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**COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE**

Project Management Graduate Studies

**Factors Affecting Cost and Time Overruns on Road Construction
Projects under Addis Ababa City Administration
In Partial Fulfillment of the Requirements for the Award of Master of
Arts Degree in Project Management**

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**ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE GRADUATE STUDIES**

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Construction Projects under Addis Ababa City Administration**

Approved by Board of Examiners

Signature

1. Advisor

2. Internal Examiner

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Declaration

I declare that this thesis entitled “FACTORS AFFECTING TIME AND COST OVERRUN IN ROAD CONSTRUCTION PROJECTS IN ADDIS ABABA” is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged.

Candidate:

Name: _____

Signature: _____

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Abstract

The objectives of this research was to identify the most common and frequent factors of cost and time overrun in road construction projects of Addis Ababa city administration.

In order to achieve this objective, the researcher implemented literature review research methodology and questionnaire survey. Employing these methods, the significance of factors contributing to delay and cost overruns within the projects of interest were identified and evaluated.

The participants were selected from clients, contractors and consultants. A total of 94 questionnaires from client, consultants and contractors were collected and a desk study of 10 completed road construction projects in Addis Ababa were investigated. The agreement among the sets of rankings for delay and cost overruns were tested using statistical methods.

From the results it was found that 100% of the road construction projects suffered both time and cost overrun. The rate of time overrun ranges from a minimum of 25% to the maximum of 264.38% of the contract amount and cost overrun ranges from a minimum of 4.11% to the maximum of 135.06% of the contract amount.

Respondents identified 45 causes of time and cost overrun for Addis Ababa case. The most important causes of time overrun were delay to furnish and deliver the site (Right of way problem), financial problems and poor planning. Whereas the most important causes of cost overrun were found to be delay in construction, inadequate supply of raw materials and equipment by contractors, design changes, Incomplete design at the time of tender.

The most common effects of cost overrun identified by this research are delay, supplementary agreement, adversarial relations among stakeholders, and budget shortfall of project owners. It is hoped that these findings will guide efforts to improve the performance of the construction industry in the future.

Key words: cost overrun, cause, effect, rate, time overrun.

CHAPTER ONE: Introduction

1.1. Background of the Study

Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (*PMBK, 2000 Ed.*). (*Mohamed, 2013*), indicated that time, cost and quality have their proven importance as a prime measures for project success.

Road project management is not something special to be treated differently; rather, like any other projects. The construction industry is truly the engine of national economy through which the total of physical development is achieved. The construction industry is a vital element of the economy and has a significant effect on the efficiency and productivity of other industry sectors. One cannot think of widespread investment in manufacturing, agriculture, or service sectors unless the construction results of infrastructure facilities are in place. In some of the developing countries, the growth rate of construction activity outstrips that of population and of GDP Cost, time, and quality are used to measure the project performance and success (*Chitkara, 2004*).

Generally, the success of a project is defined by accomplishing it within specified cost, time and quality. However, the construction industry is full of projects that are completed with significant time and cost overruns. Road projects, involving large amount of capital, also contribute to the total economy through job creation and in a ripple effect to other business activities. For the purpose of this research, time overrun is defined as the time difference between the actual completion time and the estimated completion time, agreed by and between the client and the contractor during signing of the contract. And cost overrun is the cost difference between the actual completion cost and the estimated completion cost.

The construction sector particularly road construction is a very important sector for the development and economic growth of any developing country (*.Haseeb, 2011*). Ethiopia and /or Addis Ababa city is underdevelopment and the development of road construction is vital like any other developing country if not more vital. In Ethiopia, particularly in Addis Ababa, there are many road projects constructed, under construction and planned to be constructed. But, a very common problem which is affecting almost all road construction projects in the city is the failure to meet the stated/planned completion period (delay). According to Ahmed, et. al. (2002), the inability to complete projects on time and within budget continues to be a chronic

problem worldwide and is worsening. The failure to meet time requirements of road projects will certainly end up with various side effects related with budget and other economic circulations of the country or city. And, therefore, this chronic problem is repeatedly happening in almost all road projects of Addis Ababa city administration and we can assume list of factors to affect the on time accomplishment of projects.

1.2 History of the Addis Ababa City Roads Development

Addis Ababa city was founded by Minellik II and Empress Taitu in 1887. The history of the city's road development also begins from the inception of the city. Minellik II constructed the first ever two roads in the city as well as in the country that stretch from Addis Ababa to Addis Alem and from his palace to England Embassy in 1902. In 1904 the first roller was imported by the emperor and was being pulled by many people for its operation.

Emperor Minellik was also believed to be the first in importing two cars in Addis Ababa and introduced the car technology in the city for the first time in 1907. The country's modern road construction is highly interlinked with Emperor Haile Sellase's ruling period. During the regime of Haile Sellase I, a number of contractors were organized to carry out road construction.

The first one to be established by the Government to construct roads was Public Works Department. It was established to construct roads in Addis Ababa and in its surrounding. After a few years, this department was raised to a minister level and Addis Ababa also got the chance to establish its road development organizational structure.

When it was decided for Addis Ababa to have a mayor and a council in 1942, the city roads construction and maintenance was organized under the municipality. To fulfill the road construction activities to get her with building works the "Road and Building works" department was established. This department stayed till the replacement of the Haile Sellase regime by the Derge regime performing its duties. But no fundamental organizational change of the department was observed in the Derg regime.

. The newly established road department constructed and maintained the city roads till the establishment of the Addis Ababa City Roads Authority in March 15, 1998 by regulation No.7/1998 to be administrated by board of directors to construct, maintain and administer the

road works in Addis Ababa by the city Administration. The total length of road constructed in the city till the establishment of the authority in March 1998 was 1300 km of which 900km was gravel road and the remaining 400km was Asphalt surfaced road (ERA, 2007).

The Addis Ababa City Roads Authority has done remarkable progress in the city roads expansion and upgrading in the last 11 years since its establishment. To date, the City Roads length reached 6616 kms of which 3281km is gravel surfaced and 3335km is Asphalt surfaced and the road network coverage has reached 23.09% compared with the developed area of the city (AACRA, 2009).

1.3 Statement of the Problem

The initiation for the study of this research is largely due to personal observation and low performance of asphalt road construction projects in Addis Ababa city administration in terms of time (delay) and cost. The construction sector is one of the key economic sectors and is the main force in motivating the economic development of nations (*Mehamid, 2013*).

According to Majid (2006), a construction project is commonly acknowledged as successful when it is completed on time, within budget, in accordance with specifications, and to stakeholders' satisfaction.

Sadi A. et.al. (2006), completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it is difficult to see a project is completed within the specified time.

The delay in completion of construction projects is a worldwide *problem* (*Haseeb, 2011*). This statement again implies how delay in construction projects is common even globally. According to *Faridi, et.al (2006)*, delays have an adverse impact (effect) on project success in terms of time, cost, quality and safety.

Most construction projects in this country (Ethiopia) suffer time and cost overrun, (*Nega, 2008*). As it is obviously known, Addis Ababa is the capital city of both Ethiopia and Africa and this fact makes the necessity of standardized roads in the city even more critical and vital.

Despite the fact that efforts of the city administration are visible, construction delay remains the main problem and there are various factors which affect the accomplishment of projects as planned in our case in terms of time requirement.

Important causes are financial problems, changes in the design and scope, delay in making decisions and approvals by owner, difficulties in obtaining work permit, and coordination and communication problems (Sadi, A.etal., (2006). Apolot, et al., (2002), stated, the five most important causes of delays and cost overrun are changes in scope, delayed payment to contractor, poor monitoring and control and high inflation and interest rates. Therefore, from the above fact, we can ascertain that important and frequent factors for project delay could be different in different situations.

Completion of a project is considered as the most important factors of successful projects, which help to decrease problems for all parties and give new chances to construct other related projects.

It also helps to increase the profits and development of construction industry. The accomplishment of the first 10 years Road Sector Development Program reveals that the execution of most of the Federal road projects resulted in cost and time overruns have also ascertained that the projects were not completed on time, within budget, and desired quality. For that it is of key importance to exert the utmost effort to accomplish such study, to detect the previously mentioned factors and to treat all the weakness points and from all sides and so giving specific priorities in order to avoid time and cost overruns at construction projects.

Besides to that, there are some factors which have never been mentioned in most studies which are related with clearing the environment of the project (site clearance). Nevertheless, clearing the environment of the project is assumed (hypothesized) to be the most critical factors of delay among other factors in my research case in the views of both owner, contractors and consultants. Generally, this study tried to identify the most common and frequent factors of delay for road construction projects in Addis Ababa city administration.

1.4 Research Questions

This section encompasses the questions the researcher wants to ask to shape the study. Based on the above model, and to test the hypothesis, the researcher wants to ask the following research questions:

1. What is extent of the time delay and cost overrun in Addis Ababa road construction projects?
2. What are the factors influencing time and cost overruns in road construction in Addis Ababa?
3. What are the .effects of time delay and cost overrun in road construction in Addis Ababa?

1.5 Objectives of the Research

1.5.1. General Objective

The general objective of this study was to identify the most common and frequent factors of cost and time overrun in road construction projects of Addis Ababa city administration.

1.5.2 Specific Objectives

This study has been undertaken with the following specific objectives

1. To evaluate to what extent the time delay and cost increases in Addis Ababa road construction.
2. To identify factors influencing time and cost overruns in road construction in Addis Ababa.
3. To discuss the effect of time delay and cost overrun in road construction in Addis Ababa.

1.6 Significance of the Study

The primary objectives of construction projects are to optimize quality, cost and time; and hence this thesis studies the causes and presents the resolutions of time and cost overruns.

It also assesses how to minimize or avoid additional cost and time in the construction projects of Addis Ababa road construction projects.

