of the mean of the mean.

Factor	Weighted Average	Rank
1. Material-related	3.13	6

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2. Labor-related	2.75	8
3. Equipment-related	3.08	7
4. Financial-related	3.21	5
5. Contractor-related	3.31	4
6. Client-related	3.52	3
7. Consultant-related	3.59	1
8.External Environment	3.54	2

Table 3.1.2.1 cumulative results of all respondents on groups of cause of delay

According to the result, the first category that causes delay on road construction projects is the consultant related factor. This factor was ranked 2nd, 3rd and 4th by the client, contractor and the consultant respectively, which implies more weight is given by the clients to this category. The weight given for the top three causes of categories are almost similar with slight differences. The bottom three categories are material related factors, equipment related factor and the last labor related factor.

3.2 Analysis of effects of delay

As it has been done on the analysis of the causes of delay above here, also the same procedure is used to analyze the data and find out the relative degree for the frequency of occurrence of the hypothesized effects of delay on the construction industry and the players of the industry. Even tough on the questioner there were three questions which are open ended, which the respondents have to sight if there are some effects of delay other than pre hypothesized on the questioner and weight them accordingly, no respondent have attended them. Table 3.2.1 below presents the findings of the analysis with the relative important index of each factor and the respective ranks.

Factor	Client		Contractor		Consultant		Average	
	Relative index	Rank	Relative index	Rank	Relative index	Rank	Relative index	Rank

1. Time Overrun	4.1	1	5.0	1.5	4.17	1	4.42	1
2. Cost Overrun	3.9	2	5.0	1.5	4.0	2	4.30	2
3. Dispute	3.5	3	1.9	4	3.33	3	2.91	3
4. Arbitration	2.8	5	1.6	5	2.83	5	2.4y 1	5
5. Litigation	3.1	4	1.44	6	2.92	4	2.49	4
6. Total Abandonment	1.5	6	2.2	3	2.58	6	2.09	6
Mean Relative index	3.15		2.86		3.31			

Table 3.2.1 Results of frequency of effects of Delay

For all groups of respondents it has been found that the firs two effects of delay are common one, and these are time overrun and cost overrun. This shows that these kinds of effects are occurring more frequently as a result of delays of projects. Especially 100% of the contractors have given them an equal and the highest weight to these factors. From all type of effect, total abandonment is the one with the list weighted by the clients and the consultants. In addition, this factor has been found the seldom-occurring type of effect when the cumulative weight of the entire respondent is considered. Because of high and same rating of the clients and the consultants for all kinds of effect, the ranking of the average occurrence of the effects become the same with the individual ranking of the two groups. Theses leads that the two parties have a strong agreement regarding the occurrence of the effects of delay, which arose from delay of projects. According to the table 3.2.2 below only the case of the relation between the clients and the consultants the null hypothesis is rejected and the alternative hypothesis is accepted. Since the value of the spearman correlation coefficient is one, it implies the two parties have nearly a 100% agreement. As a result, the p value is much higher than the p value for a 95% confidence.

Relation between	Spearman Correlation(rs)	Significance Value Zo value with 95% confidence	Accept/ Reject H$_0$ If Zo <= 1.64 accept Else Reject

Client &Contractor	0.5857	1.3097	Accept
Client & Consultant	1.0000	2.2361	Reject
Contractor & Consultant	0.5857	1.3097	Accept

Table 3.2.2 Spearman correlation and significance test results of effects of delay

