ASSESSMENT OF THE CAUSE OF DELAY AND FREQUENCY OF OCCURRENCES: THE CASE OF ROAD CONSTRUCTION PROJECTS IN ADDIS ABABA

A Thesis Submitted to the School of Graduate Studies of Jimma University in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Project Management and Finance (MA)

By

SELAMAWIT AYELE

Under the Supervision of

AREGA SEYOUM (PHD)

And

MR. MENGISTU DEYASA

Jimma University

College of Business and Economics

Department of Accounting and Finance

Addis Ababa, Ethiopia

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DECLARATION

I, the undersigned, declare that the research Report entitled **"ASSESSMENT OF THE CAUSE OF DELAY AND FREQUENCY OF OCCURRENCES IN THE CASE OF ROAD CONSTRUCTION PROJECTS IN ADDIS ABABA"** submitted to Research and Postgraduate Studies Office of Business and Economics College is original work and it has not been submitted previously in part or full to any university.

Student Name	Signature	Date
Selamawit Ayele	_____	_____

CERTIFICATE

We hereby certify that the research entitled "***Assessment of the Cause of Delay and Frequency of Occurrences in the Case of Road Construction Projects in Addis Ababa***" is undertaken by Selamawit Ayele under our guidance and supervision. In our opinion, the research is original and meets the minimum standard set by the School of Graduate Studies of Jimma University for submission in partial fulfillment of the requirements for the award of Master of Arts (MA) Degree in Project Management and Finance.

Name of Principal Advisor	Signature	Date
_____	_____	_____
Name of Co. Advisor		
_____	_____	_____

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First and for most I would like to appraise and glorify the almighty God who has been assisting me in every aspect to this end secondly, I also would like to give my heartfelt thanks and kind gratitude to my husband without his help and kind cooperation, this final paper would have hardly been possible.

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ABSTRACT

*It has become well known that most road construction projects in Ethiopia and Addis Ababa city are exposed to time and cost overrun. It becomes difficult to complete road projects in the allocated cost, time and quality. These problems occur frequently during project life-time leading to disputes and litigations. Therefore, it is essential to study and analyse causes of construction delays. This research presents a list of construction delay causes retrieved from literature. Therefore, this research was carried out to dig-out information on the factors that cause delay and their frequency of occurrence on Asphalt road construction projects in Addis Ababa City administration. 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. And the causes for delay was then ranked using the RII method. Based on the RII ranking it was identified that c*ontractors financial difficulties, delay in preparation and approval**,** lack of timely decision, design change, materials shortage in the local market were the top five delay causing factors as it was identified by *the respondents. And based on the results few recommendations were drawn as follows: the client is mostly the responsible party for financing of the project. And should be able to fulfill contractual obligations. More attention should be given during the design phase by the consultant to minimize the probability of change orders. In addition to that, contractors should plan their schedule and resource properly.*

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

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

Construction industry is the true power of national economy, through which the total of physical development is attained. It is energetic component of country's economy and has a significant effect on other industry sectors efficiency and productivity. It is difficult to think extensive investments like agriculture, manufacturing, fishery, etc. without construction facilities are there (Fetene 2008).

The Performance and success of projects are measured by the triple project constraints (Cost, time, and quality). Project success is measured by completing on time within the estimated cost and quality. Because the industry is a full of project activities, tasks and constraints that requires additional budget and cost. According to Faridi (2006) delays have impact on success project in its cost, time, safety and quality. The consequences of delay are not restricted to construction industry only, but also impact the whole country's economy.

According to Rajakumar A C. (2016), cost and time overruns are common in developing countries and impacts more for developing country than developed once. Ethiopia is a developing country where its construction sector is affected by cost and time overrun. Road projects in Ethiopian are victims of this problem. Road projects, requires huge amount of capital, but it contributes to the total economy through creation of jobs and have wave effect to other business activities.

The homogeneity in transportation departments is the failure to finish the projects on time and within estimated budget (Y. Honrao and Prof. D.B. Desai, 2015). There are many causes that are accountable for delays and cost overruns in the industry, so attention should be given to such factors as they cause additional expense than initially estimated.