This research is significant in various dimensions to understand the real extent of delay in Addis Ababa's road construction projects, to know who are responsible for road project delay in Addis Ababa city administration. Identify the most frequently happening factors of delay in Addis Ababa's road construction project., helps the management of the AACRA to take

corrective actions to foster project management success in the capital in terms of time and cost requirement and for further research studies.

1.7 Scope and Limitations of the Study

The study was conducted on Addis Ababa city road authority from the perspectives of owner, contractors and consultants that is an approached for questioners to identify the most common and frequently happening factors of delay and cost overrun in road construction projects.

The major limitation of this study is lack of relevant and up-to-date literatures which was conducted in this area of study (AA city).

1.8 Organization of the Study

This study is organized in five consequential chapters. The first chapter deals with the introduction part of the paper comprising statement of the problem, objectives of the study and other relevant introductory issues.

The second chapter focuses on literature review. An eye bird view on all of the relevant literatures in relation to the topic under discussion was made.

The third chapter deals with the research design, approaches used throughout the data collection and analysis process.

The fourth chapter presents the overall finding of the study which prevails about the extent of delay in asphalt road construction of Addis Ababa city administration, who were the responsible parties for delay among the project participants (stakeholders) and the most common and frequently happening factors of delay and presents the comparative analysis of the views of the respondents from the three groups (owner, contractors and consultants).

The last chapter, chapter five, encompasses the conclusion and recommendation part of the study. Conclusions were made from the previous chapter so that we can make some recommendations.

CHAPTER TWO: Literature Review

2.1. Introduction

This chapter deals about different literatures' which was conducted on the area of both project management and road project management. Most of the literatures' discussed here under are conducted on different countries and situations to ascertain the fact that delay factors could be different in different countries and situations. The purpose of this chapter is to refer it and integrate with the finding of this study.

2.2. Definition

A project is a temporary endeavor undertaken to create unique product, service, or result (*PMBOK, 2008*). The temporary nature of projects indicates a definite beginning and end. According to *PMBOK*, The end is reached when the projects objectives have been achieved or when the project is terminated because its objective will not or cannot be met, or when the need for the project is no longer exists. Temporary does not necessarily mean short in duration. *PMBOK* implies the fact that, temporary does not generally apply to the product, service or result created by the project; most projects are undertaken to create lasting outcome.

Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements (*PMBOK, 2008*). The *PMBOK* guide divides project management processes in to initiating, planning, execution, controlling and closing process. A central idea is that these processes form a closed loop: the planning process provides a plan that is realized by the executing process, and variances from the base line or requests for change lead to correction in execution or changes in further plans (*Howell 2002*).

According to *Mohamed, (2013)* Project success is measured by the planned time, cost and quality as they have their proven importance as a prime measures for project success. As it is prevailed above project requirements are commonly assumed to be time, quality and cost of a project. Success and failure of any project will be measured by these three requirements.

Therefore, a proper practices of project managerial functions; proper planning of every element of a project, proper execution/implementations including controlling and proper close-up of the project fosters/enhances project success in terms of the above three principal

requirement which is what we call golden triangles of project success. The golden triangle (time, cost and quality) is used to measure the project performance and success (*Mahamed, 2013*).

Any deviation in terms of the planned time, quality and cost will lead to argue that the project is not successful or failed to meet its requirement.

2.3. Project Delay

In construction, delay could be defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project (*Sadi.A.etal2006*). It is a projects leaping over its planned schedule and it is considered as common problem in construction projects.

In construction, the word “delay” refers to something happening at a later time than planned, expected, specified in a contractor beyond the date that the parties agreed upon for the delivery of a project (*Pickavance,2005*). *Lo, Fung and Tung (2006)* define delay as the slowing down of work without stopping construction entirely and that can lead to time over run either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project. *Syed, Azhar, etal., (2002)* classify delays into non-excusable delays, excusable non-compensable delays, excusable compensable delays and concurrent delays. Non-excusable delays are delays, which the contractor either causes or assumes the risk for. Excusable non-compensable delays are delays caused by factors that are not foreseeable, beyond the contractor’s reasonable control and not attribute able to the contractor’s fault or negligence. Compensable excusable delays are excusable delays, 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, stated or implied, in the contract. Concurrent delays occur when both owner and the contractor are responsible for the delay.

Nega (2008) concluded that, it is common to see construction projects failing to achieve their mission of creating facilities within the specified cost and time. This implies again the extent of projects failure to meet their plan or requirement. Hardly few projects get completed on time and within budgets in construction project share exposed to uncertain environments because of such factors as complex nature of construction projects; presence of various interest

groups such as the project owners, end users, consultants, contractors, financiers, materials, equipment, project funding, climatic environment, the economic and political environment and legal regulations. The delay/incompletion of construction projects is a worldwide problem (*M. Haseeb, 2011*). This statement again states how delay in construction projects is common even globally. For the client, construction delay refers to the loss of revenue, lack of productivity, dependency of existing facilities, and lack of rentable facilities etc. For the contractor, construction delay refers to the higher costs, longer work duration, increased labor cost, higher material and equipment costs etc. Completion of construction projects on specified time or time agreed within parties indicates the work and construction efficiency.

According to *Abbas (2006)*, let completion of works as compared to the planned schedule or contract schedule is what is known as delay. Delay occurs when the progress of a contract falls behind its scheduled program. It may be caused by any party to the contract and may be a direct result of one or more circumstances. A contract delay has adverse effects on both the owner and contractor (either in the form of lost revenue or expense) and it often raises the contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts (*Apolot, et al, 2009*).

According to *Majid (2006)*, a construction project is commonly acknowledged as successful when it is completed on time, within budget, in accordance with specifications, and to stakeholders' satisfaction. In construction industry, contractors tend to maximize profit to increase market share. To achieve this aim, it is crucial for contractors to carefully identify the factors that affect the success of a project and estimate their impacts before the bidding stage. A major criticism facing the Nigerian construction industry is the growing rate of delays in project delivery (*Aibinu, & Jagboro, 2002*). Delay is a situation when the contractor or the project owners jointly or severally contribute to the non-completion of the project within the original or stipulated or agreed contract period. When projects are delayed, they are either accelerated or have their duration extended beyond the scheduled completion date. These are not without some cost consequences.

According to *Faridi et al (2006)*, delays have an adverse impact on project success in terms of time, cost, quality and safety. The effect of construction delays are not confined with construction industry only, but influence the overall economy of the country. 100% of road

construction projects implemented in the west bank suffering from time overrun (Mahamid & Bruland, 2012). The delays in construction projects happen because of various causes or reasons. These causes lead to the delay in construction completion, and these delay leads to some negative effects on the construction projects.

In Ethiopia and Addis Ababa, it is very rare case that road construction projects are completed on the time specified or agreed upon. There are many road projects in Addis Ababa which suffered delay or in some cases suffered suspension or even abandonment. And a numbers of studies have been conducted to identify important causes of delay in road construction which is common globally.

2.4. Causes of Delay in Road Construction Projects

Many articles and studies conducted on causes of delay in construction project to be reviewed below for the purpose of this research.

According to *Sadi .A, and etal,(2006)*,the causes can be grouped into nine classes. Ranking of these groups associated with frequency of occurrence, degree of severity and importance by owners, contractors and consultants are presented below. According to this study, owners and consultants specify that labor, contractor and project related causes as source of delay. From owners' point of view, the most frequent causes of delay are related to both contractors and labor. The study shows that owners are realizing that awarding of projects to the lowest bidders is one of the highest frequent factors of delay. The idea here is the lowest bidders are unqualified contractors with short age in resources and low capabilities, which leads to low performance and which causes delay incomplection of the work. While contractors indicate that source of delay in construction projects are owners and consultants. The combined results presented on this study prevails that delay in construction projects is mostly originated by the owner, followed by contractors. Design, labor and consultant related factors are less important.

In another study,. *Haseeb and Xinhai, (2011)*, finance and payments, in accurate time estimation, quality of material, delay to payments to supplier and contractors and poor site management are the five most important causes of delay for construction projects. . *Haseeb and Xinhai*, identified around 16 causes of delay for construction projects ranked in terms of frequency and importance to affect successful construction project accomplishments.

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

The top three ranked factors of delay for construction projects from contractors view in Palestine are, Labors, materials and equipment's, and owner related factors (*Mahamid,2013*). According to Ibrahim, the three least important and less frequent factors in the same country are consultant, design and project related factors.

The study discussed why the above three important and frequently happening factors are taken as important factors of delay for construction projects in Palestine. Labor related factor is important because of the fact that segmentation of the west bank limits the movement of labors, goods and services b/n the areas (cities and villages). The check points b/n the Palestinian areas which are controlled by Israel may prevent or delay labors, materials and equipment to arrive the project site on time. The political situation in the West Bank is described as unstable because of the conflict between the Palestinian and Israel. This situation leads to shortage in materials, shortage in equipment, limitations on material import, and limitation on movement which lead to time overrun. Progress payments are of high importance to contractors in order to fulfill the high daily expense. Due to the delay of payments by the owner, work progress can be delayed because there is in adequate cash flow to support construction expense especially for those contractors who are not financially sound.

As the researcher stated above, factors for delay can be different in different countries and situations. According to *Chan & Kumar (1997)*, the main causes of delay for construction projects in Hong Kong are poor supervision and management, unpredictable cite conditions, slow decisions, variations by clients and variations of work. Whereas according to Masfield,

(2002), the main causes of delay for construction projects in Nigeria are finance and payments, poor handling of contract, shortage of materials and equipment, inaccurate estimations and fluctuations in price. Summary of causes of delay according to these two researchers in two different countries is presented below.