From the figure3.2.1 below, it can be clearly seen how similar the weight given by clients and contractors are. In addition, the contractors' weight for the time and cost over run is seen as the highest of all. This implies that contractors are highly affected by the time and cost overrun effect of delay.
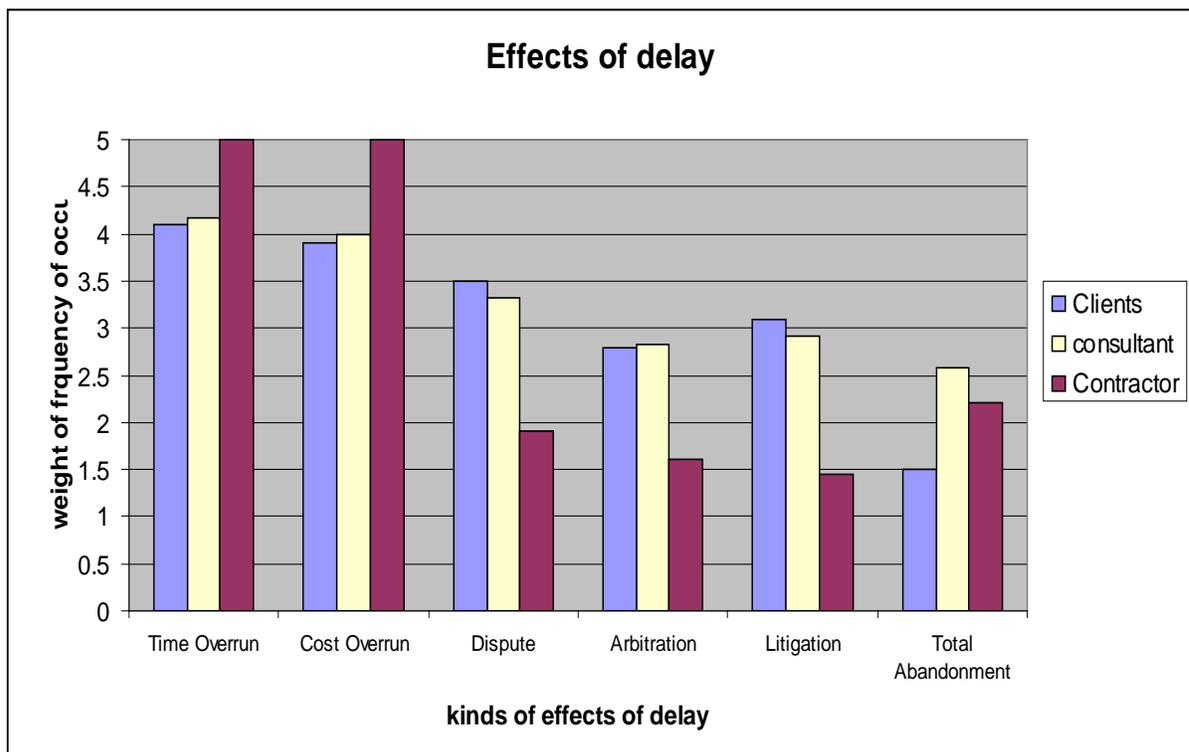
Figure 3.2.1 weights of frequency occurrence of effects of delay

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CHAPTER FOUR

CONCLUSION and RECOMMENDATION

4.1 Conclusion

Identification of causes of delay is a prerequisite to minimize or avoid delays in project deliveries. The main objective of this project is therefore to identify and investigate the key causes delay in completion time and their impacts on road construction projects in Addis Ababa. Using questionnaire survey, targeted on the main stakeholders in the sector, perception on 57 hypothesized causes of delays are identified. The 57 causes of delay are grouped under eight major categories or sub groups; material related, labor related, equipment related, finance related, contractor related client related, consultant related and external factor related cause of delays. The factors for each group are weighted and ranked by their relative important index. The strength of agreements between the main parties on causes of delay that are clients, contractors, and consultants are also tested by the spears man correlation coefficient. By using their relative mean index, the eight main groups are weighted and ranked accordingly.

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Based on the analysis the following conclusions will summarize what it has been found so far.

1. Out of all the eight main groups' contractor, consultant and financial related factors are the top three categories from the client's perspective for causing delay on the road projects. While contractors on the contrary made the client related factors the first followed by external and consultant related factor. According to the consultants, the first contributor of delay is external/ environmental factor and the contractor and equipment related being the second and the third. The following table presents the summarized results for each group of respondent.

Client		
Category	Relative index	Rank
1. Contractor-related	4.09	1
2. Consultant-related	4.0	2
3. Financial-related	3.53	3
Contractor		
1. Client-related	3.69	1
2.External Environment	3.64	2
3. Consultant-related	3.30	3
Consultants		
1.External Environment	3.61	1
2. Contractor-related	3.53	2.5
3. Equipment-related	3.53	2.5

Table 4.1 Top Three causes categories of respondents

As it can be seen on table 4.1 except client, finance and equipment related factors, each category is common for at least two groups of respondents on their top tree list. This shows that the main critical categories are contractor, consultant and external/ environmental related.

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2. It has been found that most of the respondents did not make the cause, which is related to them selves as one of the top three cause of delay for road projects. This shows that every party has related the causes of project delay with other parties or external related causes. On the other hand, it is clear that the consultant and contractor related are found on the top three lists of two groups, which shows that most of the responsibility goes to the players of the industry i.e. for contractors and consultants.

