ADDIS ABABA UNIVERSITY

College of Business and Economics (CoBE)

SCHOOL OF COMMERCE

AN ASSESSMENT ON CAUSES OF DELAY IN ROAD CONSTRUCTION PROJECTS: THE CASE OF ETHIOPIAN ROAD AUTHORITY.

By:

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A Thesis submitted to Addis Ababa University, School of Commerce in partial fulfillment of the requirements for the degree of Master of Art in Project Management (MAPM).

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June, 2018

Addis Ababa, Ethio

ACKNOWLEDGEMENTS

First of all, I would like to thank the Almighty God, who gave me the potential and patience to pass various obstacles and come up to the accomplishment of this Thesis

I am grateful to everyone who has contributed to the successful completion of this final year project. In addition, I would like to express my gratitude to my research Advisor, Fesseha Afewerk (Ast. Prof.) for his immeasurable advice, guidance and his enormous patience throughout the development of the research.

Special thanks are forwarded to my colleagues at Cooperative Bank of Oromia, team leaders and experts who sacrificed their time in editing and supporting me on my duties at work place while I was undertaking the research.

Furthermore, I would also like to express my gratitude to my loving wife (Hirut Abera), and friends who have helped and given me encouragement and supports throughout the course of the project.

Approval Sheet

This thesis/dissertation entitled **"An Assessment on Causes of Delay in Road Construction Projects: The Case of Ethiopian Road Authority."** was prepared by Eyasu Tolera and submitted in partial fulfillment of the requirements for the degree of Master of Art in "Project Management" at Addis Ababa University: School of Commerce.

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Abstract

Road construction in Ethiopia, like many other countries in the world, is an important sector due to its enormous contribution to the country's economic growth and social development in terms of employment opportunities and its contributions to GDP. However, due to various reasons, many road construction projects are prone to delay. These delay can only be avoided by identifying the factors causes delay. This study was aimed to find out the main causes of delay in Ethiopia road construction projects in the case of Ethiopian Road Authority. Quantitative data was collected from clients, consultants and contractors using questionnaires and then the data obtained were analyzed using the Relative Importance index (RII). The survey analysis results obtained identified ten major causes of delays. The RII ranking results depicted that planned work schedule, difficulties in financing the construction project as delay factors were the most influential factor by contractor were considered most important factor causing delay in road construction projects followed by of contractors' materials shortage on site and poor project manager skills. In addition, effects of delays associated to road construction project were identified.

***Key Words**: Delay, Causes of Delay, Effects of delay, Ethiopian Road Authority, Road Construction Project, Relative Importance Index (RII)*

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

A construction project is commonly admitted as successful when it complete on time, with budget, according the specifications, and stakeholder satisfaction. Timely completion of a construction project is frequently seen as a major criterion of project success by clients, contractors, consultants and related stakeholders. However, most of the projects did not finish as the expected timetable. Instead, they completed before or after the schedule due to uncertainties of events and its uniqueness (Aibinu, A. and Jagboro, G. 2002). Therefore, delay considered as one of the most common problems causing a multitude negative effect on projects, and its participating parties

1.2 Background of the study

Construction industry is an essential sector of every economy in the world because the outputs of the industry's activities to facilitate socio-economic growth and advancement of every economy. The industries all over the world spur growth of economies primarily due to the contribution the sector makes to the economies of these countries by providing the relevant infrastructure that spurs the growth of other industries (Ofori, 2012). The construction industry provides the hardware of every economy in terms of provision of a road network, social services infrastructure, markets, and offices for delivery of government machinery, railways, and the factories for production and distribution of goods and services. This means that the construction industry in every economy facilitates national productivity, distribution and delivery of services.

When construction sectors are productive, they contribute to and sustain a country's economic growth, and therefore provide the financial resources to do everything else (African Economic Outlook, 2018). For landlocked countries, transportation facilities (road construction) to links to port countries is more important, since they often determine the cost and affordability of other infrastructure. The livelihoods of the people depend on the effectiveness of the construction industry (Ofori, 2012). A flourishing construction industry in many countries over the world contributes significantly to the Gross Domestic Product (GDP) of those countries. African Economic Outlook further explained the importance of road infrastructure in terms of its impact on the overall economic growth, agricultural growth, urban growth, urban poverty reduction, and rural poverty reduction. (Fan and Kang, 2006), assert that roads contribute to economic growth

and poverty reduction because without infrastructure, efficient markets, adequate health care, a diversified rural economy, and sustainable economic growth will remain elusive. Similarly, road construction industry plays a vital role in creating employment opportunities. Throughout the developing world, the sector contributes as a major source of employment, of which the majority of employees are unskilled. Women are also found to be beneficiaries of the employment in the industry. The sector, therefore, has the singular capacity to contribute directly to the growth of economies of countries.

According to the African Economic Outlook (AEO, 2018), public construction projects in Ethiopia are parts of the country's development initiatives. It shares considerable amount of the country's scarce financial resources. Public investments are the driving forces for growth and development in the short and medium term with huge investments in infrastructure in the country. Similarly, the contribution of construction sector to the Gross Domestic Product (GDP) in Ethiopia is very large (21.2%).

The contribution of construction sector to the national economy is given high prominence and mainly driven by the energetic performance of the road construction projects. Good and safe roads for instance, facilitate timely and smooth evacuation of produces from the growing areas to the marketing centers or depots which contributes as the country's economic backbone (Nicholas and Paul, 2010).

Ethiopia is one of the land locked countries where roads play a vital role in the economic development of the country where most imported items come from neighboring countries port on a land freight transport. According to the (Ethiopian Economic Association, 2006/07), the share of the sector in the total GDP averaged at about 5.2 percent in the period 2002/03- 2006/07. The sector has registered relatively higher growth as compared to the growth of GDP during this period. Over this period, there has been increased investment on the development and expansion of road infrastructure projects.

As the Ethiopian economy is based on agriculture, transport infrastructure allows the agricultural communities to access both domestic and international markets; connecting rural communities to basic services such as education, health, administrative offices and markets throughout the year in a better way, thus it is an important requirement for their socio-economic development. Therefore,

construction projects are generally considered as an essential element for economic and social development as it provides the links required to make markets function.

The performance of construction projects against what was planned can be measured and evaluated using a number of performance indicators that could be related to various dimensions such as time, cost, quality, client satisfaction, business performance, health and safety (Enshassi et al, 2009). They further argue that time, cost and quality are, however, the three predominant performance evaluation dimensions. King (2017), stated that the application of sound Project Management practices provides construction project stakeholders with the means to meet their objectives which is described in terms of meeting the intended, purpose, the level of quality, time, and cost.

However, inability to complete projects on time and within budget continues to be a chronic problem worldwide and is worsening (Ahmed et al., 2002). Construction industry is full of projects that are completed with significant time and cost overruns (Amhel et al.,2010). Hardly few projects get completed within the budget since construction projects are undertaken in an uncertain environment. These include construction complexity, presence of various interest groups such as the project owners, end users, consultants, contractors, financiers, materials, equipment, project funding, environmental conditions, and political environment and statutory regulations.

Attempts in identifying the causes of delay have been undertaken by different scholars. For example, Zinabu (2016), identified factors that causes delays in road construction projects; of these cash flow problems during construction, mismanagement by the contractor (financial, supplier support, sub-contractor), improper planning, slow decision making, late deliveries of materials and equipment were ranked the top five factors. For example, according to Adiam (2016) concluded that time delay problem will be followed by many problems, such as causing difficulties in cost overrun, overutilization of resources, distrust, and conflicts among projects stakeholders.

1.3 An overviews of Ethiopian Road Construction Projects

According to the Ethiopian Roads Authority Profile, it was prior to the second Italian occupation i.e. between the years 1896 and 1936 that a great success was made in road construction. Emperor Menilik was said to be a successful road builder participating himself in the construction. In 1903, the road from Eritrea to Addis Ababa and the road from Addis to Addis-Alem were built. The first Asphalt roads were also appeared during this time that the first Asphalt roads appeared in Addis.

During the Italian occupation, the roads were built to meet the requirements of the military control, rather than to promote the overall development of the country's economy during the Italian occupation. Following the eviction of the Italian occupiers, Imperial Highway Authority (IHA) was established with the responsibility of rehabilitating/restoring and expanding the road network throughout the country, and with specific duties to plan, design, construct, and maintain roads. The Ethiopian Roads Authority (ERA) has been reestablished incorporating, among others, the Rural Roads Department in addition to the Highway Department.

In 1980, the Military Government that took power in 1974 reformed the agency into the Ethiopian Transport Construction Authority (ETCA). Following the shift from a command-based economy to a market oriented in 1991, ERA was re-established with a view to providing a strong administration of travel and transport on the road. As part of its reform, the government assigned administration of rural roads to the regional self-governments and main roads to ERA as part of the Federal Government's responsibility. ERA's role regarding rural roads was then limited to rendering support such as overall network planning, training and technical assistance as required by Regional Governments. To cope up with existing situations, ERA was again re-established by 1997 with the objective to develop and administer highways, and to ensure the standard of road construction. With the establishment of the new cabinet of Ministers in October 2001, a Ministry of Infrastructure and later on Ministry of Works and Urban Development has been formed with the responsibility of developing the infrastructure of the nation. ERA, which is one of the organizations, is responsible for planning and formulating long and short-term plans and programs for road construction, design, maintenance of trunk and major link roads, as well as for administration of contracts.

Currently, the main responsibilities of ERA are network planning; management of contract projects and force account operations. The long-term objective is to focus on policy, planning and contract administration and to pull out gradually from direct operational works.

In 1997, the government recognized the importance of road transport in supporting social and economic growth and its role as a catalyst to meet poverty reduction targets, the Government formulated the Road Sector Development Program (RSDP) in 1997 under four phases of RSDP during the last 18 years. The eighteen years of the RSDP has seen significant improvements in the restoration and expansion of Ethiopia's road network. Over the last fifteen years, the performance was improved but still there is a big gap for improvement. Weak implementation capacity can be cited as one of the major challenges.

1.4 Statement of the Problem

A very low road density and subsequent limited provision of services and infrastructure have been one of the difficult challenges for Ethiopia in its effort towards economic development and poverty reduction (Adiam, 2016). Recognizing this problems, and its role in supporting social and economic growth, the Ethiopian government has placed increased emphasis on road constructions projects. Hence government always allocated large amount of capital on road construction projects. For example, in 2015/16, the government has invested birr 95 billion in road construction projects (National Bank of Ethiopia, 2016/17).

Although the government allocated a large amounts of investment on the road construction projects, timely completion of the projects becomes a serious issue in Ethiopia like any other country in the world. The projects are severely suffering from over extended delays affecting the implementation of the country's road development program towards improving the road network. Various studies indicate that among the projects undertaken in recent years, almost all of them are delayed beyond the expected time for completion.

According to (Shambel and Patel, 2018) the study conducted on 10 completed road construction projects in Addis Ababa, all the projects have suffered from time overrun ranging from a minimum of 25% to the maximum of 264.38%. (Werku, & Jha, 2016) concluded that only 8% projects were finished on the original targeted completion date in Ethiopia and the other 92% of the project

delays beyond the planned completion date. Merid (2016) study on Defense Construction Enterprise concluded that 100% of the projects suffered with time and cost overruns in their execution and completion. For these construction projects, the actual time overruns ranges from 13% to 181% of the contract completion time. Robel (2015) examined 15 completed projects in different region of the country. According to this study, delay encountered in most projects range from 20.66% to 500% of original contract time. This indicate the challenge of road construction project with huge gap between the plan and completion time of the project.

Therefore, it appears that the problem of delays in road construction projects is critical and should be studied more and delay-causing factor should be identified to reduce this problem. This study will identify the most important factors that cause project delay and provide overviews on the subsequent effects of delays.

1.5 Research Questions

The research objectives above are translated into the following research questions:

1. What are the most important causes of delays in road construction projects? In the case Ethiopian Road Authority
2. What are the causes of delay in road construction projects from each stakeholder's (contractors', clients' and consultants') points of view?
3. What are the effects of delays in the road construction projects? The case Ethiopian Road Authority?

1.6 Research Objectives

1.6.1 General objective

The overall objective of the study is to identify factors that causes delay in construction projects.