Table 1: Comparison of common factors in different countries

No	Main Causes of Delay in Construction Industry	
1	Poor supervision and management	According to Chan &Kumar W(1997), in Hong Kong
2	Unpredictable site conditions	
3	Slow decisions	
4	Variations by client	
5	Variations of work	
1	Finance and payments	According to Mansfield (1994), in Nigeria
2	Poor handling of contract	
3	Shortages of materials and equipment	
4	In accurate estimations	
5	Fluctuations in prices	

Agaba (2009) attributes delays in construction projects to poor designs and specifications, and problems associated with management and supervision. In their study, El-Razek et al., (2008) found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Sambas Ivan and Soon (2007) established poor planning, poor site management, inadequate supervisory skills of the contractor, delayed payments, material shortage, labor supply, equipment availability and failure, poor communication and rework, were the most important causes of delays in the Malaysian Construction Industry.

As we can see on the above paragraph, all the researchers found and outlined their own factors of delay on construction industries in the respective countries. The idea here is, it is difficult to expect common causes of delay in construction projects due to its special nature and characteristics and level of complexity. The parties and stakeholders

To participate in the construction process are different in different countries and this fact can contribute for the heterogeneity of causes of delay factors in different countries. As the process of construction project development is very complicated and combines various parties' agendas, comprise many stages of work, and entail along period until completion (Puspasari 2006), many factors contribute to delays in construction projects.

Baldwin and Manthei (1971) investigated the reasons for delays in building projects in the United States. They indicated 17 delay factors. Their study concluded that weather, labor supply, and sub-contractors are the three major causes of construction delays.

Mezher and Tawil (1998) carried out a survey about the causes of delays in the construction industry in Lebanon. The survey included 64 causes of delay, which were grouped into 10 major categories. According to their findings, financial issues, the way in which contractors regarded the contractual relationship, and project management issues were the most important causes of delays.

Odeh and Battaineh (2002) found 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 of construction delay in Jordan.

Al-Momani (2000) investigated causes of delay in 130 public building projects constructed in Jordan during the period of 1990-1997. He presented regression models of the relationship between actual and planned project duration for different types of building facilities. He concluded that the main causes of delay are related to designer, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity.

As Naashari et al. (2009) presented the result of an investigation into the main factors which cause construction delay in Iran. The results reveal that most of construction projects in Iran are subject to delay. Cash constraints, shortage of resources, high inflation rate, delay in payments, and disputes in the supply chain are the top causes of delay in the Iranian construction industry.

To summarize, delay in construction projects is very common wherever the project is undergoing. And the causes of delay are related with and can be categorized under the different participants of a construction project (project stakeholders). But the particular causes of delay are

different in different countries and situations. This research also identified the real causes of delay for road construction projects in Addis Ababa city administration.

2.5. Discussion on the major Causes Contributing to Time Overrun on the Views of Three Project Participants.

The consequences of construction time overrun when undertaking a public sector road project affects all project parties, with issues such as extra cost. Although various methods for mitigating the problem have been developed in the previous studies, the limitation of using these methods raises the concern that probably the causes contributing to the time variance has not been adequately addressed. To investigate the causes, three interview workshops were arranged with relevant personnel in the public sectors. These discussions led to the identification of the following major categories of causes of time overruns (Wangetal2003).

2.5.1. Owner-Related Causes

A public sector project generally involves more changes, thus inducing delays in the process of implementing the project. The public sector owner in general, is less active in pushing project progress when compared with a private sector owner. There is a lack of skill in controlling construction programming. The bureaucracy exists in all procedures that a public sector project has to go through, which further induces progress delay. A public sector owner has to work with many governmental departments when changes to a project occur. He has to spend a substantial amount of time communicating with many other governmental departments, which again induces project delays (Wangetal2003).

2.5.2. Contractor-Related Causes

There are many ways in which a contractor's performance can delay a construction project. For typical examples, main contractors often have various disputes with subcontractors and materials suppliers, which can cause major delays. In fact, such disputes are considered a major cause for project delay. Other factors, such as the contractor's insufficient financial resources, mistakes in making decisions on progress control and the overall inability when performing management functions, are also possible reasons for causing project delays.

It is interesting to note that, a main contractor will sometimes deliberately demand an unreasonably short contract period although the contractor understands that the completion on contract time is impossible. In this situation, the contractors only want to secure a contract and thus agree with an unrealistic contract period imposed by a project owner. Consequently, project delay cannot be avoided (Takimetal2004).

2.5.3. Consultant-Related Causes

The consultant engaged in a road construction project can affect the progress of construction programming through various monitoring measures such as issuing certificates, and endorsing the satisfaction of certain activities in the construction process. Progress delay can happen if these monitoring measures are not implemented properly. This appears a typical problem in the main land of China where a professional called the ‘supervision engineer’ is adopted for supervising construction performance, particularly in committing public sector projects. Supervision engineers are given the authority to endorse the satisfaction of certain procedures such as piling, steel fixing, the quality of key materials, before the construction programming can proceed forward. It has been found that supervision engineers often cannot endorse these procedures in time, thus construction delays are caused (Wangetal2003).

2.6. Effects of Delay

A study by Aibinu and Jagboro, (2002) reveals six effects of delay on project delivery in Nigerian construction industry which are: time overrun, cost overrun, dispute, arbitration, total abandonment and litigation. Sambasivan and Soon (2007) disclose the same effects of delay in Malaysian construction industry. Haseeb et al (2011) identifies effects of delays in Pakistan construction industry as clash, claims, total desertion and slowing down the growth of the construction sector. Ramabodu and Verster (2010) identify critical factors that cause cost overruns in construction projects as changes in scope of work on site, incomplete design at the time of tender, contractual claims(extension of time with cost), lack of cost planning and monitoring of funds, delays in costing variations and additional works. These critical factors in turn are the delay factors. Chileshe and Berko (2010) indicate that causes cost overrun in Ghanaian road construction sector are delay in monthly payments to contractors; variations;

inflation, and schedule slippage. Again, these explain the causes of delays and the effect of cost overrun.

According to A.A. Aibinu*, G.O. Jagboro (2002), it was observed that the most frequent effects of delay on project delivery in Nigeria were time overrun. Therefore, based on the above articles, we can argue that delay in road construction projects affect everything negatively. Especially in developing countries, it might be worse than that as road and other infrastructures are needed badly to enhance the economic development of the country or the town in the case of this research. And again, developing countries didn't afford any compensation (additional cost) for a late completion of road construction projects. These fact among other things tells us about the very high extent of negative effects caused by road project delays in a given developing country or region. The effect of delay on road construction projects in the case of both Ethiopia and Addis Ababa could be worse than what we have tried to disclose above as the need for development and transformation is highly necessary.

2.7. Problems that Lead to a cost Overrun of a Project

Cost is the fundamental component for any construction project. However, cost overrun is observed as one of the most frequently occurring issues in construction projects worldwide and need to be studied more to alleviate this issue in the future. This trend is more severe in developing countries where these overruns sometimes exceeds 100% of the anticipated cost of the project. Several scholars have conducted studies to on the issue of construction cost overrun in order to identify the causative factors. Some researchers argue that construction cost overrun is one of the effects of project delay. The responsibility for project delay is reflected in whether the contractor is liable for costs and additional time to complete the project. In the study of the growing problem of construction delay in Nigeria, through a questionnaire survey and study of 61 construction projects, concluded that cost overrun is one of the effects of project delay. In Ghana studied 26 factors that cause cost overruns in construction projects and found that according to the contractors and consultants, monthly payments difficulties was the most important cost overruns factor, while owners ranked poor contractor management as the most important factor. Despite some difference in viewpoints among the three groups surveyed, there is a high degree of agreement among them with respect to their ranking of the factors. The overall ranking results indicate that the three groups felt that the major factors that can cause

excessive project cost overruns in developing countries are poor contractor management, monthly payment difficulties, material procurement, poor technical performances, and escalation of material prices. There is simultaneity between delays and cost overruns; the contractual and the institutional failures are economically and statically significant causes behind cost overruns. If a project completion is delayed due to the reasons attribute to the owner, extension of time will be granted to the contractor which will implicate requirement of additional payment for time related costs like overhead and profit. Completing transportation projects within the specified budget agreed on the contract has been a chronic problem for most of the public projects in our country. Some of the causes of cost overrun in construction projects can be avoided and controlled by the parties involved in the contract. However, some of them are beyond the control of the parties in the contract because virtually all projects are planned under the context of uncertainties. In Kuwait a major factor contributing to the time-delay and cost increase was the inadequacy of money and time allocated to the design phase. The three main causes of cost overruns on the other hand were, in order, contractor-Elide and material-related problems and, again, owners" financial constraints. Four major factors that cause cost overruns are design changes, inadequate planning, unpredictable weather conditions; and fluctuations in the cost of building materials.

CHAPTER THREE: Research Methodology

3.1. Introduction

This chapter describes the methodology of the thesis. The main topics included in this chapter are research strategy, research design and data collection. The objective of this thesis is to identify factors affecting cost and time overruns in Addis Ababa road construction projects. The research strategy and design to be followed towards this end are discussed as follows.

3.2 Research Design

Research design refers to the plan or organization of scientific investigation, designing of a research study involves the development of a plan or strategy that will guide the collection and analyses of data (Poilt and Hungler, 1985). This research consists of five phases; the first one is the proposal for identifying and defining the problems and establishment of the objectives of the study. The second phase of the research includes literature review. Literatures of time and cost overruns in road construction were reviewed.

The third phase of the research included a methodology of the thesis. The fourth phase of the research includes result and discussion. In this phase the result of desk study and questionnaires are discussed. The last phase of the research includes the conclusions and recommendations.