3. Among the 24-correlation test made on all groups of respondents, only 7 have confirmed there is a relation ship between the groups of respondents which is 29.1% only. Out of this 42.9% goes for "clients and contractors" and the rest, 57.1 % goes to "client and consultants" and "consultant and contractor" 28.55% for each. This shows that there is a relatively a strong agreement between the client and the contractors and equal agreement between the consultant and the contractor and the client and the consultant. All the parties have agreed on only on weighting the labor related factors. However, while seeing the degree of agreement the highest degree that is 2.27 is found between clients and consultants on the labor related factors and on the other hand the highest degree of disagreement is found between contractors and consultants on the consultant related factors with significance value -1.21.

4. On the analysis of the average results of the respondents, the consultant related factors become the first category that contributor of the causes of delay of the road projects. Except the external/environmental related factors, the other three of the top four factors of the average analysis are associated to each of the respondent group. This shows that the main causes of the delay on road construction projects are one of the clients, contractors, consultants or combination of them.

5. The effects of delay have been ranked according to the frequency of their occurrence and the result have showed that the three most frequently occur effects are time overrun, cost overrun and dispute. Most of delayed

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projects suffer the time overrun because this factor is the first for all group of respondents.

In general, this project revealed that most road projects in Addis Ababa are exposed for delay by the fault of the one or more of players of the industry and due to lack of agreements between them.

4.2 Recommendation

The results of the survey have identified the main causes of delay and the most frequent effect of the delay on road construction projects in Addis Ababa. To minimize or avoid delays that made the completion time of the projects double and triple of the initial contract time and effects of delay, concerned parties in sector and professionals are expected to work hand in hand for a common goal. Based on the findings of the project, the following recommendations are forwarded to the main stakeholders of the industry and other parties, which have a connection to the successful completion of a project.

I. For Contractors

The Contractor is the one, which plays the important role to change the blue print into real world project. On this process the contractor have the responsibility of managing the different resources, which are intended to the project to the success of the project.

Therefore, the following are expected from contractors.

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- Contractors should understand consequences of offering lower prices than reasonable prices that considers the actual conditions of the construction project. Low offer would bring about downfall of contractors from the sector. Other wise quality and time will significantly be affected to compensate the lower prices.

- Contractors should be able to prepare clear and proper work schedules, which shall be approved by the consultant and the client before the project commencement date. And also these schedules have to be revised periodically trough out the life time of the project.

- Contractors should plan for mobilization of equipments and machineries and labor accurately.

- Contractors should consider the consultant as a partner and have to work for a common goal, which is completing the project on time and budget.

- Contractors should avoid self-interest serving (ethics).

- Contractors should give attention to time value of money and improve contract administration knowledge.

- Contractors should improve their construction knowledge with time to be innovative and make use of current technologies for better quality and performance.

- Higher officials of the contractors working on projects and the main office, have to improve their project management skills through trainings.

II. To Consultants

The consultant plays a great role in translating client's idea in to plans, drawings and specifications. Since most of the projects in Ethiopia are designed and supervised by the same consultant, their impact on quality,

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time and cost of the project is substantial. In addition, since they are involved on projects starting from the conceptual phase to the completion of the projects their importance is higher. Therefore, the following points are forwarded to consultants of the roads projects.

- Insufficient site investigation results in consultant initiated variations. Thus comprehensive site investigation accompanied by thorough and properly detailed design prior to bid float should be prepared to reduce delays on the different phases of the project lifecycle.

- Strict approval of financial status of the contractor before project award is important to avoid finance related delays.

- Since price fluctuation is one of the highest factors of the external related category, inclusion of price escalation in the contract is necessary to reduce delays that arise from litigations of price escalations.

- They have to work hard on preparation of properly and scientifically studied completion time of the project.

- Clients have to make the supervision deep enough to confirm that the contractor is undertaking the project on the pre scheduled time, resource and budget.

- Investigating the source of delays on each task of projects, identifying the responsible party for the delay and taking the corrective action must be the routine task of the consultants.

- They have to consider delay claims being as an external party and manage claims according to their type.

III. Expectation From Clients

Clients are those parties, which are the ultimate user or owner of projects. In this regard, they are the one who at first place want to have the project

completed on time and budget. How ever, they have to participate on the process of making their dream come true rather than giving the responsibility to others and blame them for the occurrence of delay and their effect.   Therefore, the following points are recommended for the clients.