This research attempts to investigate the major causes of delay in road projects in Addis Ababa in order to assist owners, consultants and contractors to overcome cost and time performance problem of road projects.

1.2. Background of the Organization

Addis Ababa city was founded by Minellik II and Empress Taitu in 1887. The history of the city's road development also begins from the inception of the city. Minellik II constructed the

first ever two roads in the city as well as in the country that stretch from Addis Ababa to Addis Alem and from his palace to England Embassy in 1902. In 1904 the first roller was imported by the emperor and was being pulled by many people for its operation.

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

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

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

In 1993 the existing Government (EPRDF) has established regional governments and gave them power to administer their regions with autonomy. During this time Addis Ababa was also established as one of the regions. The Addis Ababa administration during this period established the "bureau of works and urban development" and the bureau organized a department under it to carry out the road construction and maintenance works. The newly established road department constructed and maintained the city roads till the establishment of the Addis Ababa City Roads Authority in March 15, 1998 by regulation No. 7/1998 to be administrated by board of directors to construct maintain and administer the road works in Addis Ababa by the city Administration. The total length of road constructed in the city till the establishment of the authority in March 1998 was 1300 km of which 900 km was gravel road and the remaining 400 km was Asphalt surfaced road. The Addis Ababa City Roads Authority has done remarkable progress in the city roads expansion and upgrading in the last 11 years since its establishment. To date the City Roads length reached 2814 kms of which

1534km is gravel surfaced and 1280km is Asphalt surfaced and the road network coverage has reached 10.34% compared with the developed area of the city.

1.3. Statement of the problem

This section of the research states about the motivations (deriving force) to study the selected area. The initiation for the study of this research is largely due to personal observation and low performance of asphalt road construction projects in Addis Ababa city administration in terms of time (delay). According to Majid (2006), a construction project is commonly acknowledged as successful when it is completed on time, within budget, in accordance with specifications, and to most construction projects in this country (Ethiopia) suffer time and cost overrun, (Fetene, 2008). As it is obviously known, Addis Ababa is the capital city of both Ethiopia and Africa and this fact makes the necessity of standardized roads in the city even more critical and vital. Despite the fact that efforts of the city administration are visible, construction delay remains the main problem and there are various factors which affect the accomplishment of projects as planned in our case in terms of time requirement. The factors could be various in numbers and types in different situations, countries and circumstances. Various studies have been conducted to identify the most critical, common and frequent factors as a cause of time overrun in different countries and situations.

According to M. Haseeb et al. (2011), the most important and highly ranked delay causes in construction industry of Pakistan is inaccurate time estimation. But in another study, Mahamid (2013), the most important and highly frequent cause of delay is financial status of the contractor. Therefore, from the above fact, we can ascertain that important and frequent factors for project delay could be different in different situations. Generally, this study tried to identify the most common and frequent factors of delay for road construction projects in Addis Ababa city administration.

This research attempts to fill the gap by investigating the major causes of delay in road projects in Addis Ababa in order to assist owners, consultants and contractors to overcome cost and time performance problem of road projects.

1.4. Research Questions

This was done aimed to answer the following research questions:

i. What are the main causes of project delay in road construction projects in Addis Ababa city administration?

ii. What is the frequency of the cause of delay among road construction projects in Addis Ababa city administration?

1.5. Objectives of the study

1.5.1. General Objective

The general objective of the study is to assess the causes of delays and the frequency of occurrences in the road construction projects in Addis Ababa City Administration.

1.5.2. Specific Objectives

This study attempts to address the following specific objectives:

1. To identify the cause of delays in the road construction projects of Addis Ababa city Administration.
2. To describe the frequency of occurrence of the cause of delays in the road projects in Addis Ababa city Administration.

1.6. Significance of the study

The primary objectives of construction projects are to optimize quality, cost and time; and hence this study has been initiated to identify the causes and presents the resolutions of time overruns. It also assesses how to minimize or avoid additional cost and time in the road construction projects in Addis Ababa.

Therefore, the significance of this study is to recommend practices, procedures and methods that can be used to minimize or avoid time overrun of construction projects; and to handover or deliver construction projects to the client within the given time, cost and quality entitled on the contract document.