3.3 Research Strategy

Research strategy is defined as the way in which the research objectives can be questioned (Naoum, 1998). Two types of research strategies are used at studies, quantitative and qualitative research. Quantitative approach is used to gather factual data and to study relationships between facts and how such facts and relationships accord with theories and the findings of any research executed previously, but the qualitative approach seek to gain insights and to understand people's perception of "the world" whether as individuals or groups (Fellows and Liu, 1997). The research strategy adapted for this research is quantitative research. Quantitative research is chosen to know stakeholders perception regarding time and cost overrun.

3.4 The Research Type

This research can be categorized as exploratory and descriptive type. It is exploratory because the research finds whether time and cost overrun exists or not. It is also descriptive because it tried to describe the actual rate of time and cost overrun and the variables of time and cost overrun and tries to draw relationship between contract amount and rate of cost overrun in the Addis Ababa road construction projects.

3.6. Data Collection

The study has used the data sources to produce the following basic documents: respondents' documents and archival documents. The respondents' documents were collected using questionnaire from client, contractors and consultants. Archival documents were mostly from completed projects, in which contract documents, project reports, correspondence letters and payment certificates were investigated thoroughly which were very important in identifying the recurrent problems related to time and cost in the Addis Ababa road construction projects. In addition, they helped to judge how problems on causes of time and cost overrun arise and how they are documented.

According to Addis Ababa City Road Authority, 2005 yearly book sixty main roads are constructed in Addis Ababa for the past 20 years. Out of those roads ten recent road construction projects in Addis Ababa were selected and investigated. Some of the selected road projects are not completed. But the rate of cost and time overrun of these projects calculated by extrapolation of the current status. These projects discussed information regarding the estimated time and actual completion date as well as estimated amount and actual amount.

3.7. Sample Size Distributions

Wood and Haber (1998) defined the sampling as the process of selecting representative units of a population for the study in research investigation. A sample is a small proportion of a population selected for observation and analysis. The samples were selected randomly from contracting companies, consultant offices and client.

Statistical equations were used in order to calculate the sample size for the contractors. Equation 3.1 was used to determine the sample size of the unlimited population (creative research system, 2001, www.cdb.riken.jp):

$$SS = \frac{Z^2 \cdot P \cdot (1-P)}{C^2} \dots\dots\dots \text{Equation 3.1}$$

Where SS = Sample size

Z = Z value (e.g. 1.96 for 95% confidence level)

P = Percentage picking a choice, expressed as a decimal (0.50 used for sample size needed).

C = Margin of error (9%)

$$SS = \frac{1.96^2 \times 0.5 \times (1-0.5)}{0.09^2} = 118.57 \approx 119$$

Correction for Finite Population

$$SS_{\text{new}} = \frac{SS}{1 + \frac{SS - 1}{POP}} \dots\dots\dots \text{Equation 3.2}$$

Where POP is the population = 38 match the proposed classes of contracting companies (only grade 1 road contractors were considered)

$$SS_{\text{new}} = \frac{119}{1 + \frac{119 - 1}{38}} = 28.9 \approx 29$$

In terms of consultants, the following method was used to select samples.

$$POP (\text{Consultants}) = 18$$

$$SS_{\text{new}} = \frac{119}{1 + \frac{119 - 1}{18}} = 15.75 \approx 16$$

Since the client of Addis Ababa roads is one no need of calculation for sample size. I simply distribute for ten engineers in clients side.

3.8 Data Analysis Procedures

The methodology used for this study is using questionnaire and desk study. A questionnaire of 45 factors was carefully designed from literatures conducted in road construction projects. It was organized in the form of a priority scaling (1 = not significant, 2 = slightly significant, 3 = moderately significant, 4 = very significant, and 5 = extremely significant).

The procedure used in analyzing the results aimed at establishing the mean score of the various factors responsible for project delay and cost overruns. The score for each factor is calculated by summing up scores assigned to it by respondents. Therefore, the level of importance as indicated by the client, contractors and consultants were used to measure the mean score of each factor.

The mean score (MS) for each variable of time and cost overrun is computed by using the following formula:

$$MS_i = \frac{\sum (f \times s)}{N} \dots\dots\dots \text{Equation 3.3}$$

Where:

S = score given to each cause of delay by the respondents;

F = frequency of responses to each score for each cause of delay;

N = total number of responses in the respective cause of delay.

Weighted Average is calculated by using the following formula:

$$\text{Weighted Avg.} = w_a x_a + w_b x_b + w_c x_c \dots\dots\dots \text{Equation 3.2}$$

Where:

w= relative weight (%)

x= mean score

a, b & c represent contractor, consultant and client respectively.

The Spearman (rho) rank correlation coefficient is used for measuring the differences in ranking between two groups of respondents scoring for various factors (i.e. clients versus consultants, clients versus contractors, and consultants versus contractors).

The Spearman (rho) rank correlation coefficient for any two groups of ranking is given by the following formula.

$$\text{Rho } (\rho_{\text{cal}}) = 1 - \frac{6 \times (\sum d_i^2)}{N \times (N^2 - 1)} \dots \dots \dots [\text{Eq. 3.3}]$$

Where:

Rho (ρ_{cal}) – Spearman rank correlation coefficient

d_i – The difference in ranking between each pair of factors

N– Number of factors (variables)

Procedure for hypothesis testing:

1. Define the null hypothesis (H_0) and the alternative hypothesis (H_A)
2. Choose a value for ρ . (i.e. choose the significance level)
3. Calculate the value of the test statistic, Rho (ρ_{cal}).
4. Compare the calculated value with a table of the critical values of the test statistic.
5. If the calculated value of the test statistic is less than the critical value from the table, accept the null hypothesis (H_0). If the absolute (calculated) value of the test statistic is greater than or equal to the critical value from the table, reject the null hypothesis (H_0) and accept the alternative hypothesis (H_A).

3.8.1 Questionnaire Approach

A questionnaire was developed to assess the perceptions of client (Addis Ababa road construction Authority, consultants, and contractors due to the importance index of causes and effects of delay in Addis Ababa road construction projects. Factors influencing time and cost overruns in road construction projects in Addis Ababa were first examined and identified through a relevant literature review and by conducting experienced professionals in road construction industry.

3.8.2 Questionnaire Design

From literature review, it has been discussed factors which affect time and cost overruns in road construction projects in various countries around the world and at intervals of time, but not all of these factors are the cause of time and cost overrun in Addis Ababa road construction projects, so 45 factors that has an impact in Addis Ababa projects have been selected.

The draft questionnaire was discussed with the supervisor of the thesis. The final questionnaire contains 32 factors influencing time overruns, and 13 factors influencing cost overruns.

3.8.3 Contents of the Questionnaire

The questionnaire included three parts that are related to the factors of time and cost overruns at construction projects in Addis Ababa, these parts are general organization information, factors influencing time overruns and factors influencing cost overruns.

3.8.3.1 Organization Profile

Four items were prepared for asking information about organization such as the name of organization, company type (client, consultant or contractor), respondents designation and his/her experience. (The questionnaire is included in annex 1)

3.8.3.2 Factors Affecting time Overruns at Construction Project

This part of questionnaire consist of 8 groups related to time overruns, the groups included 32 factors that influencing time overruns, these groups are project related factors, Owner responsibility, Contractor's responsibility, Consultant responsibility, Materials, Labor and equipments, Contractual relationship and external factors. (The questionnaire is included in annex 1).

3.8.3.3 Factors Influencing Cost Overruns

This part illustrates the factors influencing cost overruns in road construction project, these factors are the harvest of previous studies. 13 factors were included in this part. (The questionnaire is included in annex 1).

3.9 Ordinal Measurement

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. For each type of measurement, there is an appropriate method that can be applied and not others. In this research, ordinal scales were used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement or degree of influence (1, 2, 3, 4, and 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels. Based on Likert scale researcher has the following:

Table 2: Scales that represent chances of occurrence

Chances of occurrence	Extremely significant	Very significant	Moderately significant	Slightly significant	Not significant
Scale	5	4	3	2	1

3.10. Ethical Consideration

The participants of this research gave their consent to fill in the data collection tool, i.e. questionnaire. For confidentiality, the personnel who handed over some confidential documents were also not acknowledged in their names based on the agreements made. The respondents were asked to fill the questionnaire and they were assured that the information will be confidential and only for research purpose.

CHAPTER FOUR: Results and Discussion

4.1. Introduction

This chapter describes the results and discussion of desk study and questionnaire survey concerning time and cost overruns in Addis Ababa road construction projects from contractors, consultants and client view points. Finally, the effects of time and cost overrun in construction on the various stakeholders on the construction industry and on the national economy in general will be dealt.

From the desk study ten road construction projects in Addis Ababa were surveyed. During the desk study the contract amount, contract time during signing of the contract, actual cost and actual completion time at completion of the project were investigated. These help to know whether there is time and cost overrun exist or not, and to investigate how the actual time and cost at completion deviates from the contract period and contract amount.

4.2. Results of Desk Study

Before identifying the causes of time and cost overrun, it has to be identified whether time and cost overrun exists or not. During desk study ten road projects are selected and evaluated their estimated completion time and actual completion date then calculated the rate of time overrun if any. This is also done for cost overrun in the same approach. The data was collected via reviewing project documents. On the basis of data gathered from the desk study, the entire project evaluated in desk study registered time and cost overrun. The rate of time overrun ranges from a minimum of 25% to the maximum of 264.38% of the contract time. Cost overrun, on the other hand, ranges from a minimum of 4.11% to the maximum of 135.06% of the contract amount for individual projects.

Based on the result found in desk study, the name of selected road projects, contractors name, contract time, contract amount, actual completion time, actual completion cost, rate of time overrun and rate of cost overrun of selected road are described as shown in Table 3 and 4.

Table 3: Contract time and Actual completed time of some Addis Ababa Road Projects.