- Clients have to allocate adequate and accurate budget on time.
- They have to experience effecting payments on time.
- They have to avoid frequent interference.
- Hand over the site on time as agreed on contract document.
- Avoiding frequents changes of order.
- Facilitate decision making process at time of changes
- Have to work hard with consultants on the project feasibility study.

IV. External Parties

This parties being those who have a concern on projects indirectly and not a member of the industry have to work their best towards the successful completion of projects. In order to achieve this, those parties must practice the following points.

- They have to undertake their responsibility in such a way that they don not affect the well-being of the project.
- They have to believe that in one way or the other they will benefit from the success of the project.
- Work in team sprit with the players of the system.

In general all since all parties are working for the benefit of their own, it must not be in such a way that the profits are on the expense of other. The success of a project guarantees success for all parties. So all parties have to work hand in hand by giving equal tolerance and resistance for the occurrence of delay by external and environmental cause, which is beyond their control.

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Finally yet importantly, academicians have to work on further investigation and researches on related topics and give feedbacks to stakeholders of the industry to strength and support this main backbone of a country.

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QUESTIONNAIRE

CAUSES AND EFFECTS OF DELAY IN ROAD CONSTRUTION PROJETS in ADDIS ABABA

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This questioner is administered for the partial fulfillment of Master of Business Administration at Faculty of Business and Economics of Addis Ababa University**.**

Composition of the questioner

This questionnaire consist four sections:

> **Section A:** Company, respondent and project profile and project description
> **Section B:** Questions about factors that contribute to causes 0f delays
> **Section C:** Questions about factors effect of delays
> **Section D:** Questions about methods of minimizing construction delays

Objective of the Study:

The objectives of the study are as follows

> 1. To identify the major causes of delay on road construction projects in Addis Ababa.
> 2. To identify the effects of delays on the construction industry, on parties involved in it and on the country.
> 3. To find out and suggest the methods of minimizing construction delays.

NOTE:

> ✦ The findings of the study will be used for academic purposes only.
> ✦ Your answer is going to be treated confidentially.

Student Name: Biruk Zegeye

Advisor: Dr. Mehari M.

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Thank you for your corporation

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GUIDE INTRIDUCTION

Delays and their type

Delays on construction projects are common and a universal phenomenon. They are mostly accompanied by cost and time overruns.

The types of delay are classified as:

1. Non Excusable Delay: Non Justifiable delay in which the Construction company is liable for compensation to the Employer

2. Excusable - Non-Compensable Delay: It is justifiable delay for time extension but with no monetary compensation to the construction company.

3. Excusable – Compensable Delay: Justifiable delay for both time extension and monetary compensation to the construction company

4. Concurrent Delays: Justifiable delay caused by both parties and remedies are balanced.

SECTION A

COMPANY, RESPONDENT and PROFILE AND PROJECT DESCRIPTION

Please, thick one box and fill in the blanks if only for different answers.

Company Profile

1. State the name of the organization.

Name: [optional]

……………………………………………………………………………..

Address:

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

2. What is the type of the organization or company you are currently working at?

□Client   □Contractor

□Consultant   □Others, please specify …………………….

4. State the number of year of experience the organization / company have in construction industry.

□0 – 5 years   □5 – 10 years   □10 – 15 years

□15 – 20 years   □More than 20 years

5. In how many Road projects did the company participated to date?

□0 – 5   □5 – 10   □10 – 15

□15 – 20   □More than 20 years

6. How many projects does the company currently have?

□0 – 5   □5 – 10   □10 – 15

□15 – 20   □More than 20 years

Respondent Profile

1. Age ………………………………….

2. Sex…………………………………

3. Educational background

…………………………………………………………………………………………

4. State your position in the organization/company.

□Director □Project Manager

□Site Manager □Engineer/Designer

5. State the number of years of experience you have in the construction industry.

□0 – 5 years □6 – 10 years

□11 – 15 years □16 – 20 years

□More than 20 years

6. State the number of road construction projects you have been involved.

□1 – 4 □4 – 7

□7 – 10 □More than 10

7. How many of the projects are completed on time?

□1 – 4 □4 – 7

□7 – 10 □More than 10

Project Profile

1. State the name of the project.

Specify …...

2. State type of contract that the project has been awarded to the contractor.

□Open Tender   □Design - Build

□Turnkey   □Cost Plus Contract

□Fixed price Contract   □Others, please specify…………………….

3. State contract amount in Birr.

……………………………………………………………………………….

4. State the contract time of the project. (Original contract time in No of working days)

……………………………………………………………………………….