The student researcher believes that the results of its findings will be important to a number of entities. These entities are primarily; the funding unit i.e. the AA road construction authority (AARCA), students in the academics sphere and construction companies

1.7. Scope and limitation of the study

This study has set a boundary for its research investigation it was undertake. It has also defined the limitations that restrict the bulk nature of the research topic

1.7.1. Scope of the study

The scope of this project research is limited to road construction projects in Addis Ababa city. Ethiopian Road Authority is selected as the context of this study. When construction projects are performed, time and cost overruns arise due to different causes by stakeholders. 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.

1.7.2. Limitation of the study

There was not much of limitation that the researcher faced while conducting this study. The only limitation was the unavailability of recorded data at the place of the study.

1.8. Organization of the study

The research is organized into five chapters and references. Chapter one deals with the introduction, which talks about the general idea and relevance of the study. It defines the background, the problem statement, the objectives, the scope and limitation as well as the organization of the proposal.

Chapter two comprises of literature review, and quotes the various related works done in the area of study. Chapter three attempts to describe the methodology of the projects that were followed in this research study. Chapter four discusses the results found by using the methods selected on chapter three. And the last chapter will give a brief recommendation for the involved parties.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Introduction

This chapter presents the theoretical, empirical and conceptual frame work review of the literature related to the identification and analysis of the causes of construction projects time overrun or 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 forces 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.

The emergence of the road construction sector in A.A is entirely related with the inception and urbanization of the city. It is historically recorded that the city was founded by king Minelik II and Emp. Etege Taitu in 1887. In fact; the construction of modern roads in the city by an officially declared investment from the government as part of infrastructure development at national level was a phenomenon that dated back to 1902 EC. The first two roads which has ever been built in the city following the emperor's and empress's decision were the ones that stretch from Addis Ababa to Addis Alem and from the King's palace to England embassy in 1904, the first roller was imported by the empire decision.

In connection with the road construction sector it is historically evidenced that Minellik was the first in importing two cars in the city. The king introduced the car technology in the city for the first time in 1907 EC. Before these two cars were imported to the city, the usual means of transportation is being in practice to move people and commodities from place to place, had been carried out by Mules, donkeys and horses. It is believed that the inception of road construction sector is highly linked with the importation of the two cars.

Most people agree that the road construction sector took a more modern and formal structure during Haile Sellasse1st regime so, during the reign of Haile Selassie the 1st a considerable number contractors were organized to carry out road construction even though many of the city's roads had been constructed by foreign contractors by them. A need was raised by the Emperor to establish a more formal and well mandated government organ that could efficiently handle the construction of road in the city subsequently, Ethiopian roads authority was established by the Manchu's declaration. The sole responsibility to oversee and supervise the construction of roads in the city was bestowed in this government body with the appropriate authority delegated to it.

After few years, this government body that was initially structured at an authority level was further upgraded to minister level.

Following the decision to assign a mayor and a city council for the city in 1942, the road maintenance and construction department was particularly established to the city. This municipality level department had been carrying out its mandated tasks of constructing roads in the city until the emperor's reign ended and totally replaced by the Derg regime during the Derg regime, it is believed that no fundamental organization and structural charges were observed to the department.

In 1993 EC when the EPRDF government comes to power, it gave regions the full mandate and autonomy to administer them serves following this decision passed by the central government; the A.A administration established the "Bureau of works and urban development" and mandated the full authority of carrying out the management tasks in relation with the construction and maintenance of works. This department had been discharging its responsibility of constructing and maintain the city's roads until the establishment of a more formal and well-structured organ by the name the Addis Ababa city roads authority (AACRA) in March15, 1998 EC by proclamation No 7/1998 to be administrated by board of directors. It is also worthwhile mentioning the historical spot of the nation that goes to period of Italian immersion to Ethiopia (1928 EC till 1933 EC). It must be noted that many of the cities and its outlaying modern roads were constructed by the Italian contractors during this period. It is believed that, as part of its vision to colonize Ethiopia for too long, the Italian government constructed roads that interlink the various areas of the city and roads that extend from the city to various regions of the nation.

2.1Theoretical Perspective

2.1.1 What is project?

A project is a temporary endeavour 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 (Flávio Roberto Souza dos Santos et al., 2008).