No	Project Name	Project Type	Length	Contractor's Name	Commencement date	Contract Time (days)	Actual Completed Time (days)	Rate of Time Overrun (%)
1	Sheromeda to Kidanmihret	Asphalt	2100 meter	Yemangray	End of sep.2016	330	1048	217.58
2	Abo-squer to Bisarte Gebriea	Asphalt	1435 meter	IFH Enginee	Nov.02,2015	365	1330	264.38
3	Yeka-square to Condominiu m	Asphalt	2710 meter	MEDROC	Octo.22,2008	365	1155	216.44
4	CMC square to Michalel church	Asphalt	660 meter	MEDROC	Nov.19,2014	550	726	32
5	CMC square to Kara	Asphalt	1990 meter	Yemangray	14th july 2014	575	2370	58.42
6	Ambo road to Keranio squeare	Asphalt	2.13 k.meter	MEDROC	8,Ap.16	575	1232	114.26
7	Radio station to Kotebe west destilation	Asphalt	1.491 k.meter	MEDROC	march 4,2015	90	270	200
8	K.Mariam to Minilik Hospital	Asphalt	1315 meter	MEDROC	10,octo.15	224	763	240.63
9	ECX to 40-60 condominiu m	Asphalt	2117 meter	IFH	May15,2015	420	709	68.81
10	Genet park to Condominiu m	Asphalt	1548 meter	Yemangray	may 15,2015	180	225	25

Source: Addis Ababa City Road Authority (Projects' Progress and completion report)

Table 3: Contract amount and Actual completed amount of some Addis Ababa Road Projects

No	Project Name	Project Type	Length	Contractor's Name	Commencement date	Contract Amount (Eth.Birr)	Actual Completed Cost (Eth.Birr)	Rate of Cost Overrun (%)
1	Sheromeda to Kidanmihret	Asphalt	2100 meter	Yemangray	End of sep.2016	154,485,787.41	181,139,826.67	17.25
2	Abo-squer to Bisarte Gebriea	Asphalt	1435 meter	IFH Enginee	Nov.02,2015	36,213,579	54,334,900	50.04
3	Yeka-square to Condominium	Asphalt	2710 meter	MEDROC	Octo.22,2008	54,214,003.00	68,563,420.00	26.47
4	CMC square to Michalel church	Asphalt	660 meter	MEDROC	Nov.19,2014	1,162,448,900.69	1,214,586,635.23	4.49
5	CMC square to Kara	Asphalt	1990 meter	Yemangray	14th july 2014	49,587,265.63	78,558,144.39	135.06
6	Ambo road to Keranio squeare	Asphalt	2.13 k.meter	MEDROC	8,Ap.16	109,512,767.87	145,311,625.22	32.69
7	Radio station to Kotebe west destilation	Asphalt	1.491 k.meter	MEDROC	march 4,2015	36,554,500.46	41,654,715.37	13.95
8	K.Mariam to Minilik Hospital	Asphalt	1315 meter	MEDROC	10,octo.15	144,440,764.43	150,374,645.56	4.11
9	ECX to 40-60 condominium	Asphalt	2117 meter	IFH	May15,2015	224,055,813.14	265,104,212.54	18.32
10	Genet park to Condominium	Asphalt	1548 meter	Yemangray	may 15,2015	30,000,000	32,450,000.00	8.17

Source: Addis Ababa City Road Authority (Projects' Progress and completion report)

Tables 3 and 4 clearly show that, the rate of time and cost overrun has been significantly high in Addis Ababa road construction projects. From the projects' completion report, it was found that the main reasons for time and cost overruns are right of way problem, design change, contractors' financial problem.

4.3. Results of Questionnaire for Causes of Time and Cost Overrun

The causes of time and cost overrun from the questionnaire survey are also identified based on participants' responses on each variable of time and cost overrun. Accordingly, causes of time overrun identified by the different researchers, as indicated in the literature review part of this thesis, might not be causes of time overrun for the Addis Ababa road construction industry. Hence it was important to ask the respondents for their agreement on each particular variable of time and cost overrun, and then this was accompanied by identification of causes of cost overrun based on their occurrence. To clearly identify the most common causes of cost overrun, it was important first to identify the causes of cost overrun for Addis Ababa road construction projects, and then identify their rate of occurrence.

4.3.1. Respondents' Characteristics

This part is mainly designed to provide general information about the respondents in terms of the name of organization, company type, position and experience contact person.

4.3.1.1 Type of Respondent's Organization

Table 4: Type of respondents' organization

No of Respondents	No of Questionnaires Distributed	No of Questionnaires Returned	Response Rate (%)
Contractor	72	58	80.56
Client	10	10	100
Consultant	30	26	86.67

As shown on the above table, 58(61.70% contractors, 26 (27.66 %) owners, and 10 (10.64%) consultants filled in and returned the questionnaires distributed. The general response rate for all participants was 83.93%. In terms of each category of participants, the response rate of contractors was 58 (80.56%), for the owner 100% (10 out of 10 participants) and it was 26 (86.67%) for consultants.

4.3.1.2 Designation of Respondents

Participants of this research were selected from different backgrounds. In order to show how diverse they are, the summarized data is presented on the table below.

Table 5: Respondents designation

Respondents designation	Contractor	Consultant	Client
Project manager/ Resident Engineer	12	10	6
Site Engineer	28	10	4
Office Engineer	18	6	0

Table 6 shows that 28 (48.28%) of contracting companies' respondents were site engineers, 12 (0.69%) were projects managers and 18 (31.03%) were office engineers.

It has been founded that an equal number of participants, i.e. 10 (38.46%), of the consultants companies respondents were resident and site engineers, the remaining 6(23.08%) were office engineer.

It has been found that 4(40.0%) of the client respondents were site engineers and 6(60%) were project managers. Moreover, the table shows none of the client participants were from office engineers. And totally, out of the 94 respondents from all three parties of participants, 42(44.68%) respondents were site engineers, 28 (29.79%) were projects managers, and 24 (25.53%) were office engineers.

4.3.1.3 Experience of Respondents

Work experience of the participants is presented on the table below.

Table 6: Work experience of respondents (in years)

Experience of respondents	Contractor	Client	Consultant	Total
1 – 4	28	3	7	38
4 – 8	23	2	9	34
8 – 12	5	4	6	15
>12	2	1	4	7

The above table shows that 38 (40.43 %) of the respondents' firm had a work experience between 1 to 4 years at construction works and 34 (36.17%) had experience between 4 to 8 years. Mean while, 15 (15.96%) of the participants had a work experience of 8 to 12 years, and the remaining 7(7.45%) had an experience of more than 12 years in the construction sectors.

4.3.2 Factors Influencing Time Overruns at Construction Projects

This part consists of results and discussion of factors that influenced time overruns in the projects they had been working when the researcher met them. For simplicity of analysis, the factors are grouped into project related factors, contractors' responsibility, consultants' responsibility, client's responsibilities, and external factors. Based on this, all three groups of participants expressed their views as mentioned below.

4.3.2.1. Contractors, Consultants and clients' Views

In terms of factors that have been affecting the time overrun on the selected road construction projects in the city administration of Addis Ababa, the views of contractors who took part in this study is presented on the table below.

Table 7: Factors influencing time overruns from point view of contractors, consultants and client

No	Factors affecting time overrun	Contractor		Consultant		Client		Weighted average	
		MSi	Rank	MSi	Rank	MSi	Rank	MSi	Rank
1	Delay to deliver the site (Right of way problem)	4.483	1	4.231	2	4.4	1	4.404	1
2	Financial problems	4.207	2	4.385	1	4.3	2	4.266	2
3	Improper planning	3.897	3	3.962	5	4.3	2	3.958	3
4	Weather condition	3.845	4	3.731	6	4.0	6	3.830	5
5	Site management	3.759	5	4.115	3	4.2	4	3.904	4
6	Unrealistic imposed contract duration	3.233	6	3.423	8	4.1	5	2.895	7
7	Suspension of work by client or contractor	2.966	7	4.038	4	3.9	7	3.287	6
8	Contract Administration	2.914	8	3.385	10	3.5	11	3.107	8
9	Change orders	2.914	8	3.577	7	3.6	8	2.723	8
10	Shortage in material	2.69	10	3.269	11	3.5	11	3.107	11
11	Quality assurance/control	2.69	10	3.038	16	3.5	11	2.872	21
12	Absence of consultant's site staff	2.622	12	3.115	14	3.3	15	3.149	16
13	Equipment availability and failure	2.592	13	3.423	8	3.6	8	2.844	13
14	Labor productivity	2.459	14	3.346	11	3.6	8	2.702	26
15	Unforeseen ground condition	2.424	15	2.962	21	3.2	16	2.760	14
16	Quality of material	2.311	16	3.00	18	3.0	21	2.724	12
17	Discrepancies between contract documents	2.311	16	3.231	13	3.4	14	2.853	25
18	Waiting time for approval of tests and inspections	2.269	18	2.962	21	3.1	20	2.670	22

Table 8: Factors influencing/Continued/

No	Factors affecting mtime overrun	Contractor		Consultant		Client		Weighted average	
		MSi	Rank	MSi	Rank	MSi	Rank	MSi	Rank
19	Slow decision-making by consultants and owners	2.269	18	3.038	16	3.2	16	2.669	20
20	Poor communication and coordination	2.245	20	2.731	24	2.9	21	2.682	10
21	Lack of experience on the part of the consultant	2.228	21	3.115	14	3.2	16	2.638	18
22	Subcontractors	2.184	22	3.0	18	3.2	16	2.713	15
23	Finance and payments of completed work	2.184	22	3.0	18	2.8	22	2.742	29
24	Mistakes during construction	2.152	24	2.462	31	2.7	24	2.450	24
25	Inadequate contractor experience	2.152	24	2.846	23	3.1	20	2.568	23
26	Regulatory changes	2.136	26	2.538	29	2.5	27	2.532	26
27	Owner interference	2.136	26	2.577	28	2.4	29	2.534	28
28	Preparation and approval of drawings	2.136	26	2.731	24	2.4	29	2.532	19
29	Labor supply	2.122	29	2.654	27	2.8	22	2.463	17
31	Major disputes and negotiations	2.102	30	2.5	30	2.5	27	2.380	31
32	Lack of communication between the parties	2.086	31	2.731	24	2.3	31	2.383	30

Table 8 above shows that the **contractors** ranked "Delay to deliver the site (Right of way problem)" in the first position with a mean score of 4.483. This indicates how right of way problem affected the time of the selected projects. If there is a right of way problem in construction project, therefore, it will lead to a significant delay in a project. As revealed in the findings of many studies reviewed in this study, Tadesse (2009), for instance, some projects delayed for years only due to right of way problem. In other words, it can be inferred that the delay to deliver the site (Right of way problem) has a high impact of delay and cause time overrun in Addis Ababa road construction projects.