1.6.2 Specific Objectives

The specific objectives are:

1. To identify the most important causes of delay in road construction projects from the overall perspectives: The case of Ethiopian Road Authority.
2. To identify and analyse the causes of delay from each stake holders' (contractors, clients and consultants) perspectives.

3. To analyse effects of delay in road construction projects: The case of Ethiopian Road Authority

1.7 Significance of the Study

This work is important because time is one of three pillars of construction project management: time, cost and quality. The aim of this study is therefore, to identify and rank factors that causes delays to the road construction projects in the case of Ethiopian Road Authority from contractors', owners' and consultants' point of views. A study on project delays will lead to a better understanding of the causes of inefficiency in road construction projects and the subsequent effects.

1.8 Scope of the Study

The scope of this project research is limited to road construction projects. Ethiopian Road Authority is selected as the context of this study. Although, there are several causes of delays related to various project players in construction projects, such as contractors, client, consultant, labor, equipment, external factors, etc. related factors, this study is limited to assess the causes of delays occasioned by the main project players such as clients, contractors and consultants.

1.9 Methodology

Descriptive research design was used to conduct this study. A quantitative approach is adopted for this study for gathering rich data from which ideas are induced and the experiences of the participants are important. The factors influencing completion of road construction projects have been investigated from review of literatures. The literature reviews mainly focused on previous researches in relation to time delay issues on construction projects as a whole, and those factors that are relevant to road projects. Furthermore, a questionnaires were prepared and distributed to respondents to analyze the response and rank causes of delay based on their relative importance. The questionnaires are distributed to engineers who have been involved in the road construction projects in Ethiopia Road Authority on behalf of a client, consultant and contractor.

1.10 Limitations of the Study

There is unorganized system toward project management and the project management practice and the project information was not clearly documented. During the study process, most of the construction projects were completed. However, there was inadequate documented information on

project undertaking. Therefore, questionnaire distribution to project stakeholder's, to clients, contractors and consultants were the main tools that was employed for the process of data collection.

1.11 Organization of the research report

In this thesis, the first chapter introduces the background information about the research and its objectives and the second chapter discusses about the literature reviewed in relation to the topics. In the third chapter, the research methodology is described incorporating data collection and analysis methods, study approach and study design. The fourth chapter analyzes the research findings while in the fifth chapter conclusions and recommendations are given. The last chapter cites all the reference materials used for the study. In addition, relevant data and information about the thesis is given on the appendices.

CHAPTER TWO: LITERATURE REVIEWS

2.1 INTRODUCTION

This chapter presents the theoretical and empirical and conceptual frame work review of the literature related to the identification and analysis of the causes of construction projects delay from the contractors, owners and consultants' aspects. The literature review includes the identification of methodologies regarding the identification and ranking of the critical delay factors in the construction industry. This chapter discusses the different types of delay factors at different countries with different project environment which are responsible for delays in the delivery of a construction project. The causes of delays related to contractors, owners and consultants are discussed and presented in this section.

The overall socio economic importance of road construction project topic is one of the driving force of the research undertaking. Thus, reviewing the critical points of current knowledge on the particular topic and formulation of research problems is the most important and prerequisite steps in the study.

2.2 Theoretical Reviews

2.2.1 What is Project?

A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates that a project has a definite beginning and end. Every project creates a unique product, service, or result. Since projects are temporary in nature, the success of the project should be measured in terms of completing the project within the constraints of scope, time, cost, quality, resources, and risk as approved between the project managers and senior project management.

2.2.2 Construction Project Management

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project management is accomplished through the appropriate application and integration of project management processes, which are categorized into five Process Groups. These five Process Groups are: Initiating, Planning, Executing, Monitoring and Controlling, and Closing.

In general terms, project management is defined as managing resources over the life cycle of a project through various tools and methodologies to control scope, cost, time, quality, etc., when working in the construction industry the outlook is broader. It usually includes a wider variety of constraints to consider specific to design, build and construction projects, and can interact with a variety of different disciplines in the lifetime of a project from architecture, engineering, etc. PMBOK identified 47 project management processes which are further grouped into ten separate Knowledge Areas. These are:

a. Integration Management

Project Integration Management includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups. In the project management context, integration includes characteristics of unification, consolidation, communication, and integrative actions that are crucial to controlled project execution through completion, successfully managing stakeholder expectations, and meeting requirements

b. Scope Management

The Project Scope Management Plan is the document that describes how the project scope will be defined, and verified and how the work breakdown structure will be created and defined, and that provides guidance on how the project scope will be managed and controlled by the project management team. It is contained in or is subsidiary plan of the project management plan. Project scope includes the features and functions that characterize the product, service, or result, and includes the work that must be done to deliver it with its specified features and functions. Scoping a project is putting boundaries around the work to be done as well as the specifications of the product to be produced.

c. Cost Management

Cost Management processes includes the processes involved in estimating, budgeting, and controlling costs so that the project can be completed within the approved budget. The cost budgeting process involves establishing budgets, standards, and a monitoring system by which the

cost of the project can be measured and managed. Cost control entails gathering, accumulating, analyzing, monitoring, reporting, and managing the costs on an ongoing basis.

d. Quality Management

Quality Management includes the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken. Quality management implements make use of quality planning, quality assurance, quality control, and quality improvement techniques and tools. If the requirements for the product of the project are consistent with the real, or perceived, needs of the customer, then the customer is likely to be satisfied with the product of the project.

e. Human Resource Management

Human Resource Management comprises all the processes that organize and manage the project team. Human resource planning and the formation, development, and management of the project team are all part of Human Resources Management. The project manager is responsible for developing the project team and building it into a cohesive group to complete the project. Two major types of tasks are recognized: administrative and behavioral. The behavioral aspects deal with the project team members, their interaction as a team, and their contacts with individuals outside the project itself. Included in these are communicating, motivating, team building, and conflict management. Administrative tasks include employee relations, compensation, and evaluation, as well as government regulations and evaluation.

f. Communications Management

Communications Management includes the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information. The communications process is not always easy because the project manager may find that barriers exist to communication, such as lack of clear communications channels and problems in a global team environment. The project manager has the responsibility of knowing what kind of messages to send, knowing whom to send the messages, and translating the messages into a language that all can understand.

g. Risk Management

Risk Management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project. Risk management is the formal process whereby risk factors are systematically identified, assessed, and provided for. Risk management must be seen as preparation for possible events in advance.

h. Procurement Management

Procurement Management includes the processes to purchase or acquire the products, services, or results needed from outside the project team to perform the work. Planning for purchases or acquisitions, contracting, requesting seller responses, source selection, and contract administration are all part of Procurement Management. In a global business environment, it is essential to understand varying social, political, legal, and financial implications in this process.

i. Time Management

Project Time Management includes the processes required to manage the timely completion of the project. Time Management is one of the Project management process which is crucial to the successful completion of a project. The final deliverable from the scheduling process is the estimated time target to complete the entire project. The time beyond the estimated time the is considered as time of project delay.

2.2.3 Definition of Project Delays

Many researchers have different definitions for “delay”. (Assaf and Hejji 2006), defined delay in construction projects 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. It is a project slipping over its planned schedule and is considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rentable space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases.

Rauzana (2016), defined construction project delays as additional implementation time completion of projects that have been planned and specified in the contract documents. Timely completion of the work is not a shortage of productivity levels, and will result in waste in financing, either in the form of direct financing is spent on government projects, as well as swelling of intangible investments and losses on projects. A construction project is commonly admitted as successful when it complete on time, with budget, according the specifications, and stakeholder satisfaction. Kikwasi (2012) defines delay in construction as a prolonged construction period than specified in a contract or beyond the date that the parties agreed upon for the delivery of a project. Lo, Fung & Tung (2006) define delay as the slowing down of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project.

Historically, the definition of success in construction project has been meeting the customer's expectations regardless of whether or not the customer is internal or external. Success includes getting the job done within the constraints of time, cost and quality (Kerzner, (2009). Using this standard definition, success is defined as a point on the time, cost, and quality/performance grid. The singular point of time, cost, and quality would be a point within the cube, constituting the convergence of the critical success factors for the project.

According to (Megha and Bhatt, 2013), 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 as the causes of delay in construction projects.

It is all very well for a contractor to be granted an extension of time for practical completion because of delays beyond its control. Delays also have the potential to involve the contractor in additional costs, both direct and indirect costs (Goldfayl. G., 2014).

Direct costs of delay include all time-related costs, such as wages, hire charges and service charges, as well as the related site and head office overheads. Indirect costs include disruption, such as having to re-schedule subcontractors' work and the delivery of materials, given that subcontractors

and suppliers may have other commitments that make their co-operation difficult to obtain. Other indirect costs may be the necessarily inefficient use of labor and/or plant, and unavoidable increases in the cost of labor and/or materials over the increased duration of the project.

2.2.4 Parties in Construction Projects

The delay occurred when the contractor failed to complete the project within the specified period by the date of the contract as agreed by both parties in the contract. Various factors contribute to delays in completion of road construction project. Clients, contractors and consultants are the most important factors among many other factors.

2.2.4.1 Owner

The client related factors are concerned with client's type, individuality, experience, financial status, awareness, organization, construction complexity, confidence, extent and risk dealing. Delays are caused by the client's actions emanating from his need or inactions contrary to provisions stipulated in the contract. Where the cause of the delay is the project owner's responsibility, the contractor would be entitled to compensation against these losses. The owner related factors are concerned with the lack of experience of owner, financial problems, slow decision-making process, unrealistic contract duration and requirements, poor communication and coordination of the owner with other parties, delay in delivering construction site to the contractors etc.

2.2.4.2 *Contractor*

Contractors are those who tied directly to a contract of construction projects that are responsible for controlling and implementing the project during the construction site until the project is fully completed. Contractor is someone who undertakes to carry out and complete any construction work.

In project undertaking, contractors are assigned to a construction project during the design or once the design has been completed by a licensed architect. The assignment of contractors is done through a bidding process with different contractors. The contractor is selected by using one of the three common selection methods: low-bid selection, best-value selection, or qualifications-based selection.

Contractor delays are caused by the contractor's non-performance of activities due to his own problems within his control, which finally result in time overrun, cost overrun, disputes, resource underutilization, arbitration etc. (Goldfayl. G., 2014). Where a delay is due to action or omission by the contractor, then the contractor is totally responsible for the effect of the delay on the time for completion. It is also therefore responsible for the cost of any remedial action that may need to be taken to recover the time lost and to avoid the contractual remedies, such as liquidated damages, which may be available to the owner in the event of late completion.

On the other hand, where a delay is due to causes beyond the contractor's control, the contractor may claim, and be granted, a reasonable extension of time for completion. Delays inevitably entail disruption of the planned construction sequence and thus trigger additional costs, which the contractor may recover from the owner where an extension of time has been granted.

2.2.4.3 Consultant

Delays may also result from consultant problems which include design errors, late approval of tests and drawings, inadequate experience of consultant, lack of consultant's site staff, poor project administration etc. (Alaghbari, et al., 2007) listed some of the possible factors of consultant delays which includes lack of consultant site engineer, lack of adequate knowledge on the part of the consultant, inexperience on the part of the consultant site staff, delayed in making decisions, insufficient documents, and slowness in passing information. In this case, the contractor will be entitled to claim for time extension or/and financial compensation whereas the client will not be entitled to claim for liquidated damage as the consultant is the representative and within control of the client.

2.2.5 Types of delays

2.2.5.1 Intrinsic and Extrinsic delays

From the design stage to the stage where project is completed, a numerous factors affects construction projects (Baloia, 2001). These factors can be categorized into intrinsic and extrinsic factors. Intrinsic factors are factors that relate to construction organizations; whereas extrinsic factors involve various elements ranging from the socio cultural, technological, economic and political environments within which these organizations function. Extrinsic causes of delay are difficult to influence or control, whereas the intrinsic causes of delay can be addressed by efficient

project management. Extrinsic causes such as geopolitical risk, inflation and currency rate drop have been often called ‘global risk factors’ (Baloia, 2001). Global risk factors vary from region to region; each region is known to have its own region-specific causes of delay in construction projects.

2.2.5.2 Critical and Non Critical Delays

Construction project contracts are concerned with delays that may result in the works being delayed in reaching practical completion: that is to say, delays to ‘critical’ activities (Goldfayl. G., 2014). These are activities which are on the ‘critical path’ of a construction program for the project. Their start and finish dates are fixed, so that they have no ‘float’ or discretionary time. The contractor has no time flexibility in implementing such activities. Thus, a delay in a critical activity necessarily lengthens the critical path, thereby lengthening the minimum time required for the completion of the works, which are required to be completed by the date for practical completion.