2.1.2 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 (T. D. King, 2017).

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 (Shahron Williams van Rooij. 2009). 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, analysing, monitoring, reporting, and managing the costs on an on-going 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 behavioural. The behavioural 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 processes 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 is considered as time of project delay (Aibinu and Odeyinka, 2006).

2.1.3 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) defines 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 Assaf and Hejji (2006).

2.1.4 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.

2.1.4.1 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 Assaf and Hejji (2006).

2.1.4.2 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 (Mahamid, 2013).

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.

2.1.4.3 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.

2.1.5 Types of delays

2.1.5.1 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.

2.1.5.2 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

2.1.5.3 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 (Mahamid, 2013).

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 Adiam (2016).

2.1.5.4 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) 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(2010) 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 (Mahamid, 2013).

2.1.5.5 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 (Megha and Bhatt, 2013).

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 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.

2.1.5.6 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.

2.1.5.7 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.

2.2 Project Delays: Empirical Reviews

2.2.1 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.

2.2.2 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.

2.2.3 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 subcontractors' schedule, improper construction methods implement, frequent change of subcontractors, 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 subcontractors 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, and lack 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.

2.2.4 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 contractors' 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.

2.2.5 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 none 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 constrains 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 behavioural 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 (2009), 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,2014, 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 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.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

This is research, which is aimed at addressing open ended problem (Fellows & Liu, 2007) as its objective is to identify major causes to the delay in road construction projects of Addis Ababa Road Construction Authority, so as to solve the problem. It is also a descriptive research as it is aimed at revealing the existing problem using the responses of client, consultants and contractors (Abiy et al., 2009).

3.1. Research Design

This study adopted a descriptive research design which is used to provide quantitative approach 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 causes and effects of delay.

Source of data and data collection technique

In this study, primary data were collected by the use of distributions of questionnaires to the respondents. The study questionnaires were prepared and distributed to the selected samples of involved parties, contractors, owners, and 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 frequency of delays in road construction. It was a structured questionnaire and it contained close-ended questions. 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 frequency 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 5 (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 15 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 =Extremely Significant, 4 = Very Significant, 3 = Neutral, 2 = Slightly Significant, 1 = Not Significant). 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 were 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 frequency of delay on construction projects.

On the other hand, another five Likert scale was used to measure the frequency of delays on construction projects where; 5 =extremely frequent, 4 = very frequent, 3 = Neutral, 2 = slightly frequent, and 1 = not frequent to show how the past events had affected the projects and the frequency of variables. Delay usually result in losses of one form or another for everyone.

3.2. Target population and sampling methods

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 Addis Ababa Road Construction Authority. The unit of analysis on which this research study's investigation is focused to solve the research problem include concerned officials (stakeholders) and employees in AARCA office and engineers in the road construction companies selected for investigation and other related individual from whom relevant facts can be gathered to solve the problems.

3.3. Sample and Sample Size

Study participants consist of 50 individuals from Addis Ababa Road Constructions Authority (AARCA). From these total study participants 21 of them were clients and consultants and contractors were 15 and 14 respectively. From the target population, the researcher has purposively distributed questionnaires to the respondents of engineers and clients. 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 objectives. Accordingly, 21 Engineers from Addis Ababa Road Construction Authority (clients), 15 engineers from Addis Ababa Road Construction Corporation (contractors), and 14 engineers from Addis Ababa Road Construction Design and Supervision Corporation 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 3.1: Category of the study participants

Category	**Frequency**	**Percentage**
Clients	21	42.0
Consultants	15	30.0
Contractors	14	28.0
Total	**50**	**100.0**

Source: AACRAC, 2019

3.4. Methods of data analysis

The data were analysed 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.

3.5. Relative Importance Index (RII)

The causes and frequency 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:

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

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 DISCUSSIONS

The purpose of this chapter is to present the issues that related to survey questionnaire distribution and response rates by sector organizations, respondents' designation, and work experience distribution, collection of the responses and subsequent analysis of the responses from the professionals working in the three stakeholders' 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.