5. State the time the project is signed and the date actual construction started.

Signed Date..…...

Start Date   …..

6. State the project completion time according to the contract.

Completion Date …...

7. State actual time spent for the project, if the project is already completed.

Specify…..

8. State the percentage of the work that must be completed according to the original schedule or the contract to date.

Specify…..

9. State the actual percentage of the projected completed to date.

Specify…..

10. State the estimated time needed to complete the project from now onwards

Specify…..

SECTION B

FACTORS THAT CONTRIBUTE TO CAUSES OF DELAYS

Objective of the Study: Identify the major factors that cause delays on the road projects.

- Rate each factors according to the following rating scale by putting a thick mark for each factor stated below

Each scale represents the degree of contribution for the delays to occur:

(5) = Very high   (4) = High contributing

(3) = Medium   (2) = Low contributing

(1) = Very low

Question: How did the following related factors below that contribute to causes of delays on road construction project?

FACTORS		1	2	3	4	5
1. Material-related						
	1. Shortage of Construction Materials					
	2. Poor Quality of Construction Materials					
	3. Poor Procurement of Material					
	4. Imported Construction Material					
	5. Escalation of Material Prices					
	6. Late Delivery of Materials					
	7. Unreliable Supplier					

FACTORS		1	2	3	4	5
2. Labor-related						
	1. Slow Mobilization of Labor					
	2. Shortage of Skill Labor					
	3. Labor Productivity					
	4. Labor Supply					
	5. Absenteeism					
	6. Strike					
	7. Low Motivation/Morale					
3. Equipment-related						
	1. Insufficient Numbers of Equipment					
	2. Frequent Equipment Breakdown					
	3. Shortages of Equipment Parts					
	4. Improper Equipment					
	5. Slow Mobilization of Equipment					
	6. Equipment Allocation Problems					
	7. Inadequate Modern Equipment					
4. Financial-related						
	1. Inadequate Fund Allocation					

Y FACTORS		1	2	3	4	5
	2. High Interest Rate					
	3.Contractor's Financial Difficulties					
	4.Client's Financial Difficulties					
	5. Unreasonable Constraints to Client					
	6. Delay Payment to Supplier/Subcontractor					
	7. Monthly Payment Difficulties					
5. Contractor-related						
	1. Inadequate Contractor Experience					
	2. Inappropriate Construction Methods					
	3. Inaccurate Time Estimating					
	4. Inaccurate Cost Estimating					
	5. Poor Site Management & Supervision					
	6. Improper Project Planning & Scheduling					
	7. Incompetent Project Team					
	8. Unreliable Subcontractor					
	9. Obsolete Technology					

FACTORS		1	2	3	4	5
6. Client-related						
	1. Slow Decision Making by Client					
	2. Lack of Experience of Client in Construction					
	3. Change Orders					
	4. Client's Interference					
	5. Lack of Capable of Client Representative					
	6. Lack of Communication/Coordination					
	7. Improper Project Feasibility Study					
7. Consultant-related						
	1. Inadequate Consultant Experience					
	2. Poor Design & Delays in Design					
	3. Inadequate Project Management Assistance					
	4. Slow Response and Poor Inspection					
	5. Incomplete Drawing/Details Design					
	6. Inaccurate Site Investigation					

FACTORS		1	2	3	4	5
8.External Environment						
	1. Unforeseen Ground Condition					
	2. Unexpected Geological Condition					
	3. Inflation/Prices Fluctuation					
	4. Slow Site Clearance					
	5. Problem with Neighbors					
	6. Weather Condition					
	7. Conflict/War/Public Enemy					

SECTION C

EFFECT OF DELAYS

Objective of the Study: Identify the effects of delays on the construction industry.

Please, thick and fill in the blanks if you select others.

Each scale measures the occurrences effects, which arise from delays:

(5) = Always   (4) = Mostly

(3) = Sometimes   (2) = Seldom

(1) = Never.

Questions: What do you think are the Effect due to delays?

EFFECT	1	2	3	4	5
1. Time Overrun					
2. Cost Overrun					
3. Dispute					
4. Arbitration					
5. Litigation					
6. Total Abandonment					
7. Others, please specify…………………………….. ………………………………………………………….					
8. Others, please specify ………………………………. ………………………………………………………….					
9. Others, please specify…………………………….. ………………………………………………………….					
10. Others, please specify …………………………… ………………………………………………………….					

Thank you for your time