Non critical delays can be seen as those delays that do not impact the completion date of the project but in a way, affect the progress of the work. It can therefore be said that both excusable and non-excusable delays are all critical delays. This leaves non critical delays as a standalone delay classification (Trauner, 2009).

Based on the responsibilities for delay happening, any delaying event in construction could happen from the fault of the employer, consultant, or the contractor or for a condition that is beyond the control of all parties. In this respect classified delays into three categories.

- Those over which neither party to the contract has any control
- Those over which the client (or his representative) has control
- Those over which the contractor (or any subcontractor) has control

Such classifications are defined for the purpose of defining the responsibility and subsequent entitlement for compensation of the impact of any delay event in the context of the conditions of contract provisions. (Alkass et al., 1996) have classifies delays as follows:

- Excusable Delays with Non-compensable
- Excusable Delays with Compensable
- Non-excusable Delays
- Concurrent Delays

2.2.5.3 Compensable and Non-compensable

A compensable delay is a delay where the Contractor is entitled to a time extension and to additional compensation. Relating to the excusable and no excusable delays, only excusable delays can be compensable. A non-compensable delay means that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay. Thus, the question of whether a delay is compensable must be answered.

Under a non-compensable event the contractor can obtain an extension of time which provides the contractor with an extension to the agreed contract completion date and acts as a mechanism to protect the client's entitlement to liquidated damages. If the delay event is deemed compensable the contractor can claim loss and expense, but they must prove the damages they have suffered from events not their fault. A combination of both forms of compensation is also possible. In most cases, a contract specifically notes the kinds of delays that are non-compensable, for which the contractor does not receive any additional money but may be allowed a time extension

2.2.5.4 Excusable delays

Excusable delays are delays that excuse a contractor from performing within the contract period and justify an extension of time to perform. Excusable delays are caused by conditions that are beyond the control of the contractor that allows them a form of compensation. The compensation available will depend on whether the event is deemed compensable or non-compensable. (Alkass et al, 1996 cited in) described excusable delay as delays that are not attributable to the contractor's actions or inactions and typically include unforeseen events. The events cannot be foreseen by any experienced contractor and has to be proven that they are caused without fault or negligence of the contractor. Whether the delays are excusable depends on contract provision. Excusable delays can be further classified into delays with compensation and without compensation.

Jack A. Lazarczyk, stated major elements representing excusable delays as:

- General labour strikes
- Fires, floods and other natural disasters
- Owner directed changes
- Errors and omissions in the plans and specifications
- Differing site conditions or concealed conditions
- Lack of action by government bodies

- Intervention by outside agencies

Before concluding the delay is excusable based solely based only on the on the preceding definition the analyst must refer to the construction contract documents because decision concerning delays must be made within the context of the specific contract. The contract should clearly define the factors that are considered valid delays to the project that justify time extensions to the contract completion date, for example some contracts may not allow for any time extension caused by weather conditions, regardless of how unusual, unexpected, or sever.

2.2.5.5 Excusable Delays with Non-compensable

When a delay is caused by factors that are not foreseeable, beyond the Contractor's reasonable control and not attributable to the Contractor's fault or negligence, it may be "excusable". This term has the implied meaning that neither party is at fault under the terms of the contract and has agreed to share the risk and consequences when excusable events occur. The contractor will not receive compensation for the cost of delay, but he will be entitled for an additional time to complete his work and is relieved from any contractually imposed liquidated damages for the period of delay.

2.2.5.6 Excusable Delays with Compensable

In addition to the compensable delays that result from contract changes by change notice, there are compensable delays that can arise in other ways. Such compensable 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. If the delay is compensable, then the contractor is entitled not only to an extension of time but also to an adjustment for any increase in costs caused by the delay. Owner-issued contracts specifically address some potential compensable delays and provide equitable adjustments. The usual equitable adjustment clauses in owner issued contracts that apply to delay are:

- Changes
- Differing Site Conditions
- Suspension

The changes clause in Owner-issued contracts provides that equitable adjustments may be considered as: Changes with the help of a written change notice, the owner may, without any notice

to the sureties (if any), unilaterally make any change, at any time in the work within the general scope of the Contract, including but not limited to changes:

- In the drawings, designs or specifications
- In the method, manner or sequence of Contractor's work
- In Customer or Owner furnished facilities, equipment, materials, services or site(s)
- Directing acceleration or deceleration in the performance of the work
- Modifying the Contract Schedule or the Contract milestones

If at any time Contractor believes that acts or omissions of customer or owner constitute a change to the work not covered by a change Notice, Contractor shall within ten (10) calendar days of discovery of such act or omission, submit a written change Notice request, explaining in detail the basis for the request. Owner may either issue a change notice or deny the request in writing.

If any change under this clause causes directly or indirectly an increase or decrease in the cost, or the time required for the performance of any part of the work, whether or not changed by any order, an equitable adjustment shall be made and the contract will be modified accordingly.
The clause recognizes that changes in the work or changes in the method or manner of performance may require changes in the schedule and schedule milestones and this could further necessitate revisions in activity durations, sequence of work items, or 7 interrelationships of various tasks. These changes may have a direct impact on the schedule, as where a change in method requires a greater or lesser period of performance or its effects may be subtler, as where the change merely rearranges priorities. In addition to a time extension, the contract's clause provides compensation for any delay resulting from a contract change by allowing an equitable adjustment for the increased cost of the performance of the work caused by the change.

Differing Site Conditions, the portion of the clause addressing cost or time adjustments for 'differing site conditions' provides: If such conditions do differ in material and thus cause an increase/decrease in the contractor's cost or time required for performance of the work, an equitable adjustment will be made pursuant to the general condition titled "Changes". No claim of the contractor under this clause will be allowed unless the contractor has given the required notice. The main intention is to leave the contractor neither damaged nor enriched because of the resultant delay.

The differing site conditions clause must not be confused with the site conditions clause in owner issued contracts - the so-called “Exculpatory” clause. Its intent is to disallow any claims for delays relating to conditions at the site, which the contractor should have anticipated. The exceptions are limited to those conditions defined in the ‘Differing Site Conditions’ clause.

2.2.5.7 Non-excusable Delays

Non-excusable delays are events that are within the contractor’s control or that are foreseeable. This type of delay is caused due to contractor’s action or inaction, on which the contractor could have foreseen and prevented. Hence the delay presents no entitlement both to time extension and cost. According to (Alkass et al., 1996) if the delay can be proved to have affected the whole project performance, then the contractor could be entitled to liquidated damages. These delays might be the results of underestimates of productivity, inadequate scheduling or mismanagement, construction mistakes, weather, equipment breakdowns, staffing problems, or mere bad luck. Such delays are inherently the contractor’s responsibility and no relief is allowed. The following are some examples of non-excusable delays:

- Late performance of subcontractors.
- Untimely performance by suppliers.
- Faulty workmanship by the contractor and subcontractors.
- A project specific labour strike caused by either the contractor’s unwillingness to meet with labour representatives or by unfair labour practices.

2.2.5.8 Concurrent Delays

Concurrent delay is said to be caused when there is a situation of two or more delay occurrence at the same time or overlap to some degree. It occurs when both parties to the construction contract (owner and contractor) delay the project during an excusable but non-compensable delay (such as severe weather conditions). Concurrent delays occur when both owner and the contractor are responsible for the delay. Generally, if the delays are inextricably intertwined, neither the contractor can be held responsible for the delay (forced to accelerate, or be liable for liquidated damages) nor can he recover the delay damages from the owner.

Concurrent delays may also be an excusable delay with compensation, which may grant some reliefs to the contractor in the form of extension of time, remission of liquidated damages, and

sometimes, potential delay of damages subject to the given circumstance and the contractual agreement. In the same vein, a concurrent delay may also be inexcusable where the delay of the contractor, though concurrent with that of the owner, had a more severe impact on the finishing date.

2.3 Project Delays: Empirical Reviews

2.3.1 Category of Delays

A number of studies have been conducted about delays in construction projects for decades with scholars advancing various factors and groups of factors that contribute to causing delays. Delay is considered to be one of the most recurring problems in the construction industry and it has an adverse effect on project success in terms of cost, time, quality, and safety. Several factors cause delay in construction projects. These are clients, users, consultants, designers, owners, contractors and suppliers may cause construction project to delay. This study however re-clustered these factors into three broad categories as consultant-related, contractor-related, and client-related, those are considered as the most significant factors that cause delay of construction projects. Clients, consultants and contractors play key role in a construction project and the non-excusable types of delay are usually related to the inaccuracy of their responsibilities, therefore, it is extremely important to review and investigate them to give a better understanding and to determine from their experience what factors are causing project delay in the construction projects.

In a study of the significant factors that cause delay of construction projects

2.3.2 Consultant Related Delay Factors

Several studies have identified consultant related factors that cause schedule delays. Kang (2010) identified delay in approving major changes, mistakes and discrepancies in design documents, un-use of advanced engineering design software, unclear and inadequate details in drawings, delays in producing design documents, insufficient data collection and survey before design, poor communication and coordination, inadequate experience of consultant as the consultant related delay factors. (Ashraf and Ghanim (2016) identified that errors in design and contract documents, changes in the original design, drawings are not efficient enough, non-availability of consultant's staff on site as the consultant related delay factors in construction sector in Jordan.

(Assaf, et al., 2006) identified design errors made by designers, changes in types and specifications during construction, insufficient communication between owner and consultant during design stage as critical delay factors. (Assaf and Hejji, 2006) identified delay in performing inspection and testing, delay in approving major changes in the scope of work, inflexibility (rigidity) of consultant, poor communication and coordination between consultant and other parties, late review and approval of design documents, conflicts between consultant and design engineer, inadequate experience of consultant as the consultant related delay factors. M. Haseeb (2011), concluded that lack of completeness and timeliness of project information, missing some detail in drawing, priority on construction time, incomplete understand of client requirements, and poor design ability by the consultant was the major cause of delay.

Adiam (2016) asserted that poor qualification of consultant / engineer's staff assigned to the project and delay in the approval of contractor's submissions by the engineer. The identified critical factor is highly dependent on quality and performances of consulting firms assigned for a project. Robel (2015) on the other hand identified incomplete documents, delayed and slow supervision in making decisions, Absence of consultant's site staff, lack of managerial experience and supervisory personnel, lack of experience on the part of the consultant as a company as the consultant's responsibility. Siraw (2015) concluded that progress payments delay by owner, inflation, delay in commencement, contractors' financial problems, unforeseen cite conditions, inadequate contractors experience, inaccurate cost estimation, slow equipment movement, incomplete drawings, and quality of material as the top ten consultant related delay factors.

2.3.3 Contractor Related Delay Factors

Several studies have identified contractor's related factors to cause delays in construction projects. Kang (2010) identified delays in sub-contractors' work, poor communication and coordination, inadequate contractor's work, ineffective planning and scheduling of project, conflicts in sub-contractors' schedule, improper construction methods implement, frequent change of sub-contractors, rework due to errors during construction, conflicts between contractor and other parties, and difficulties in financing project as the top delay causing factors. (Ashraf and Ghanim, 2016) concluded that inadequate management and supervision by the contractor, inadequate planning and control by the contractor, rework due to mistakes during construction, low level

productivity, technical problems faced by the contractor, incorrect construction methods followed by the contractor, cash flow problems suffered by the contractor and delay due to sub-contractor's works as contractors related delay factors in construction project in Jordan.

(Assaf and Al-Hejji, 2006) identified that difficulties in financing project, conflicts in sub-contractors schedule in project executions, rework due to errors, conflicts between contractor and other parties (consultant and owner), poor site management and supervision, poor communication and coordination with other parties, ineffective planning and scheduling of project, improper construction methods implemented by contractor, delays in subcontractors work, inadequate contractor's work, frequent change of sub-contractors, poor qualification of the contractor's technical staff, delay in site mobilization as the contractor's related delay factors. Haseeb (2011), asserted that the most important factor relevant to contractors are lack of acquiring new equipment, poor material used in construction, and unfair relationship of subcontractors with employees are the major factors that contribute to causes of delays.