4.1 Basic Information of the respondents

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

4.1.1 Survey responses and respondents' Characteristics

Out of the 70 questionnaires sent out, a total of 50 questionnaires were returned. Out of the questionnaires issued only 50 (out of which 21 from client, 15 from consultant and 19 from contractors) were properly completed and returned giving a return rate of 71.4% 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 were not directly participating in the field work. The general characteristic of the respondent is presented in the table below [see table 4.1].

Table 4. 1. Characteristics of the Respondents

Organization	Designation	Questionnaire Distributed	Questionnaire Collected	Percentage
AARCA	Client	25	21	42.0
	Contractor	25	15	30.0
	Consultant	20	14	28.0
Total		**70**	**50**	**100.0**

4.1.2 Gender Distribution of the Respondents

The study found out the gender composition of the respondents as shown in the table 2 below. Majority of the respondents, 62.0% are male respondents while 38.0% are female population.

Table 4.2. Gender Distribution of the Respondents

Sex	Frequency	Percent	Valid percent
Male	31	62.0	62.0
Female	19	38.0	38.0
Total	**50**	**100.0**	**100**

4.1.3 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 4.3. Educational level of the respondents

Educational level	Frequency	Percent	Valid percent
Diploma	8	16.0	16.0
First degree	24	48.0	48.0
Masters	18	36.0	36.0
Total	**50**	**100.0**	**100.0**

Respondents with a degree education dominated at 48.0%. They were followed by those with diploma and Master degree of 36.0% and diploma 16.0%.

4.1.4 Work Experience

Respondents' percentage years of work experience shows that 23 (46.0%) of the respondents have 3-5 years of work experience, (15) 30% of the respondents have above 5 years of work experience, (12) 24.0% of the respondents have around three years of work experience.

Table 4.4. Summary of the relevant work experiences of the respondents

Work experience	Frequency	Percent	Valid percent

Up to three years	12	24.0	24.0
3-5 years	23	46.0	46.0
Above three years	15	30.0	30.0
Total	**50**	**100.0**	**100.0**

4.1.5 Respondents' Perception

The data were analysed 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 analysing 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.

4.1.5.1 Overall Perspectives on the Causes of Delay

The perspective of all parties that were participated in the road construction projects owned by the Addis Ababa Road Construction Authority was first analysed 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 4.5: Overall ranking of delay factors

Delay Factors	Mean	RII	Rank
Contractors financial difficulties	3.10	0.82	1
Delay in preparation and approval	3.04	0.808	2
Lack of timely decision	3.02	0.804	3
Design change	2.90	0.78	4
Materials shortage in the local market	2.90	0.78	4
Owner's financial difficulties	2.86	0.772	5
Inadequate planning, scheduling & coordination	2.84	0.768	6
Payment delay for contractors	2.74	0.746	7
Failure to update schedules on time	2.74	0.746	7
Rework due to wrong work	2.64	0.728	8
Bureaucratic procedures	2.64	0.728	8

Incomplete design at the time of tender	2.64	0.728	8
Lack of experienced labor at the project location	2.46	0.692	9
Unexpected engineering problem	2.44	0.688	10
Conflict between contractors and other parties	2.44	0.688	10

Table 5 summarizes the factor according to the category that perceived by all parties. Accordingly, the overall results show that clients, contractors and consultants agree that financial difficulties of contractor as delay factors were the most influential factor. Delay in preparation and approval of drawing by consultant were considered the second most important factor causing delay in road construction projects followed by of lack of timely decision and design change.

In general, the overall results show of the ten top delay factors, all the factors are resource, engineering and management related factors. The seventh and eighth factors, payment delay and rework due to wrong work by contractors for the contractor technical staffs are again related with the engineering related delay factors.

4.1.5.2 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.

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 is 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.