The second important factor ranked by contractors was "Financial problems" with a mean score of 4.207. This is a strong indication that financial problem will cause delay. This result also coincides with the results of Tadesse (2009). The suitable description for this consensus is that cash is very necessary for contractor to construct the project within specified time. Any shortage of cash for the contractor will most likely cause many problems such as slow progress and work decline in productivity. Moreover, financial shortage results in problems being not able to

purchase the needed equipment for work, and so the client has to pay in advance before the project starts. Hence, the financial problem reflects contractor's mismanagement.

Improper planning is ranked by contractor as the third important factor that can cause time overrun with a mean score of 3.897. Proper planning is important for accomplishing the project successfully. If the contractors fail to plan their work properly, it will affect the project completion time and it will be a big loss for contractor and other end users.

The respondents from contractors ranked "Weather condition" in the fourth with mean score of 3.845. It is known that July and August are the rainy months and this period is being taken in to consideration in most road projects. But sometimes the rain might extend up to October or might start early in June. This has therefore been affecting the project completion time significantly in Addis Ababa. Moreover, roads can be constructed in the rainy season by using shades. But the shading should be done properly so as to avoid water entering to sites that affect optimum moisture content.

Site management problem is ranked as the fifth important factor that can cause time overrun with a mean score of 3.759. Poor site management can cause many constraints at the projects, such as poor following up of progress, incorrect distribution of works, lack of employees' commitment at the site, poor monitoring of project, etc. These factors, therefore, contribute to delay in the road construction project to a greater extent in the study area.

4.3.2.2 Consultants View

In terms of the consultants' views, the above table (Table 8) also shows that the consultants ranked financial problems with a mean score of 4.385 as the first factor that causes delay in road construction projects. This indicates the high importance of cash for the timely progress of projects. Any shortage of cash for the contractor will cause many problems such as slow progress and work decline in productivity. Also the contractors will not be able to purchase the needed equipment for work. More over the problem of cash expands to traders and suppliers, which in turn leads to slow the work, then to occurrence of project's delay.

The second factor that causes delay was "Delay to deliver the site (Right of way problem)" with a mean score of 4.231. This directly delays site hand over. Domestic contractors tolerate delayed hand over of construction sites but foreign contractors do not tolerate delayed hand over of

construction sites by employers. Foreign contractors claim to be compensated for idle hours of man power and equipments due to the delay. As found from review of related studies, these are due to work culture differences between domestic and foreign contractors; domestic contractors who suffered from delayed payments and late site hand over stated that such tolerance is to avoid adversarial relationship with the stakeholders on that project and hence to create conducive working environment (Fetene, 2008).

The third important factor the consultants ranked was site management problem with a mean score of 4.115. Poor site management related factors, such as poor following up of progress, incorrect distribution of works, un commitment of employees at the site, poor monitoring of projects, etc., causes many constrains at construction projects. These factors in turn contribute to delay the project.

The consultants ranked "the suspension of work by owner or contractor" in the forth position with mean score of 4.038. This indicates the high importance of work continuity in order to complete the project on time. The suspension of work creates disputes between the parties of the project. The sequence of project activities will be affected, and then lead to delay.

The fifth key factor ranked by the consultants was “Improper planning” with a mean score of 3.962. This result shows the importance of planning and time scheduling to deliver the project on time. When the activities execution is without priorities of tasks and knowledge of critical path activities, it certainly causes delay of a project.

4.3.2.3 Clients View

Table 8 above shows that clients ranked “Delay to deliver the site” or Right of way problem as the first factor that cause delay with a mean score of 4.4. Late hand over of construction sites, sometimes may happen and substantially increase the cost of construction projects. In most international projects in Ethiopia, late site hand over is a common form of claim source for compensation for contractors (Girmay, 2003). But site hand over problem is still a major reason for time overrun according to contractors and clients while consultants ranked it as second.

The second important factor was improper planning and financial problems with an equal mean score of 4.3. The first result is the same with the contractor, which support the importance of this factor. This result shows the importance of planning to deliver the project on time. When the activities execution is without priorities of tasks, it certainly causes delay of the project.

The fourth important factor was “poor site management” with a mean score of 4.2. This result is in full conformity with the contractors and client but in the case of consultant, the value of the mean score is higher.

Finally one can see that the fifth factor ranked by client was “unrealistically imposed contract duration” with a mean score of 4.1. This is a strong indication of the importance of proper estimation of project duration. Sometimes, the project duration is determined roughly, and therefore results in the project’s delay. One of the important obligations of consultant is to determine the duration of project according to the volume of activities.

4.3.3 Factors Influencing Cost Overruns at Construction Projects

Cost is another aspect of project management. Hence, the views of participants on the factors causing cost overrun in road construction projects is presented on table 9 below.

Table 8: Factors influencing cost overruns from point view of contractors, consultants and clients

No	Factors affecting time overrun	Contractor		Consultant		Client		Weighted Average	
		MSi	Rank	MSi	Rank	MSi	Rank	MSi	Rank
1	Design changes	4.207	1	4.143	1	4.1	1	4.178	1
2	Inadequate review for drawings and contract documents by consultants.	3.897	2	3.714	2	3.7	3	3.825	3
3	Fluctuations in the cost of materials	3.845	3	3.714	2	4.1	1	3.836	2
4	Lack of cost planning/monitoring during pre and post contract stages	3.328	4	3.571	4	3.7	3	3.435	4
5	Indecision by the supervising team in dealing with the contractor’s queries resulting in delays	3.292	5	3.342	7	3.5	6	3.328	5
6	Contractual claims, such as, extension of time with cost claims	3.224	6	3.286	8	3.5	6	3.271	7
7	Delays in issuing information to the contractor during construction stage	3.121	7	3.571	4	3.5	6	3.286	6
8	Technical incompetence, poor organizational structure, and failures of the enterprise	3.12	7	3.142	9	3.6	5	3.177	8
9	Project materials monopoly by some suppliers	3.035	9	3.142	9	3.2	9	3.082	10
10	Additional work at owner’s request	2.914	10	3.429	6	3.2	9	3.087	9
11	Lack of experience of technical consultants	2.914	10	2.857	11	3.1	11	2.918	11
12	Some tendering maneuvers by contractors, such as front-loading of rates	2.69	12	2.857	11	2.7	12	2.737	12
13	Unpredictable weather conditions	2.552	13	2.571	13	2.6	13	2.562	13

The above table 9 summarizes the rank of all factors of cost overruns that have been investigated in this research from contractor, consultant and client view points. A total of 13 factors which influence cost overruns in Addis Ababa road construction projects have been identified. The rank was based on mean score of the factors.

4.3.3.1. Contractors View

Table 9 shows that contractors ranked "Design changes" in the first position with mean score of 4.207. There are many possible causes for design changes. Some may be the client's need for additional work, the need change due to quality of materials, the need for alignment, or omission of some work may be needed due to financial reason. Design changes in particular and contract change or modification in general is one of the important reasons that cause delay. As any modification in the technical specification, bill of quantities or replace any work with another one, it would lead to disputes between the contractor's and client's teams. Change order refers to changes that are generated by unanticipated causes, for example, scope changes from the owner, Incomplete/in consistent drawings, design error/defect, omissions of site conditions, and changes in codes and regulations.

To solve these disputes and develop new agreements, it takes additional time that affects the project schedule and hence affects the total duration of the project. Therefore such design change of any form would significantly affect the cost of the project.

"Inadequate review for drawings and contract documents" was ranked as the second major factor of cost overruns by contractors with a mean score of 3.897. The third cause of cost overruns was "Fluctuations in the cost of materials" with a mean score of 3.845. Fluctuation in prices has a significant impact on cost increase. Often the contractor estimates prices of the tender according to the present prices at local markets. It's known that the tendering phase and awarding is an early phase of the project, even the awarding process takes long time, so there is a chance of price fluctuation. In case of high prices, the contractor would face the problem of cost overruns at the execution phase.

The contractors ranked "unpredictable weather conditions" as the least factor that causes cost overruns with a mean score of 2.552. Addis Ababa has good climatic conditions, so it isn't exposed to any hurricanes or great leaps in temperature or snow fall. Therefore, the weather

condition does not have a significant impact on execution of construction project and to make any damages of these projects.

4.3.3.2 Consultants View

The first important factor that cause delay according to consultants was “Design changes” with a mean score of 4.143. “Inadequate review for drawings and contract documents” and “Fluctuations in the cost of materials” were the second factors of cost overruns ranked by consultant with an equal mean score of 3.714 respectively. Consultants consider “Lack of cost planning/monitoring during pre contract stages” and “Delays in issuing information to the contractor during construction stage” ranked by consultants as the fourth factors to cause cost overruns with a mean score of 3.571. Any information should be given to contractor on time. Delay in giving information will incur additional costs to contractor.