Adiam (2016) identified seven top delay-causing factors. These are poor management of finance by the contractor, poor site management and supervision by the contractor, ineffective planning and scheduling of work by the contractor, weakness in following the planned work schedule by the contractor, delay in site mobilization, lacks of field survey by the contractor before commencement of the work, ineffective contractors head office involvement in the project. Robel (2015) identified delay in delivering material on site, poor site management, shortage of material on site, incomplete documents (design drawings and schedule updates) as contractor's responsibility.

2.3.4 Client Related Delay Factors

Several studies have identified client/owner related delay factors to cause schedule delays. Kang (2010) identified late in revising and approving design documents, change orders by owner, delay in approving shop drawing and sample materials, slowness in decision making process, poor communication and coordination, conflicts between joint-ownership of the project, delay to furnish and deliver the site, suspension of work by owner, delay in progress payments as client related delay factors. Ashraf S., Ghanim (2016) concluded that client's changes of the design, using lowest bid that lead to low performance, changes in the extent of the project, delay in progress payments

by the client, lack of cooperation between client and contractor, delay of approval contractor submittals as client related delay factors construction projects in Jordan. Haseeb (2011) identified economic ability/ economically arrangement for the project, late payment of bills, lack of proper and timely decision, not definite about material, and concerns for construction time as client related problems.

Adiam (2016) identified four major categories, both contractors and consultants ranked four of the variables in the most 25 client related delay causes. These are type of project bidding and award (selection based on least evaluated bidder), poor assessment of original contract duration, delay in effecting payments by the owner, delay in site possession by the owner, delay in settlement of right of way issues by the owner. Robel (2015) observed delayed site handover and right of way, financial problems (delayed payments), slowness in making decisions, lack of coordination with the contractor and the public utility providers, contract modifications (replacement and addition of new work to the project and change in specifications) as the client responsibility.

In general, design-related delays are the role of consultants as they are in charge of the design process in conjunction with the owner of the project. On the other hand, the contractor has the major responsibility for delays in construction-related delays. Delays caused by contractors such as lack of planning and poor understanding of accounting and financial principles that can lead to many contractor's downfalls can generally be attributed to poor managerial skills. Delays such as late submission of drawings and specifications, frequent change orders, and incorrect/inadequate site information generate claims from both the main contractors and subcontractors, which many times entail lengthy court battles with huge financial repercussions are related to clients. Delays due to Financial/Economical Causes as well as management or administrative Causes share an intermediate position of importance.

2.3.5 Causes of Delay

The execution of a project is said to be successful when it is completed within the scheduled time, without exceeding the allotted budget, and according to the specified quality and standards. There are many causes for late completion or delay of construction projects and several studies have pointed out various factors based on the underlying conditions that the specific study is concerned; that is, for a particular project type, specific location or to a particular project size.

Delays in construction projects are still very common in most parts of the world even with the introduction of modern management techniques. Studies have been conducted by different scholars in different countries of the world on the causes of construction project delays. There is a wide range of views for the causes of time delays for construction projects. Although there are some similarities in findings, the differences reiterate the need to have geographic dimension to this subject matter. Some causes are major whiles some are minor in their prevalence as observed by various researchers hence, those who attempted classifying the causes based them on the ones identified by stakeholders as very pervasive in nature.

Natasha (2004), identified the causes of delays in executing construction projects in Ghana. This are, improper planning on the part of contractors during bidding, low cash flow to complete projects and the lack of financial capacity on the part of the contractors were rated high in terms of the causes that delay execution of construction projects. Some are attributable the causes of project delay to a single party, others can be ascribed to several quarters and many relate more to systemic faults or deficiencies. (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 (Megha and Bhatt, 2013). According to (Al Hammadi and Nawab, 2016), time overruns or, time extensions happen due to many reasons, such as designer changes or errors, economic conditions, resource availability and performance of project parties. Usually, majority of project delay occurs during Construction phase, where unforeseen factors (environmental concerns and restrictions, ground conditions etc.) are always involved.

(Mezher et al., 2009) conducted a survey of the causes of delays in the construction industry in Lebanon from the viewpoint of owners, contractors and architectural/engineering firms. It was found that owners had more concerns with regard to financial issues, contractors regarded contractual relationships the most important, while consultants considered project management issues to be the most important causes of delays. Furthermore, a study conducted by Assaf (2006) found that any changes made by client during the construction period would affect in progress payment by client. Other causes are improper planning and scheduling of projects by contractor,

poor site management and supervision by contractor, shortage of labor, difficulties in financing project by contractor. This shows that changes made by client while construction is already in progress will not only slow the progress but also affect everything that contractors has planned for the project in terms of materials delivery schedule or any activities that were due to finish on time. Such changes made by client could stop the work and increase project cost and delay the delivery schedule.

Kikwasi (2012) on his study on 'Causes and effects of delays and disruptions in construction projects in Tanzania' concluded that design changes, delays in payment to contractors, information delays, funding problems, poor project management, compensation issues and disagreement on the valuation of work done are the major delay causing factors construction projects in Tanzania. The study pointed out that there still exist a number of causes of delays and disruptions and their effects put construction projects at great risk that have an effect on their performance. (Gidado, et al., 2012) identified 10 major causes of construction delays in Afghanistan where security and corruption are the two top delay factors with the highest rank of importance followed by poor qualification of the contractor's technical staff, delay in progress payments by owner, poor site management and supervision by contractor, ineffective planning and scheduling of project by contractor, difficulties in financing project by contractor, poor communication and coordination by contractor with other parties, and frequent change of sub-contractors because inefficient work as delay causing factors in their order of importance.

(Mydin, et al., 2014), conducted a research on influential causes of construction project delay in Malaysian private housing from developer's viewpoint. In the study, the most important top 10 causes of delay in private housing projects have been identified: weather conditions on the site (external factors), poor site condition, incomplete documentation by the consultant, lack of experience on the part of consultant site staffs (managerial and supervisory personnel), financial problems, contract modifications (replacement and addition of new work and changes in specifications) by the client, delay in approving major changes in the scope of work by the consultants, contractors coordination problems with other parties, constructions mistakes and defective work are identified as the most important causes of delay.

(Sweis, et al., 2008), conducted a research on potential delay in construction projects in Jordan construction projects as seen by clients, contractor and consultants. Five principal factors with the with the highest-ranking causes according to the mean of the averages of the groups are: financial difficulties faced by the contractor, too many change orders from owner, poor planning and scheduling of the project by the contractor, severe weather conditions on the job site and changes in government regulations and laws have been identified. Seboru (2015), summarized main causes of delay in an investigation into factors causing delays in road construction projects in Kenya. The study identified payment by client, slow decision-making and bureaucracy in client organization, Claims, inadequate planning / scheduling, rain as the most top five important causes of delay. (Kamanga, and Steyn, 2013), conducted a survey of the causes of delays in the construction industry in Malawi from the viewpoint of owners, contractors and architectural/engineering firms. In this study seventy-two causes of delay were identified and divided into six categories related to consultants, client, contractors, projects, resources and external factors. From this study a collective analysis of all three groups show that among the top ten causes of delay, five (fuel shortage, insufficient cash flow, Foreign currency shortage, slow client payment procedure and insufficient equipment) are related to resource shortages and non are related consultant related factors.

Based on the research findings conducted on analysis of causes of delay and time performance in construction project at Aceh Besar, Indonesia, by Rauzana (2016), it concluded that the key factor that constrain completion of construction projects was social factor as a major inhibiting factor. In Indonesia, social and cultural life of a group of people is influenced by tribal customs and traditions. Customs and habits of the people will give birth to a culture that shapes and influences the character of its people. Indonesia is a country, which consists of various ethnicities, customs, and traditions that will provide behavioral and social or cultural difference.

According to the case study conducted by Shah (2016) at different countries, Australia, Malaysia & Ghana on the causes off delay and cost overrun in construction projects, shows that the key factors of causing the project delay varies from one country to another country. For example, in Ghana the most critical factor and threat to the project delay is the delay in payment which could have significant impact on the project progress and its performance in terms of quality and services.

In contrast, Australia and Malaysia share the most of critical factors, the lack of planning and scheduling by contractors would affect the estimated targets and could result in project delay and cost overrun. The 2nd most factored causes placed in Ghanaian ranking is underestimation of the project cost, However, in Malaysia and Australia, poor site management and ineffective construction techniques are ranked as 2nd most influential factor for delaying the project. Ghana and Malaysia, shared common factors in which both ranked in 3rd place, is the lack of contractor's experience in the construction industry and underestimation of the complexity of the project. In general, these two factors are related to one another in terms of improper management of project. In contrast, 3rd ranked factor in Australia is related to the poor site management.

According to (Rabbani, et al., 2011), the most common factors that cause the construction delay in Pakistan are external factors due to natural disaster such as earthquake and floods. Similarly, (Bramble and Callahan, 2010) found that unexpected problem such as act of natural phenomenon also causes the project delay. Other factors causing delay in Pakistan are financial payment issues, poor planning, poor site management, lack of experience and shortage of materials and equipment.

Ibrahim Mahamid, conducted study on, 'Common Risks Affecting time overrun in road construction projects in Palestine: Contractors' Perspective The most critical factors are: payment delays by the owner, the political situation, the segmentation of the West Bank, the financial status of the contractor, poor communication between the construction parties, lack of equipment efficiency and high competition in bids. In constructor's perspective, it can be seen that the most critical factors are due to both external and internal issues: the external being high competition, the political situation and segmentation of the West Bank. The internal issues are: payment delays by owners, financial status of the contractors, poor communication between construction parties and low equipment efficiency.

According to the study conducted on, 'Factors Affecting Cost Overrun in Road Construction Projects in Saudi Arabia from contractors' viewpoint' by Abdullah Alhomidan, 41 factors considered in a survey indicates that the most severe factors affecting cost overrun in road construction projects are: internal administrative problems, payments delay, poor communication between construction parties, and delays in decision making. The results show that most of the

critical factors are managerial factors that could be controlled and minimized by improving the managerial skills of the construction teams by conducting proper trainings and workshops. Ashraf, S., & Ghanim A. B., (2016) identified 10 causes of delay in public construction projects in Jordan where among the top 10 factors causing delays on construction sites in Jordan, eight out of the ten are related to client and contractor (four for each). Only two factors are related to consultant the sixth and the ninth. The top ten delay causing factors are: inadequate management and supervision by the contractor, client's changes of the design, inadequate planning and control by the contractor, using lowest bid that lead to low performance, changes in the extent of the project, errors in design and contract documents, delay in progress payments by the client, rework due to mistakes during construction, changes in the original design, and low level productivity.

Study by Endale, M. (2016) on Major Causes to the delay in the construction of 40/60 Saving Houses Project in Addis Ababa have been identified ten top causes of delay. These include: shortage of labors, unqualified work-force, inadequate contractor's experience, difficulties in financing project by contractor, ineffective planning and scheduling of project by contractor, low productivity of labors, delay in progress payments by owner. Similarly, Tsegay G. & H. Luo (2017) study on analysis of delay impact on construction project identified six critical factors of delay in the Ethiopian construction project most as from overall respondent's point of views. These are sequentially ranked as corruption, unavailability of utilities at site, inflation or price increases in materials, lack of quality materials, late design and design documents, slow delivery of materials, late in approving and receiving of complete project work, poor site management and performance, late release budget/ funds, and ineffective project planning and scheduling.

Study by (Shambel and Patel, 2018), on factors influencing time and cost overruns in road construction projects in Ethiopia identified six main sources of delay. They include financial problems, improper planning, land acquisition and construction delay, design changes, less materials and equipment supply by contractors, incomplete design. According to Robel, (2015) on schedule delay identification and assessment on Addis Ababa's light rail transit construction projects, all of the construction projects are susceptible to delay in Ethiopia. Financial problems, managerial problems and contractor's ability are the main causes of delay. Merid (2016) concluded less emphasis to planning, poor contract management and Poor pre planning process has been ranked in the first, second and third position as the causes of time overruns at Defense Construction

Enterprise in Ethiopia. Siraw (2015) concluded that slow cite clearance, contractor's financial problems, inflation, exchange rate fluctuation, supply of material, inadequate contractors experience, low productivity of labor, inaccurate cost estimation, poor resource management, and improper planning are the top ten client related construction delay. Shewaferahu (2016) identified lack of funds to finance the project, changes in drawings, lack of effective communication among parties, lack of adequate information from consultants, slow decision making, unrealistic contract duration and variations, mistake and discrepancies in contract document, equipment availability and failure, mistakes during construction, bad weather, fluctuation in materials prices, ineffective planning and scheduling, low labor productivity as construction delay factors. Soroush (2017) were investigated the causes of construction delays in the United Stated using a national survey. The analysis of the data revealed that excessive change orders, time-consuming decision processes taken by the owners, design error, time delay in approving design documents by the owner, error in contract documents, unrealistic schedule, delay in getting permission and acquisition, complexities and ambiguities of project design, poor communication and coordination of the owners with other parties and delay in providing the design documents by the designer were the top ten main factors. As it can be seen in from the survey result, the role of the owner was significant as a top factor in causing delays, and change orders were identified as the primary cause of delay.

The delay and cost overrun are also key issues in the developed countries. For example, Shah (2016) published a report entitled 'Exploration of causes for delay and cost overrun in construction, projects in the case of Australia, Malaysia & Ghana' identified the critical factors for developed and developing counties. The study concluded that in Ghana the most critical factor and threat to the project delay is the delay in payment, which could have significant impact on the project progress and its performance in terms of quality and services followed by underestimation of the project cost and underestimation of complexity of the projects. These factors are common in the developing countries in the construction industry. In contrast, Australia and Malaysia share the most of critical factors are similar. For example, lack of planning & scheduling by contractors and poor site management & ineffective construction techniques are ranked as the first and second most influential factor for delaying the project.

(Chan and Kumaraswamy, 1997) studied delay factors on projects in in Hong Kong construction projects and found out that site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client-initiated variations and necessary variations of works appear to be five significant sources of construction time overrun of projects. (Al Ahmadi and Nawab, 2016) investigated delay factors in construction projects in Saudi Arabia. The main causes of delay identified were slowness of owner decision making process, delay in contractor ‘s payment by owner, delay in progress payment by owner, change orders by owner during construction and uncooperative owners.

2.4 Conceptual Framework

2.4.1 Effects of Delay

In relation to the literature review, the conceptual framework has underlined a number of factors that determine the rate of project execution at which the projects are completed. It outlined variables in road construction projects that is affected by the variables interaction. The variable in this case is the delay of road construction projects implementation in the road construction sector and the subsequent outcomes of delays. These are time overrun, cost overrun, disputes between parties, underutilization and wastage of resources etc.

Road construction project delays carries a rippling effect on the contracting parties and the citizens in an economy. Different from causes of delay where it varies across country and may have some geographical restrictions, the impact of delay is universal in nature. It turned out that in many studies all the respondents chose time and cost overrun giving it the highest ranking. Delay give rise to disruption of work and loss of productivity, Wastage and underutilization of resources, late completion of project, increased time related cost, and third party claims and abandonment or termination of contract.

(Ashish and Wagh, 2016). Delays and cost overruns have significant implications from economic as well as political point of view. Due to delays in project implementation, the people and the economy have to wait for the provisions of public goods and services longer than is necessary. Thus, delays limit the growth potential of the economy. Similarly, Kikwasi (2012) concluded that the effects of delays are time overrun, cost overrun, negative social impact, idling resources disputes idling resources, disputes, Arbitration, loans return delay by the client, poor quality of

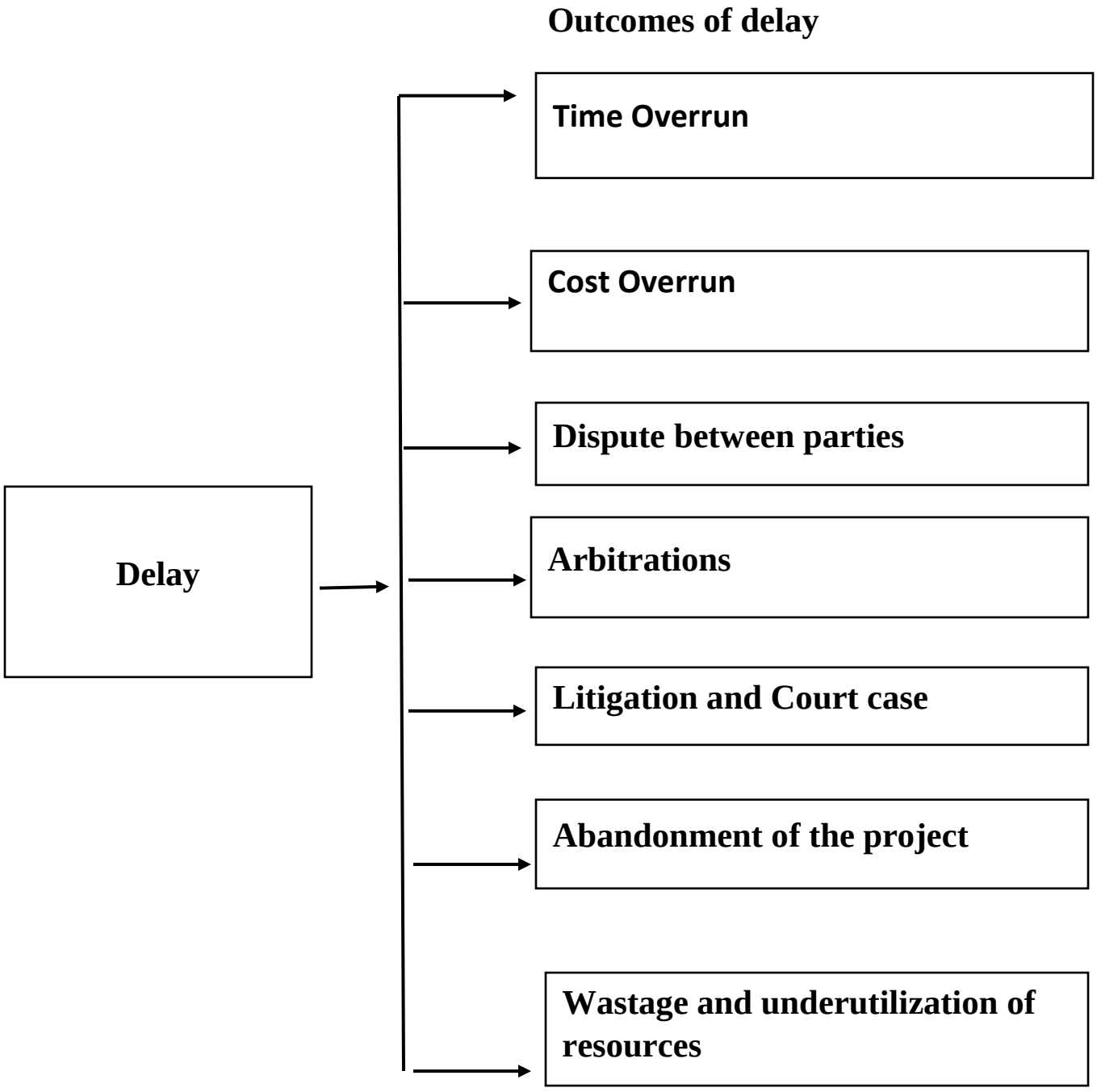
work due to hurry, and delaying in getting profit by clients as the top effects of construction project delay in Indonesia. (Ashraf S., and Ghanim, 2016) identified time overrun, cost overrun, disputes, arbitration, total abandonment and litigation as the effects of delay in construction sector in Jordan.

(Megha and Bhatt, 2013), concluded that delays almost always accompanied by cost and time overruns. They explained that construction project delays have an adverse effect on parties (owner, contractor, consultant) to a contract in terms of a growth in adversarial relationships, distrust, litigation, arbitration, cash-flow problems, and a general feeling of apprehension towards each other. Therefore, it is essential to define the actual causes of delay in order to minimize and avoid the delays in any construction project. A research work carried out by (Assaf and Al-Hejji, 2006) reveals six effects of delay on project performance in Nigeria. These effects are time and cost overruns, disputes, arbitration, litigation and total abandonment. Mukasera (2016) studied the effects of time overruns in road construction project in Malawi. The analysis of the data revealed, cost overruns, extension of the performance period, claims, disputes between contractual parties, termination of the contract, loss of profits on the part of the contractor, project abandonment, poor quality of work due to hurried execution of works, negative social impact and idling of resources as the top effects of construction project delay.

Robel (2015) identified the effects of delays in Ethiopian construction project. These are time overrun, cost overrun, loss of political and economic value towards the project, arbitrations between the contracting parties are the effects of the delay encountered. Shewaferahu (2016) identified eight effects of construction project delay in Ethiopia. These are time overrun, cost overrun, wastage and underutilization of work force & resources, tying down of Clients' capital, abandonment of the project, dispute among parties, arbitration and litigation and Court case.

The following seven effects of delays were identified for the purpose of this study from the previous studies that have been carried out on addressing how the causes of delays have effects on construction projects:

The conceptual framework outlined the delay in the implementation of project and the outcomes of delay discussed in the literature review as shown below.



2.4.2 Delay Factors

From the literature reviews, the researcher has adopted the following 30 independent variables and categorized them into client, contractors and consultant related factors as the basis of the questionnaire for the present study.

There are other external variables that affect the project completion time such as government policies, environmental factors politics, social and economic factors. These are factors that have a direct impact on the performance of the projects or have it coming indirectly but the final results felt in the rate at which these projects are implemented. Due to time limitations, these factors have not been included in the literature but they have an impact on the time of projects completion. Therefore, for the purpose of this study, the researcher has adopted internal factors i.e. client, contractor and consultants related factors.

Table 1: Categorization of list of delay factors extracted from literatures

	I. Delays related to clients
1.	Delay in delivering construction site to the contractors
2.	Lack of experience of owner
3.	Financial problems (delayed payments for completed work, financial difficulties, and economic problems)
4.	Slow decision making process
5.	unrealistic contract duration and requirements imposed and
6.	Poor communication and coordination of the owner with other parties.
7.	Lack of coordination with the contractor and utility providers
8.	Change orders by owner during construction (replacement and addition of new work and change in specifications)
9.	Type of project bidding and award (selection based on least evaluated bidder)
	II. **Delays related to contractors**
10.	Poor qualification of the contractor's technical staff;
11.	Shortage of contractors' materials on site;
12.	mistakes during construction stage

13. inadequate contractor experience
14. difficulties in financing the project during construction by the contractor
15. Inadequate planning and scheduling of work by contractor
16. Conflicts with sub-contractors
17. Poor site management and supervision by contractors
18. Contractors inefficiency in handling resources
19. Weakness in follow up the planned work schedule by the contractor
20. Rework due to error during construction
21. Poor communication and coordination of the owner with other parties.
22. Poor project manager skills

III. Delays related to consultants

23. Poor communication and coordination of the consultant with other parties.
24. Delay in inspection and testing by the consultant
25. Lack of consultant's site staff
26. Inadequate experience of consultant;
27. Mistakes and discrepancies in design documents
28. Poor contract management
29. Delay in design documents preparation by consultant
30. Inaccurate site investigation

CHAPTER THREE: METHODOLOGY

3.1 Research Design

This study adopted a descriptive research design which is used to provide quantitative or numerical description of attitude, or opinions of participants to evaluate the perception of parties involve in the construction process. Literature review and questionnaire survey were designed and employed to assess the knowledge and practice of participants on the cause and effects of delay.

3.2 Target Population

The target population of this study was the major stakeholders of the road construction projects such as client, contractor, and consultant organization in road construction projects such as Ethiopian Road Authority, Ethiopian Road Construction Corporation and Ethiopian Construction Design and Supervision Corporation comprising of engineers working in the ERA.

3.3 Sample and Sampling size

Study participants are composed of 80 engineers from the three target population who have been engaged in the road construction projects. From the target population, the researcher has purposively distributed questionnaires to the respondents of engineers. These respondents having been in construction sector and directly working in departments perceived to be oriented in dealing with road construction therefore aligned to the study research objective. Accordingly, 32 Engineers from Ethiopian Road Authority (client), 23 engineers from Ethiopian Road Construction Corporation (contractor) and 25 engineers Ethiopian Construction Design and Supervision corporation (Consultants) were selected for the purpose of this study.

The main aim of choosing this type of population is to be able to get current and past information from engineers who have participated in the implementation of roads construction projects and thus experienced the implementation delay challenges that the projects face.