The table also shows that consultants ranked “unpredictable weather conditions” as the least factor that cause cost overruns with a mean score of 2.571. As discussed earlier Addis Ababa has good climatic conditions, so it does rarely expose to any hurricanes or great leaps in temperature or snow fall. Hence, the weather condition does not have a significant impact on execution of construction project and to make any damages of these projects.

4.3.3.3 Clients’ View

“Design changes” and “Fluctuations in the cost of materials” were the factors ranked first by the clients with regard to causing cost overruns with an equal mean score of 4.1. Design changes are considered as one of major factor for increasing the cost of project by other participants as well. As any modification in the design will affect the volume of required materials, type of required materials and needed labor, it affects the budget allocated for the project. Besides, design changes also cause the rework of already completed items, which means it increases project duration and loses materials. Thus, the cost overruns will occur at this case.

“Inadequate review for drawings and contract documents” and “Lack of cost planning/monitoring during pre contract stages” were ranked as the third factors of cost overruns with an equal mean score of 3.7. The fifth factor ranked by clients was “Indecision by the supervising team in dealing with the contractor’s queries resulting in delays” and “Contractual claims, such as, extension of time with cost claims ”with a mean score of 3.5. On the other hand,

"Unpredictable weather conditions" by the clients ranked as the last factor with a mean score of 2.6. Hence, harsh weather condition has insignificant impact on the cost of projects in Addis Ababa.

4.3.4 Tests for Agreements on Causes of Time and Cost Overrun among Stakeholders in the Construction Industry

One of the purposes of this study is to investigate whether there is agreement or not on the attitudes of stakeholders towards the causes of time and cost overrun on road construction projects in Addis Ababa. In this section, hence, response of the participants are tested for correlation using Spearman rank correlation coefficients to see if there is difference in ranking between two groups of respondents; these are Clients versus Contractors, Contractors versus Consultants, and Clients versus Consultants, on the variables of cost overrun and their rate of occurrence.

The purpose of a hypothesis test is to avoid being deceived by chance occurrences. The test also helps to evaluate whether consensus of opinions exist among respondents. For this study, therefore, the null and alternative hypotheses were outlined as follows:

Null Hypothesis (H₀): There is no agreement in the ranking of causes of time and cost overrun between two groups of respondents.

Alternative Hypothesis (H_A): There is agreement in the ranking of causes of cost overrun between two groups of respondents

The spearman correlation coefficient (ρ) is calculated using Equation 3.3 and tabulated as shown below in Table 4.8 below.

In order to decide whether to accept or reject the null hypothesis, the level of significance 95% ($P = 0.05$) is used. This allows to state whether or not there is "agreement" between respondents response.

If the calculated value of ρ is greater than the critical value, H₀ is rejected, i.e. there is evidence of a statistically significant agreement between the groups. If the calculated value of ρ is less than the critical value, H₀ is accepted, i.e. there is no evidence of a statistically significant agreement between the two groups.

Table 9: Summary of correlation test on the ranking of causes of time overrun

Respondents	$\text{Rho } (\rho \text{ cal}) = 1 - \frac{6 * (\sum di^2)}{N * (N^2 - 1)}$	Critical value of ρ cal (Appendix B)	Significance for $P < 0.05$
Client Vs Contractor	0.438	0.3021	reject
Contractor Vs Consultant	0.497	0.3021	reject
Client Vs Consultant	0.567	0.3021	reject

With a significance level of 95% ($P = 0.05$), the calculated value of ρ for all the three group cases are greater than the critical values of ρ . So the hypothesis that there is no significant agreement between the respondents is rejected i.e. the null hypothesis is rejected.

From Table 10 above, it can be concluded that there is strong correlation between the attitudes of the respondents in all the three groups. Hence, the null hypothesis is rejected and the alternative hypothesis is accepted. In other words, most of the participants have the same perception about causes of time overrun and their responses are acceptable.

In a similar way correlation test was done for cost overrun as shown below.

Table 10: Summary of correlation test on the ranking of causes of cost overrun

Respondents	$\text{Rho } (\rho \text{ cal}) = 1 - \frac{6 * (\sum di^2)}{N * (N^2 - 1)}$	Critical value of ρ (Appendix B)	Significance for $P < 0.05$
Client Vs Contractor	0.825	0.4825	reject
Contractor Vs Consultant	0.615	0.4825	reject
Client Vs Consultant	0.607	0.4825	reject

In the case of cost, with a significance level of 95% ($P = 0.05$), the calculated values of ρ for all three group cases are greater than the critical values of ρ . So the hypothesis that there is no significant agreement between the respondents is rejected i.e. the null hypothesis is rejected.

From the above Table 4.9, it can be concluded that there is strong correlation between the attitudes of the respondents in all the three groups and hence the null hypothesis should be rejected and the alternative hypothesis shall be accepted. This means that most of the respondents have the same perception of variables of cost overrun.

4.4. Effects of Cost Overrun

It was noted from the desk study result that almost all projects were delayed and incurred additional cost from estimated amount. This shows the severity of the effects of time and cost overrun. The first victim from time and cost overrun is the project end user; i.e. the people of the city. Although the degree of effects of time and cost overrun on the stakeholders varies in the construction industry, all the parties involved are affected by time and cost overrun. Cost overrun does not only affect those parties that are involved directly in the construction of a project, but its effects also pass to the construction industry as a whole. This in turn affects the national economy of the country.

If there is excessive cost overrun, then it requires additional budget; this in turn affects the scarce financial resources of the country, which lead to further budget short fall for construction projects. This prevents the planned increase in property and service production from taking place and this phenomenon affects, in a negative way, the rate of national growth. Cost overrun will also be a source of dispute among stakeholders and it will lead to adversarial relationship among project participants. Clients will lose confidence on consultants and on professionals in general. To the industry as a whole, cost overruns could bring about a drop in construction activities, bad reputation, and inability to secure project finance easily from public authorities in the future.

CHAPTER FIVE: Summary, Conclusions and Recommendations

5.1. Summary

The road construction sector in the Addis Ababa city area is mainly driven by the need to reduce traffic jamming as well as the attractiveness of the city. Therefore, this sector is severely suffering from over extended project delays and excessive cost overruns, affecting the implementation of the country's construction sector development programs and the country's economy by losing investments on a project.

There are many causes of delays and cost overruns in construction projects and several studies have pointed out various factors based on the underlying conditions that their specific study is concerned with. Therefore, this research attempts to investigate the problems particularly for road construction projects in Addis Ababa city Administrations.

The research has been undertaken by reviewing literature, which was used to identify the possible variables causing delays and cost overruns in construction projects as a whole. Then the variables have been scrutinized in line with the road construction. Forty-five variables for delay and thirteen variables for cost overruns have then been identified. The variables for delay have been categorized in five groups based on the sources of delay. These variables are then used to design a questionnaire.

After distributing the questionnaire for professionals who had experience in road construction projects in Addis Ababa, sufficient responses were collected with a response rate of more than 80%, which was well above the minimum requirement to conduct an analysis. The data was classified into three groups according to the type of respondents: client, contractor and consultant. From the data retrieved in each group, severity, frequency and importance indices were calculated. Based on the respective importance indices, the variables were ranked separately for delays and cost overruns. The agreement among the rankings was checked using Kendall coefficient of concordance, which resulted in high values of the coefficient confirming strong agreement among the rankings. Besides, significance levels for the null hypothesis to be true were found out to be less than 0.05, confirming that the alternative hypothesis, there is agreement among the sets of rankings by the parties, was verified with more than 95% confidence level.

With regard to delay variables the 20 most important factors have been identified for each set of ranks. The most important causes identified by the survey, and based on overall results, were: contractor's cash flow problems; delay in progress payments by the client; poor site supervision and management by contractor; inefficient quality control by the contractor during construction, leading to rework due to errors; and contractor's difficulties in financing the project. Out of these most important delay variables, three were found to be common between all parties, which were "delay in progress payments by the client"; "delay in delivery and late ordering of material"; and "insufficient skill of labor". The respondent groups showed disagreement in some causes of delay, where one points out the responsibility of delay causes on other parties. For instance, the contractors ranked "inadequate and unclear details in drawings" and "changes in scope of the project" as the second and third most important causes of delay respectively, blaming the other parties. However, the clients and consultants gave these causes a lesser ranking. Likewise, the clients and consultants highly ranked contractor's difficulties in financing the project, contractor's cash flow problems, poor site supervision and management by contractor, and inefficient quality control by the contractor during construction, leading to rework due to errors" which usually originated from contractors, as the main causes, while the contractors did not include these causes in the 20 top important causes of delay.

Furthermore, the categories of causes of delay with respect to responsible parties were analyzed based on the overall results. The categories of indices of each group were determined by taking the average of the frequency, severity and important indices of the variables under the group in question. The results of the material categories showed the greatest source in project delay as it was highly ranked by all parties. The slowdown of global economy, the fluctuation of currency exchange rate for imported material and inflation of materials challenge the clients, contractors and consultants to complete projects within scheduled time and budget.

Similarly variables of cost overruns were also ranked in their order of importance. Besides, in all the three sets of rankings design change, quantity underestimation, and price escalation were regarded as the most critical factors for cost overruns.

5.2. Conclusion

Based on the results of the analysis of desk study and respondents' responses the following conclusions were drawn.