Table 2: Sampling and Sample Size

Category	Frequency	Percentage
Clients	32	41.38
Contractors	23	32.76
Consultants	25	25.86
Total	**80**	**100**

3.4 Research Instruments

In this study, primary data was collected by the use of distributions of questionnaires to the respondents. The study questionnaires are prepared and distributed to the selected samples of involved parties, contractors, owners, consultants in order to determine the factors causing delay in the completion of road construction projects

A questionnaire was developed to assess the perceptions of clients, consultants and contractors on the relative importance of delay causes and effects of delays in road construction. It was a structured questionnaire and it contained open-ended and close-ended questions. An open opportunity was left to the respondents to include and rate variables that might have been missed out by the researcher to discover additional factor affecting the project completion time specific to the Ethiopian road construction projects. The variables in the questionnaire were adapted from the studies cited in the literature review. It was designed based on the objectives of the study, to point out the most important causes of road construction project delays and the effects of delays.

The researcher was met some contractors, client and consultants to conduct pilot study to test the validity and reliability of the instruments. They took some time to study the questionnaires and gave some feedback. The respondents of whom the piloting was done were part of the study sample to avoid biased results of the study. The pilot sample consisted of 8 (representing 10% of study sample) respondents involved in road construction depending on the study size. The feedbacks obtained were then noted and the questionnaires modified and adjusted accordingly. The feedbacks obtained were as followed;

- The sections in the questionnaires should contain general information about the respondents

- Some questions needed to be modified including more details
- Use simple words to ease understanding of the questions

Many factors induce delay on construction projects, however in this study, the factors are limited to 30 factors causing delay and they were selected according to their relative importance in the previous studies conducted in the cases of Ethiopia and other developing countries road construction projects. As part of the data collection, the respondents were asked to rank the factors for project delay in road projects using a five- point Likert scale (5 =Very High, 4 = High, 3 = Moderate, 2 = Low, 1 = Very Low). They were asked to measure the factors the extent to which they believe that it can contribute to delays of road construction projects in road construction projects.

The questionnaires are classified into three sections: The first section contained general background information of the respondents. Section two of the questionnaire concentrated on causes of delay in road construction projects while the final section contained questionnaires concentrated on the effects of delay on construction projects.

On the other hand, another five Likert scale used to measure the effects of delays on construction projects where; 5=Strongly agree, 4=agree, 3=Slightly agree, 2=Disagree and 1=Strongly disagree to show how the past events had affected the projects and the effects of variables. Delay usually result in losses of one form or another for everyone.

3.5 Method of Data Analysis

The data were analyzed using descriptive statistics. The relative importance indices were calculated for each question within the form using the statistical techniques used for ranking elements in the order of their importance as seem or indicated by the participants.

3.6 Relative Importance Index (RII)

The causes and effects of construction delays were all examined and the ranking of their attributes was done using the Relative Importance Index (RII). Analysis of data consists of calculating the Relative Importance Index (RII) and ranking of factors in each category based on the results. The RII was used to rank the different causes. This helped to determine the proportionate contribution of each variable and its incremental contribution when combined with other variables. The values of RII is ranged from 0 to 1 which the higher the value of RII, the more important was the cause of delays. The relative importance index is given as:

$$RII = \frac{\sum W}{A * N}$$

Where: RII= Relative Index; W= Weighting given to each factor by the respondents (ranging from 1 - 5); A= the highest weight (i.e. 5 in this case); N= Sample size (i.e. total number of respondents).

CHAPTER FOUR: FINDINGS AND DISCUSSION

4.1 INTRODUCTION

The purpose of this chapter is to present the issues that related to survey questionnaire distribution and response rates by sector organizations, respondents' designation, work experience distribution, collection of the responses and subsequent analysis of the responses from the professionals working in the three stake holders' client, consultant and contractor involved in the road construction sector. The results and discussion contains the findings of the questions directed towards identifying delay causes and raking in the level of their importance. Similarly, the most important and frequent effects of delay were analyzed and the seven potential effects that has been selected from previous studies were ranked based on their potential effects.

4.2 Basic Information of the Respondents

The study wanted to find out the Characteristics of the respondents, bio data of respondents, age and educational level respondents as shown in the tables below.

4.2.1 *Survey responses and respondents' Characteristics*

Table 5 shows the distribution profile of the respondents' organization in terms of type, size and designation. Here, it is important to note that the Ethiopian road construction corporation is a contracting group that has been participating in the road construction projects under the Ethiopian Road (Client). Similarly, the Ethiopian Construction Design and Supervision Work Corporation is working as a consulting groups.

Out of the 80 questionnaires sent out, a total of 65 questionnaires were returned. Out of the questionnaires issued only 58 (out of which 24 from client, 15 from consultant and 19 from contractors) were properly completed and returned giving a return rate of 73% of the questionnaires issued that could be used for analysis. For the non-returned questions, respondents stated that have less than one-year experience or the were not directly participating in the field work. The general characteristics of the respondent is presented in the table below.

Table 3: Characteristics of the respondents

S.N	Type of organization percent	Designation	Qr. Distributed	Qr. Collected	Percentage
1	Ethiopian Road Authority (ERA)	Client	32	24	41.38
2	Ethiopian Construction Design and Supervision Work Corporation	Consultants	23	15	25.86
3	Ethiopia Road Construction Corporation	Contractors	25	19	32.76
	Total		**80**	**58**	**100**

4.2.2 Gender Distribution

The study found out the gender composition of the respondents as shown in the table 6 below. Majority of the respondents, 63.79% are male respondents while 36.21% are female population.

Table 4: Gender Distribution of Respondents

Sex	Frequency	Percentage
Female	21	36.21
Male	37	63.79
Total	**58**	**100**

4.2.3 Age Distribution

The study sought to find out the age brackets of the respondents in the study and the results were as shown below.

Table 5: Age Distribution of Respondents

Age	Frequency	Percentage
18-30yrs	45	77.59
31-40yrs	12	20.69
41-50yrs	1	1.72
51-60yrs	-	-
Over 70yrs	-	-
Total	**58**	**100**

Table 7 shows that the majority of the population that participated in the study was between ages 18-30 years making 77.59%. This was followed by ages 31-40 years and 41-50 years by 20.69% and 1.72% respectively.

4.2.4 Educational Level

The study sought to establish the level of education of the respondents and the results indicated by the table below were arrived at.

Table 6: Academic Qualification of Respondents

Education	level Frequency	Percentage
Vocational Training	-	-
Diploma	12	20.69
Degree	34	58.62
Masters	12	20.69
Total	**58**	**100**

Respondents with a degree education dominated at 58.62%. They were followed by those with diploma and Masters with equal 20.69%.

4.2.5 *Work Experience*

Respondents' percentage years of work experience shows that 43 (74.14%) of the respondents have 5-10 years of work experience, (9) 15.52% of the respondents have 6-10 years of work experience, (4) 6.9% of the respondents have 11-15 years of work experience, (1) 1.72% of the respondents have (1) 1.72% of the respondents have 16-20 and (1) 1.72% of the respondents have more than twenty years (20) of work experience in the construction sector.

Table 7: Experience of respondents

Experience	**Frequency**	**Percentage**
1-5yrs	43	74.14
6-10yrs	9	15.52
11-15yrs	4	6.90
16-20yrs	1	1.72
Over 21yrs	1	1.72
Total	**58**	**100**

4.2.6 Respondents' Perceptions

The data was analyzed using simple descriptive analysis and presented in different sub-sections are in relationship with the objectives of the study and the items asked in the questionnaire. The first objective of the study is related to analyzing the causes of delays in road construction projects

in various stakeholders' perspectives that have been identified and grouped into three major groups. These factors were ranked in each group based on their Relative Importance Index (RII) to delay from the contractors, owners and consultant's viewpoint. The following is a brief description of these factors.

4.1.1 Overall perspectives on Causes of delay

The perspective of all parties that were participated in the road construction projects owned by the Ethiopian Road Authority was first analyzed from each stakeholder's perspectives and then the overall result was computed. The causes of delay were discussed based on the RII ranking depicted in the following table.

Table 8: Overall ranking of delay factors

Delay Factors	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	3.93	0.79	1
Difficulties in financing the construction project by the contractor	3.88	0.78	2
Shortage of contractors' materials on site	3.72	0.74	3
Poor project manager skills	3.72	0.74	4
Inadequate planning and scheduling of work by contractor	3.69	0.74	5
Poor site management and supervision by contractors	3.69	0.74	6
Inaccurate site investigation	3.66	0.73	7
Poor qualification of the contractor's technical staff	3.59	0.72	8
Contractors inefficiency in handling resources	3.57	0.71	9
Delay in design documents preparation by consultant	3.53	0.71	10

Table 10 summarizes the factor according to the category that perceived by all parties. Accordingly, the overall results show that clients, consultants, and contractors agreed that weak follow up the planned work schedule by the contractor as delay factors were the most influential factor. Difficulties in financing the construction project by the contractor were considered the second most important factor causing delay in road construction projects followed by of contractors' materials shortage on site and poor project manager skills.

In general, the overall result show of the top ten delay factors, the first six delay factors are related to contractors. The seventh and tenth which are inaccurate site investigation and delay in design documents preparation by consultant respectively are related to consultant's delay factors agreed in common by the three groups. The eighth and ninth delay factors, poor qualification of the contractor's technical staff and contractors' inefficiency in handling resources factors are again related to contractors. In the top ten delay factors, no client related factors exists.

4.1.2 Causes of delay from each group perspectives

It is important to compare the causes of delay as perceived by all parties in the group, consultants, client and contractors separately. It shows one party were blaming the other parties. The consultant and client groups were blaming contractors for the delay of road construction projects.

The consultant ranks weak in follow up the planned work schedule by the contractor, difficulties in financing the construction project by the contractor, poor qualification of contractor's technical staff and poor project manager skills as the first top four delay factors that all are related to contractors. Similarly, client ranked weak follow up planned work schedule by the contractor, inadequate planning and scheduling of work by contractor, shortage of contractors' materials on site, poor site management and supervision by contractors, and poor project manager skills as the top five most important road construction delay factors. Both client and consultant commonly ranked that 'Weak in follow up the planned work schedule by the contractor' as the first most important delay factor. On the other hand, consultant and contractors ranked slow decision-making process by client in the top five causes of delay.

Adiam (2016) identified seven top delay-causing factors and proved that, poor site management and supervision by the contractor, ineffective planning and scheduling of work by the contractor are the top five delay factors related to contractors. Similarly, Robel (2015) ranked poor site management, shortage of contractor's material on sites as the most important delay factors in the Ethiopian road construction projects.

4.1.3 Clients perspectives

The following table shows the results of the study analysis of factors of client ranking delay factors. Factors were ranked based on relative important index between group of respondent of contractor, client and consultant.

Table 9: Clients' ranking of the causes of delay

Delay Factors	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	3.83	0.77	1
Inadequate planning and scheduling of work by contractor	3.75	0.75	2
Shortage of contractors materials on site	3.54	0.71	3
Poor site management and supervision by contractors	3.54	0.71	4
Poor project manager skills	3.50	0.70	5
Poor qualification of the contractor's technical staff	3.46	0.69	6
Contractors inefficiency in handling resources	3.42	0.68	7
Delay in design documents preparation by consultant	3.38	0.68	8
Difficulties in financing the construction project by the contractor	3.38	0.68	9
Inaccurate site investigation	3.29	0.66	10

Based on the survey results, client ranks weak follow up the planned work schedule by the contractor is the major factor that causes delay in road construction projects. Followed by "Inadequate planning and scheduling of work by contractor" as the second ranked factor which caused delays. The factors "Shortage of contractors' materials on site" seem to be the third-ranked factors that cause delay in the road construction projects. Consequently, factors such as "Poor site management and supervision by contractors" and "Poor project manager skills" were ranked fourth and fifth respectively.

In general, the survey analysis result shows the first seven and the ninth delay factors ranked by the client as the most important delay factors related to contractors. The other two factors such as delay in design documents preparation by consultant and inaccurate site investigation are related to consultant no factors are related to the client organization. This is good indication of the client organization blaming other parties for the delays occurred under its authority. On the other hand, consultant and contractors ranked slow decision making process by the owner/client in the top five delay factors.

4.1.4 Contractors' perspectives

Table 10: Contractors ranking of the causes of delay

Delay Factors	Mean	RII	Rank
Unrealistic contract duration and requirements imposed	4.16	0.83	1
Difficulties in financing the construction project by the contractor	4.16	0.83	2
Slow decision making process	4.05	0.81	3
Inaccurate site investigation	4.05	0.81	4
Shortage of contractors materials on site	4.00	0.80	5
Delay in design documents preparation by consultant	3.89	0.78	6
Poor site management and supervision by contractors	3.89	0.78	7
Weak in follow up the planned work schedule by the contractor	3.84	0.77	8
Poor project manager skills	3.84	0.77	9
Poor contract management	3.79	0.76	10

As referring to table 12, contractors ranked unrealistic contract duration & requirements imposed as top the delay factors. The contractors rank difficulties in financing the construction project by the contractor, slow decision-making process by clients and inaccurate site investigation as second and third important delay factors.

This finding can be agreed with what was found by Robel (2015) a study on delay schedule delay identification and assessment on construction projects; proved that a slow decision making process by the client as the main causes of delay.

4.1.5 *Consultants' perspective*

Table 11: Consultants' ranking of the causes of delay

Delay Factors	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	4.47	0.89	1
Difficulties in financing the construction project by the contractor	4.33	0.87	2
Poor qualification of the contractor's technical staff	4.13	0.83	3
Poor project manager skills	3.93	0.79	4
Slow decision making process	3.87	0.77	5
Delay in progress payments	3.80	0.76	6
Inadequate contractor experience	3.80	0.76	7
Unrealistic contract duration and requirements imposed	3.73	0.75	8
Inaccurate site investigation	3.73	0.75	9
Inadequate planning and scheduling of work by contractor	3.73	0.75	10

Based on the level of ranking as perceived by consultant, weak in follow up the planned work schedule by the contractor, difficulties in financing the construction project by the contractor, poor qualification of the contractor's technical staff, poor project manager skills that are related to contractors and slow decision-making process by client are the top five delay factors.

Slow decision making process, delay in progress payments which are related to the client organization are also considered as the most important delay factors perceived by consultants. On the other hand, only inaccurate site investigation is considered in top ten delay factors as consultant related delay factors.

4.2 Effects of delay

The primary data that collected from all parties was analyzed from the perspective of consultants, client and contractors. The ranking order of effects of delay by all party's perspectives is presented in the following table.

The analysis of data from the questionnaire survey shows that the three most important effects of delays (based on all respondents perspectives) as shown in table 14 are: time overrun (RII= 0.87), cost overrun (RII=0.86) and disputes (RII=0.68).

Both consultant and contractors ranked the effects of delay in road construction project as follow:

- Time overrun
- Cost overrun
- Wastage and underutilization of resources

On the other hand, client ranked the three most important effects of delays as:

- Time overrun
- Cost overrun
- Dispute between parties involved

The clients ranking of top three delay effects and the overall ranking are in agree with each other while that of consultants' and contractors' ranking of top three is similar. On the other hand, all parties perceived time and cost overruns as the top two effects of delay. Kikwasi (2012) concluded that the effects of delays are time overrun, cost overrun, negative social impact, idling resources disputes idling resources, disputes, arbitration, loans return delay by the client, poor quality of work due to hurry, and delaying in getting profit by clients as the top effects of construction.

Robel (2015) identified time overrun, cost overrun, loss of political and economic value towards the project, arbitrations between the contracting parties as the effects of the delay encountered in Ethiopian construction project.

CHAPTER FIVE: SUMMARY AND CONCLUSION

5.1 INTRODUCTION

This chapter presents the summary of the study findings, discussions, conclusions and recommendation of the research. The chapter also contains suggestions of related studies that may be carried out in the future.

5.2 Conclusions

Construction industry is considered as an essential sector of every economy in the world because the outputs of the industry's activities to facilitate socio-economic growth and advancement of every economy. The industry spur growth of economies primarily due to the contribution the sector makes to the economy by providing relevant infrastructure that spurs the growth of other industries. The industry contributes significantly to the Gross Domestic Product (GDP) of those countries in terms of creating employment opportunities, provision of a road network, social services, infrastructure, markets etc. In general, construction industry affects the overall economic growth, agricultural growth, urban growth, urban and rural poverty reduction. The contribution of this sector to the national economy is mainly driven by the energetic performance of the road construction projects.

Inability to complete projects on time and within budget has been remained a chronic problem in construction in Ethiopia. The main objective of this research was to identify the major causes of delay in the road construction projects in the case of Ethiopian Road Authority. Accordingly, 30 delay factors were identified and questionnaire survey was developed to collect respondent's perception on the causes of delay. Finally, survey questionnaires were sent to the respondents, the data was analyze and ten top most important delay factors were identified from each groups (client, consultants and contractors) perspectives.

When causes of delay perceived by each group were compared, it shows one party were blaming the other parties. It indicates that client and consultant groups were blaming contractors. Perspective of each group participated in projects owned by ERA was first analyzed and then the overall result was computed. According to the overall results, weak follow up of the planned work followed by difficulties in financing the construction project by the contractors are considered as

the two most influential factor in causing delays. Of the top ten, all except two delay factors are related to contractor.

In separate scenario, both client and consultant groups were commonly agreed on ‘Weak in follow up of the planned work schedule by the contractor’s as the first most important delay factor. Similarly, consultant perception agreed with contractor perception on ‘Slow decision making process by the client’ as one of the top five delay factors. The summary of the findings is discussed as follows:

5.1 Summary

Road construction project delay in Ethiopia is explained through literature review and field survey. Through literature review 30 causes of delay were identified, the factors combined into three groups. Three major stakeholders, including 24 clients, 19 contractors and 15 consultants responded the questionnaire forms. The respondents perceived the following top ten causes of delay factors.

1. Weak in follow up the planned work schedule by the contractor (RII=0.79)
2. Difficulties in financing the construction project by the contractor (RII=0.78)
3. Shortage of contractors’ materials on site (RII=0.74)
4. Poor project managers skills (RII=0.74)
5. Inadequate planning and scheduling of work by contractor (RII=0.74)
6. Poor site management and supervision by contractors (RII=0.74)
7. Inaccurate site investigation (RII=0.73)
8. Poor qualification of the contractor's technical staff (RII=0.72)
9. Contractors inefficiency in handling resources (RII=0.71)
10. Delay in design documents preparation by consultant (RII=0.71)

The importance index was used to rank each cause of delay based on the relative importance of the factors toward delay. Out of the top ten delay factors, it was found that only two causes of delay are common between all parties, which are ‘Difficulties in financing the construction project by the contractor’ and ‘Inaccurate site investigation by the consultant. Clients and consultants agreed that weak in follow up the planned work schedule by the contractor is the most sever causes

of delay by the contractors. Whereas, the contractor reported that unrealistic contract duration and requirements imposed by the client is one of the significant causes of project delay.

Contractors indicates that client and consultants are the significant source of delays, while both client and consultant specified 'contractor' as sources of delay. The combined result of group causes shown that mostly the delay is caused by the 'contractor', followed by consultants and, while client related cause is less important. The survey result shows that the highest degree of agreement is between clients and consultant while the lowest degree of agreement is contractors with both consultant and client.

Regarding effects of delay, the analysis of survey result shows that the two most important effects of delays based on all respondent's perspective are time and cost overrun with the highest RII= 0.87 and 0.86 respectively. This finding agree with the most of the findings revised in the literature reviews. The finding is in agreement with the finding of other scholars conducted studies on effects of road construction delay. Time and cost overrun is considered as the immediate effects od construction delay.

5.2 General recommendations

The following points can be recommended in order to reduce delays in construction projects.

- ✓ Weak in follow up the planned work schedule by the contractor have prevented projects from being completed on schedule. Poor follow up is considered as the most difficult challenges that stakeholders face in implementing construction projects on time. Therefore, more attention is required for strong follow up of the project during the it is under construction so as to complete the projects on timely manner.
- ✓ Another problem in contributing delays is difficulties in financing project by contractors. A serious attention must be paid in project feasibility. A vivid mechanism for selecting the contractors who are financially capable to run the projects without incurring delays is a must.
- ✓ Shortage of contractors' materials on site is perceived to be critical delay factor in road construction. Contractors should always take inventory of the quantity of materials on site so as to know when it is due for replacement to avoid delay caused by shortage of

materials. Therefore, contractors should ensure that materials are always on site before its use.

- ✓ Poor project manager's skills are also a critical cause of delays. Thus contractors should ensure that they employ well skilled and experienced project manager or has to facilitate capacity building for project manager to avoid the skill gaps.
- ✓ Another critical factor is 'In adequate planning and scheduling of work by contractor'. Effective planning and scheduling of a project is a must to secure early completion of the project. The planning process should be developed from start of the project until completion of a project. The planning stages should be devised very carefully, starting from strategic, tactical and operational planning.
- ✓ Poor site management and supervision by contractor has also another impact on delay. There is a need for contractor in improving abilities of managers, engineers which is a vast demand in successful completion of projects. Thus, the contractors have to adapt some essential innovative management techniques, including organizing and controlling, and team building and value engineering that may be more efficient and effective. Having applied these techniques, it would guarantee to reduce the problems of such critical factors.
- ✓ Inaccurate site investigation by consultant is a critical cause of delays, and as a result many projects are behind schedule. There is a serious need for the consultants to devise an explicit mechanism to investigate the project during its implementation. Consultants should monitor the work done by the contractor closely and making inspection time to time. Qualified consultants, who are often responsible for investigating the project site should be employed.
- ✓ Poor qualification of the contractor's technical staff is also another delay factor. Contractors should ensure that they employ well skilled and experienced labour to avoid defective work
- ✓ Delay in design documents preparation by consultant is also ranked by parties as an important delay factor. Therefore, consultants should avoid delays in reviewing and approving design documents.
- ✓ Contractors inefficiency in handling resources is ranked tenth in causing delay. Thus, contractors should develop resource handling mechanism.

5.3 Recommendation for Parties

To avoid delays in road construction projects, the following issues can be recommended for all parties:

5.3.1 Client

Unrealistic contract duration and requirements imposed, slow decision making process and delay in progress payments are ranked by contractors and consultants as the three most important client related delay factors. Therefore, clients should pay special attention to the following factors:

- Clients should ensure that contract duration and requirement are realistic so as to avoid delays
- Pay progress payment to the contractors on time as it weakens the contractor's ability to finance the work. Client should work closely with contractor so that bank or any finance institution will have released the payment on schedule.
- Clients should always speed up decision making process (reviewing and approving of design documents etc.) to avoid all delay that might arise as a result slow decision making process

5.3.2 Contractor

The overall survey analysis result shows that the first six delay factors such as weak in follow up the planned work schedule, difficulties in financing the construction project, shortage of materials on site, poor project manager skills, inadequate planning and scheduling of work, poor site management and supervision are related to contractors. Therefore, contractors should give more attention to the following factors:

- Improve project monitoring and evaluation mechanism of to ensure that the project work is undertaken as planned.
- Contractors should have enough money based on the cash flow to start the project in order to run the project smoothly. Contractors should also able to manage its financial by utilizing progress payments
- Contractors take inventory of materials on site so as to know when it is due for replacement
- Contractors should hire capable project manager, or facilitate training to build its capability.

- Planning and scheduling the works from start of project and during the work to match with the resources and time to avoid delays
- Improve site management and supervision to achieve completion of work within specified time

5.3.3 Consultant

Inaccurate site investigation, delay in design documents preparation by consultants are the two most important delay factors that has been ranked among the top ten delay factors by all stakeholders. Therefore, consultant should focus on the following points:

- Consultant should work on drawing carefully and on time and void delays in reviewing and approving design documents
- Consultants should also monitor the work done by the contractor closely and making inspection time to time.

5.3.4 Recommendations for future studies

Similar study on causes of road construction project delays should be performed in order to develop methods of reducing the effects of construction delays. Furthermore, another study should be done for a specific type of construction projects.

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Appendix A.