1. The first specific objective was to identify whether time and cost overrun exist or not and evaluate the extent of time and cost overrun in Addis Ababa road construction. Ten out of ten, (100%), road projects investigated in the research suffered time and cost overrun in their execution. For these road construction projects, the actual time overruns ranges from 25% to 264.38% of the contract time and the cost overrun ranges from 4.11% to 135.06% of the contract amount.
2. The second specific objective was to identify factors influencing time and cost overruns in road construction in Addis Ababa. From the results of these thesis 32 causes of time overrun and 13 causes of cost overrun were identified by the respondents. Common causes of time overrun are Delay to deliver the site (Right of way problem), financial problems of contractors, Improper planning, and Site management. And the most common causes of cost overrun are Design change, fluctuation in the cost of materials and inadequate review for drawings and contract document.
3. Results indicated that the factor "Delay to deliver the site (Right of way problem)" has been ranked in the first position by contractors and owners while it gets the second rank by consultant. This result indicates the high importance of delivering the site on time to complete the project on time. The right of way problem creates disputes between the parties of project, and then the time of completion will be affected even more. This agreement of opinions between contractors and owners proves the importance of these factors in projects delay.
4. The factor of "Financial problems" has been ranked in the 2nd position by the contractors and owners while the consultants ranked in the 1st position. This result indicates the high importance of cash for the progress of project. Any shortage of cash for the contractor will cause many problems such as slow progress and work decline in productivity. Also the contractors will not be able to purchase the needed equipment for work. More over the problem of cash also expanded to traders and suppliers, which in turn leads to slow the work, then to occurrence of project's delay. Shortage of cash is created either by improper use of advance payment by contractor or delay in payment by client.

5. From the results obtained at this thesis, and compare it with the results and analysis of previous literatures, it's found that there are a real similarity of the important factors that influencing time and cost overruns. But right of way problem is a major problem in Ethiopia and not that much significant in other country. Because literatures that are done out of Ethiopia not included right of way problem as a major factor for time overrun.
6. The third specific objective was to identify the effect of time and cost overrun in overall road construction in Addis Ababa. There are many effects of time overrun to stakeholders in the construction industry. The most common effects of time overrun in the construction industry are; cost overrun, dispute and arbitration.
7. Cost overruns have obvious effects for the key stakeholders in particular, and on the construction industry in general. To the client, cost overrun implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental/lease costs or prices. To the professionals, cost overrun implies inability to deliver value for money and could well tarnish their reputations and result in loss of confidence reposed in them by clients. To the contractor, it implies loss of profit for non completion, and defamation that could jeopardize his/her chances of winning further jobs, if at fault.

5.3. Recommendations

The following points are recommended to all parties in order to minimize and control time and cost overruns in construction projects.

Contractors are recommended to:

1. Use advance payment properly to eradicate the financial problems. It is advised to conduct breakeven analysis from time to time.
2. Have a proper planning and good site management system in the different activities of the project so as to avoid any mistakes that may lead to rework of activities, resulting time and cost overruns. Contractors are advised to setup stores for required construction materials, and especially that are scarce or that are in limited quantity in the markets to avoid time and cost overruns.

3. Carry out planning and scheduling: they are continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and disputes. Site management and supervision: administrative and technical staff should be assigned as soon as project is awarded to make arrangements to achieve completion within specified time with the required quality, and estimated cost.

Clients are recommended to:

1. Give attention on the right of way problem. Before the construction starts the client has to fulfill all the necessary requirements for delivering the site. Failure to deliver the site will cause time and cost overrun.
2. Determine the required duration of project and impose realistic duration to avoid time and cost overruns. Client recommended to have technical staff who is able to manage the different stages of any project and to follow the performance percentages, and also able to compare the actual performance with the planned one.
3. Giving sufficient time for bid documents such as technical specifications, drawings, bill of quantities and designing of the project and revising it in a good way. This is because any discrepancy in bid documents will lead to disputes between projects parts and so delay may occur. Pay progress payment to the contractor on time because it impairs the contractors' ability to finance the work.
4. Minimizing change orders as possible as they can in order to avoid any time and cost overruns. The communication and coordination between the stake holders also have to be improved to minimize time and cost overruns.

Consultants are recommended to:

1. Continuous coordination and direct communication with contractors and clients, which will eliminate design discrepancies and errors as well as omissions in design and also provide an opportunity to review the contract documents thoroughly. This would help in eliminating change orders or variations due to discrepancy in contract documents.
2. Hire a qualified technical staff to manage the project in a good way, so he would be able to overcome any technical or management problems that happen. It is also advised for consultant to have high qualification to give suitable instruction in a suitable time and to be able to answer any question stated by contractor to avoid time and cost overruns. They

have to Review and approve design documents, shop drawings, and the payments of contractor to avoid any delay or cost overruns at the project.

3. Adopt efficient information distribution systems to guard against communication gaps; respond as quickly as possible to contractor and client questions and requests for clarification to avoid associated delays and confusions which consequentially will lead to time and cost overrun.

Government is recommended to:

1. Create a climate of economic stability that is sufficient to inspire investors, especially in the production of construction materials to be produced from local materials and production of enough quantity and quality of construction materials in the local market, this will help to reduce excessive price fluctuations associated with imported construction materials.
2. Give capacity building for professionals and firms on the construction sector so as to develop the performance of the professionals. In addition, government has to initiate intellectuals to do researches regarding causes of time and cost overrun.
3. Create opportunities for local contractors and consultants to work with international contractors and consultants to share experiences and adopt new technologies.

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APPENDIX A

Addis Ababa University

College of Business and Economics Department of Project Management

Questionnaire:

This questionnaire is prepared to conduct a study in the partial fulfillment of a Master's Degree in project management (MAPM) program entitled with "Analysis of Factors Contributing for Time and Cost Overrun in Road Construction Projects under Addis Ababa City Administration". Hence, you are kindly requested to give the necessary information for the research questions.

There is no need to write your name and address and the information that you provide will be kept confidential. The accuracy, honesty, and fairness of your response will have a great impact on the outcome of the research.

Aim of the questionnaire: This questionnaire is developed to assess the views of owners, consultants, and contractors to identify important factors contributing for time and cost overrun in the road construction projects under Addis Ababa city administration

General guidelines:

Please read each question (hypothesized factor) carefully and make a tick or a circle under each value and you can write your opinion on the remark section.

SECTION A: GENERAL ORGANIZATION INFORMATION

1. Name of organization: _____

2. State respondent organization/company type.

Client ☐ Contractor ☐ Consultant ☐

3. Respondents designation:

Owner of organization ☐ Project manager ☐ Site Engineer ☐ Office Engineer ☐

Resident Engineer ☐ Site Supervisor ☐ Other _____

4. Relevant working experience (Years):

1-4Yrs 4-8Yrs 8-12Yrs >12Yrs

SECTION B: FACTORS AFFECTING TIME COST OVERRUNS OF CONSTRUCTION PROJECTS IN ADDIS ABABA

Please indicate the significance of each factor by ticking the appropriate boxes. Add any remarks relating to each factor on the last column e.g. as to the reasons, the critical factors or the solutions.

E.S. = extremely significant (5); V.S. = very significant (4);

M.S. = moderately significant (3); S.S. = slightly significant (2);

N.S. = not significant (1)

<i>Hypothesized factors</i>		1	2	3	4	5	<i>Remark</i>
	Project – related						
1	Discrepancies between contract documents						
2	Suspension of work by owner or contractor						
3	Change order						
	Owner –related						
4	rework due to errors during construction						
5	Poor soil quality						
6	Poor ground condition						
7	undefined scope of working						
8	financial problems						
9	poor site supervision by consultant						
10	progress payments delay by owner						
11	Inflation						
12	exchange rate fluctuation						
13	bankers policy for loans						
14	weather condition						
15	Unrealistic contract duration and requirements						
16	Non-capable owners representative						
17	Change in specifications						
	Contactor						
18	Poor site management						
19	delay in performing inspection by consultants						
20	incapable inspectors						
21	Improper planning						
22	Inadequate contractor's experience						
23	Inaccurate cost estimation						
24	Incompetent project team						
25	inappropriate design						
26	Contract management						
27	Incomplete drawings						
28	Changes in drawings						
29	Quality assurance						
31	Labor supply (insufficient labors)						
32	low productivity of labors						
33	personal conflict between labors and						
34	Labor injuries						
35	Non-attendance of labors						
36	Slow equipment movement						
37	Natural disasters						
38	Regulatory change						

39	Unforeseen site conditions						
	Consultant						
40	Absence of consultant's site staff						
41	Lack of experience on the part of the consultant						
42	Contract management						
43	Quality assurance						
44	Test and inspection of time, cost and scope						
45	Legal issues						

Appendix B

Spearman's Rank Table

Sample size (n)	$p = 0.05$	$p = 0.025$	$p = 0.01$
4	1.0000	-	-
5	0.9000	1.0000	1.0000
6	0.2860	0.8857	0.9429
7	0.7143	0.7857	0.8929
8	0.6429	0.7381	0.8333
9	0.6000	0.7000	0.7833
10	0.5636	0.6485	0.7455
11	0.5364	0.6182	0.7091
12	0.5035	0.5874	0.6783
13	0.4825	0.5604	0.6484
14	0.4637	0.5385	0.6264
15	0.4464	0.5214	0.6036
16	0.4294	0.5029	0.5824
17	0.4142	0.4877	0.5662
18	0.4014	0.4716	0.5501
19	0.3912	0.4596	0.5351
20	0.3805	0.4466	0.5218
21	0.3701	0.4364	0.5091
22	0.3608	0.4252	0.4975
23	0.3528	0.4160	0.4862
24	0.3443	0.4070	0.4757
25	0.3369	0.3977	0.4662
26	0.3306	0.3901	0.4571
27	0.3242	0.3828	0.4487
28	0.3180	0.3755	0.4401
29	0.3118	0.3685	0.4325
30	0.3063	0.3624	0.4251
40	0.2640	0.3128	0.3681
50	0.2353	0.2791	0.3293
60	0.2144	0.2545	0.3005
70	0.1982	0.2354	0.2782
80	0.1852	0.2201	0.2602
90	0.1745	0.2074	0.2453
100	0.1654	0.1967	0.2327