1. Consultants' ranking of the causes of delay

Delay Factors	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	4.47	0.89	1
Difficulties in financing the construction project by the contractor	4.33	0.87	2
Poor qualification of the contractor's technical staff	4.13	0.83	3
Poor project manager skills	3.93	0.79	4
Slow decision making process	3.87	0.77	5
Delay in progress payments	3.80	0.76	6
Inadequate contractor experience	3.80	0.76	7
Unrealistic contract duration and requirements imposed	3.73	0.75	8
Inaccurate site investigation	3.73	0.75	9
Inadequate planning and scheduling of work by contractor	3.73	0.75	10
Shortage of materials on site	3.67	0.73	11
Poor site management and supervision by contractors	3.67	0.73	12
Contractors inefficiency in handling resources	3.67	0.73	13
Lack of coordination with the contractor and utility providers	3.60	0.72	14
Poor communication & coordination of owner with other parties	3.47	0.69	15
Mistakes and discrepancies in design documents	3.40	0.68	16
Poor contract management	3.33	0.67	17
Delay in design documents preparation by consultant	3.33	0.67	18
Mistakes during construction stage	3.27	0.65	19
Conflicts with sub-contractors	3.27	0.65	20
Lack of experience of owner	3.13	0.63	21
Change orders by owner during construction	3.13	0.63	22
Rework due to error during construction	3.13	0.63	23

Delay Factors	Mean	RII	Rank
Poor communication & coordination of the owner with other parties	3.00	0.60	24
Delay in inspection and testing by the consultant	3.00	0.60	25
Delay in delivering construction site to the contractors	2.87	0.57	26
Poor communication and coordination of the consultant with other parties	2.87	0.57	27
Lack of consultant's site staff	2.80	0.56	28
Type of project bidding and award (selection based on least bidder)	2.73	0.55	29
Inadequate experience of consultant;	2.47	0.49	30

2. Consultants' ranking of the effects of delay

Factors	Mean	RII	Rank
Time overrun	4.60	0.92	1
Cost overrun	4.60	0.92	2
Wastage and underutilization of resources	4.20	0.84	3
Total abandonment of the project	3.93	0.79	4
Dispute between parties involved	3.73	0.75	5
Arbitration	3.73	0.75	6
Litigation and court case	3.47	0.69	7

3. Clients' ranking of the causes of delay

Delay Factors	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	3.83	0.77	1
Inadequate planning and scheduling of work by contractor	3.75	0.75	2
Shortage of contractors' materials on site	3.54	0.71	3
Poor site management and supervision by contractors	3.54	0.71	4
Poor project manager skills	3.50	0.70	5
Poor qualification of the contractor's technical staff	3.46	0.69	6
Contractors inefficiency in handling resources	3.42	0.68	7
Delay in design documents preparation by consultant	3.38	0.68	8
Difficulties in financing the construction project by the contractor	3.38	0.68	9
Inaccurate site investigation	3.29	0.66	10
Mistakes during construction stage	3.29	0.66	11
Poor contract management	3.25	0.65	12
Mistakes and discrepancies in design documents	3.13	0.63	13
Inadequate contractor experience	3.08	0.62	14
Delay in inspection and testing by the consultant	3.04	0.61	15
Lack of consultant's site staff	3.04	0.61	16
Rework due to error during construction	3.04	0.61	17
Delay in progress payments	2.96	0.59	18
Poor communication & coordination of owner with other parties	2.96	0.59	19
Lack of coordination with the contractor and utility providers	2.88	0.58	20
Poor communication and coordination of the consultant with other parties	2.79	0.56	21
Inadequate experience of consultant;	2.79	0.56	22
Slow decision making process	2.71	0.54	23
Type of project bidding and award (selection based on least bidder)	2.67	0.53	24
Change orders by owner during construction	2.46	0.49	25
Conflicts with sub-contractors	2.38	0.48	26

Delay Factors	Mean	RII	Rank
Unrealistic contract duration and requirements imposed	2.33	0.47	27
Delay in delivering construction site to the contractors	2.29	0.46	28
Poor communication & coordination of the owner with other parties	2.13	0.43	29
Lack of experience of owner	1.67	0.33	30

4. Clients' ranking of the effects of delay

Effects of Delay	Mean	RII	Rank
Time overrun	3.92	0.78	1
Cost overrun	3.92	0.78	2
Dispute between parties involved	3.33	0.67	3
Wastage and underutilization of resources	3.29	0.66	4
Total abandonment of the project	3.04	0.61	5
Litigation and court case	2.83	0.57	6
Arbitration	2.58	0.52	7

5. Contractors ranking of the causes of delay

Delay Factors	Mean	RII	Rank
Unrealistic contract duration and requirements imposed	4.16	0.83	1
Difficulties in financing the construction project by the contractor	4.16	0.83	2
Slow decision making process	4.05	0.81	3
Inaccurate site investigation	4.05	0.81	4
Shortage of contractors' materials on site	4.00	0.80	5
Delay in design documents preparation by consultant	3.89	0.78	6
Poor site management and supervision by contractors	3.89	0.78	7
Weak in follow up the planned work schedule by the contractor	3.84	0.77	8
Poor project manager skills	3.84	0.77	9
Poor contract management	3.79	0.76	10

Delay Factors	Mean	RII	Rank
Delay in inspection and testing by the consultant	3.74	0.75	11
Inadequate experience of consultant;	3.68	0.74	12
Contractors inefficiency in handling resources	3.68	0.74	13
Change orders by owner during construction	3.63	0.73	14
Inadequate planning and scheduling of work by contractor	3.58	0.72	15
Inadequate contractor experience	3.53	0.71	16
Lack of coordination with the contractor and utility providers	3.47	0.69	17
Poor communication and coordination of the consultant with other parties	3.47	0.69	18
Poor communication & coordination of owner with other parties	3.42	0.68	19
Delay in progress payments	3.37	0.67	20
Mistakes and discrepancies in design documents	3.37	0.67	21
Lack of consultant's site staff	3.32	0.66	22
Poor qualification of the contractor's technical staff	3.32	0.66	23
Rework due to error during construction	3.32	0.66	24
Delay in delivering construction site to the contractors	3.21	0.64	25
Type of project bidding and award (selection based on least bidder)	3.21	0.64	26
Poor communication & coordination of the owner with other parties	3.16	0.63	27
Mistakes during construction stage	3.00	0.60	28
Lack of experience of owner	2.63	0.53	29
Conflicts with sub-contractors	2.53	0.51	30

6. Contractors' ranking of effects of delay

Time overrun	4.63	0.93	1
Cost overrun	4.53	0.91	2
Wastage and underutilization of resources	4.05	0.81	3
Total abandonment of the project	3.32	0.66	4
Dispute between parties involved	3.16	0.63	5
Arbitration	2.84	0.57	6
Litigation and court case	2.84	0.57	7

7. Overall ranking of causes of delay

Delay Factors	Mean	RII	Rank
Weak in follow up the planned work schedule by the contractor	3.93	0.79	1
Difficulties in financing the construction project by the contractor	3.88	0.78	2
Shortage of contractors' materials on site	3.72	0.74	3
Poor project manager skills	3.72	0.74	4
Inadequate planning and scheduling of work by contractor	3.69	0.74	5
Poor site management and supervision by contractors	3.69	0.74	6
Inaccurate site investigation	3.66	0.73	7
Poor qualification of the contractor's technical staff	3.59	0.72	8
Contractors inefficiency in handling resources	3.57	0.71	9
Delay in design documents preparation by consultant	3.53	0.71	10
Slow decision making process	3.45	0.69	11
Poor contract management	3.45	0.69	12
Inadequate contractor experience	3.41	0.68	13
Delay in progress payments	3.31	0.66	14
Unrealistic contract duration and requirements imposed	3.29	0.66	15
Mistakes and discrepancies in design documents	3.28	0.66	16
Lack of coordination with the contractor and utility providers	3.26	0.65	17
Delay in inspection and testing by the consultant	3.26	0.65	18
Poor communication & coordination of owner with other parties	3.24	0.65	19
Mistakes during construction stage	3.19	0.64	20
Rework due to error during construction	3.16	0.63	21
Lack of consultant's site staff	3.07	0.61	22
Poor communication and coordination of the consultant with other parties	3.03	0.61	23
Change orders by owner during construction	3.02	0.60	24
Inadequate experience of consultant;	3.00	0.60	25
Type of project bidding and award (selection based on least bidder)	2.86	0.57	26
Delay in delivering construction site to the contractors	2.74	0.55	27

Delay Factors	Mean	RII	Rank
Poor communication & coordination of the owner with other parties	2.69	0.54	28
Conflicts with sub-contractors	2.66	0.53	29
Lack of experience of owner	2.29	0.46	30

8. Overall ranking of effects of delay

Effects of delay factors	Mean	RII	rank
Time overrun	**4.33**	**0.87**	**1**
Cost overrun	4.29	0.86	2
Dispute between parties involved	3.38	0.68	3
Arbitration	2.97	0.59	4
Litigation and court case	3.00	0.60	5
Total abandonment of the project	3.36	0.67	6
Wastage and underutilization of resources	3.78	0.76	7

Appendix B

Research Questionnaire

Dear participant,

Dear participant, my name is Eyasu Tolera and I am a student undertaking a Master of Arts Degree in Project Management at Addis Ababa University, School of Commerce. To fulfill the completion of this course, I am carrying out a study on the causes of delays in road construction projects in the case of Ethiopian Road Authority. I am inviting you to participate in this research study by completing the attached questionnaire. If you choose to participate in this research, please answer all questions as honestly as possible. In order to ensure that all the information will remain confidential, you do not have to include your name. The data will be for academic purposes only.

Section I- respondent background

1. Gender: Male ( ) Female ( )
2. Age: 18-30yrs ( ) 31-40yrs ( ) 41-50yrs () 51-60yrs ( ) Over 60yrs
3. Level of education: Secondary ( ) Vocational Training ( ) Diploma ( ) Degree ( ) Masters ( )

4. Which of the stakeholder are you? (Please choose one).

Contractor ( )	Client ( )	Consultant ( )

5. For how long have you worked in construction industry? (In Years)

1-5 ( ) 6-10 ( ) 11-15 ( ) 16-20 ( ) 21 above ( )

Section II: Causes of Delay in Road Construction projects

6. Please tick the extent to which you believe that the following **Client related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.

Client related factors	***1***	***2***	***3***	***4***	***5***
a. Delay in delivering construction site to the contractors					
b. Lack of experience of owner					
c. Delay in progress payments					

d. Slow decision making process					
e. Unrealistic contract duration and requirements imposed					
f. Poor communication & coordination of the owner with other parties					
g. Lack of coordination with the contractor and utility providers					
h. Change orders by owner during construction					
i. Type of project bidding and award (selection based on least bidder)					

7. *Please tick the extent to which you believe that the following **Consultant related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.*

Consultant related factors	*1*	*2*	*3*	*4*	*5*
a. Poor communication and coordination of the consultant with other parties					
b. Delay in inspection and testing by the consultant					
c. Lack of consultant's site staff					
d. Inadequate experience of consultant;					
e. Mistakes and discrepancies in design documents					
f. Poor contract management					
g. Delay in design documents preparation by consultant					
h. Inaccurate site investigation					

8. *Please tick the extent to which you believe that the following **Contractors related** factors that can contribute to causes of delays of road construction projects in Ethiopian Road Authority. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high.*

Contractors related factors	***1***	***2***	***3***	***4***	***5***
a. Poor qualification of the contractor's technical staff					
b. Shortage of contractors' materials on site					
c. Mistakes during construction stage					
d. Inadequate contractor experience					
e. Difficulties in financing the construction project by the contractor					
f. Inadequate planning and scheduling of work by contractor					
g. Conflicts with sub-contractors					
h. Poor site management and supervision by contractors					
i. Contractors inefficiency in handling resources					

j. Weak in follow up the planned work schedule by the contractor					
k. Rework due to error during construction					
l. Poor communication & coordination of owner with other parties					
m. Poor project manager skills					

*If you have comments regarding the causes of delay, please specify here:*_____
_____
_____
_____

Section III: Effects of Delay in Road Construction projects

9. Please rank effects of delay below in what you consider to be the most important effect of delay.
1= Strongly Disagree, 2= Disagree, 3= Slightly Disagree, 4= Agree, 5= Strongly Agree

Effects Of Delay	*1*	*2*	*3*	*4*	*5*
1. Time overrun					
2. Cost overrun					
3. Dispute between parties involved					
4. Arbitration					
5. Litigation and court case					
6. Total abandonment of the project					
7. Wastage and underutilization of resources					

*If you have comments regarding delay effects, please specify here:*_____
_____
_____
_____

What is your general comment regarding causes of delays and their effect on the road construction project?
_____
_____

Thank you very much for your contribution to this study!