1. Clients Perspective

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

Table 4.6: Clients' ranking of the cause of delay

Delay Factors	Mean	RII	Rank
Delay in preparation and approval of drawing	3.14	0.83	1
Lack of timely decision	3.14	0.83	1
Failure to update schedules on time	2.71	0.75	2
Bureaucratic procedures	2.67	0.73	3
Materials shortage in the local market	2.71	0.72	4
Incomplete design at the time of tender	2.62	0.72	4
Owner's financial difficulties	2.57	0.71	5
Inadequate planning, scheduling & coordination	2.57	0.71	5
Conflict between contractors and other parties	2.52	0.70	6
Design change	2.48	0.69	7
Unexpected engineering problem	2.43	0.68	8
Lack of experienced labor at the project location	2.29	0.67	9
Rework due to wrong work	2.38	0.67	9
Payment delay for contractors	2.33	0.57	10
Contractors financial difficulties	2.86	0.57	10

Based on the survey results, client ranks delay in preparation and approval of drawing by the consultant is the major factor that causes delay in road construction projects. Followed by "Failure to update schedules on time" as the second ranked factor which caused delays. The factors "bureaucratic procedures" seem to be the third-ranked factors that cause delay in the road construction projects. Consequently, factors such as "Materials shortage in the local market" and "Incomplete design at the time of tender"; and "Owner's financial difficulties "Inadequate planning, scheduling & coordination" 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 and management. 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.

2. Contractors' perspective

Table 4.7: Contractors ranking of the cause of delay

Delay Factors	Mean	RII	Rank
Owner's financial difficulties	3.07	0.81	1
Materials shortage in the local market	3.00	0.8	2
Contractors financial difficulties	3.00	0.8	2
Delay in preparation and approval	3.00	0.8	2
Payment delay for contractors	3.00	0.8	2
Rework due to wrong work	3.00	0.8	2
Lack of timely decision	2.93	0.78	3
Design change	2.93	0.78	3
Inadequate planning, scheduling & coordination	2.86	0.77	4
Incomplete design at the time of tender	2.86	0.77	4
Bureaucratic procedures	2.71	0.74	5
Failure to update schedules on time	2.64	0.73	6
Conflict between contractors and other parties	2.57	0.71	7
Unexpected engineering problem	2.50	0.7	8
Lack of experienced labor at the project location	2.36	0.67	9

As referring to table 4.7, contractors ranked owner's financial difficulties as top of delay factors. Contractors ranked material shortage in the local market, delay in preparation and approval of drawing, payment delay, and rework due to wrong work as second and lack of timely decision and design change 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

3. Consultants' perspective

Table 4.8: Consultants' ranking of the cause of delay

Delay Factors	Mean	RII	Rank
Contractors financial difficulties	3.53	0.91	1
Design change	3.47	0.89	2
Inadequate planning, scheduling & coordination	3.20	0.84	3
Owner's financial difficulties	3.07	0.81	4
Payment delay for contractors	3.07	0.81	4
Lack of timely decision	2.93	0.78	5
Delay in preparation and approval	2.93	0.78	5
Failure to update schedules on time	2.87	0.77	6
Materials shortage in the local market	3.07	0.76	7
Lack of experienced labor at the project location	2.80	0.76	7
Rework due to wrong work	2.67	0.73	8
Incomplete design at the time of tender	2.47	0.73	8
Bureaucratic procedures	2.53	0.71	9
Unexpected engineering problem	2.4	0.69	9
Conflict between contractors and other parties	2.20	0.64	10

Based on the level of ranking as perceived by consultant, contractors' financial difficulties, design change, inadequate planning, scheduling and coordination, owners' financial difficulties and delay in preparation and approval of drawing are the top five delay factors.

4.1.5.3 Frequency of occurrence the causes of delay

Table 4.9: Overall frequency of the occurrence of delay in the construction projects

Delay Factors	Mean	RII	Rank
Contractors financial difficulties	2.86	0.808	1
Lack of timely decision	2.98	0.796	2
Inadequate planning, scheduling & coordination	2.82	0.764	3
Delay in preparation and approval	2.78	0.756	4
Design change	2.78	0.756	4
Failure to update schedules on time	2.74	0.748	5
Incomplete design at the time of tender	2.76	0.728	6
Materials shortage in the local market	2.62	0.724	7
Bureaucratic procedures	2.50	0.700	8
Payment delay for contractors	2.38	0.676	9
Owner's financial difficulties	2.36	0.672	10
Unexpected engineering problem	2.30	0.660	11
Rework due to wrong work	2.24	0.648	12
Lack of experienced labor at the project location	2.16	0.632	13
Conflict between contractors and other parties	2.06	0.612	14

As referring to table 9, contractors' financial difficulties were the most significantly occurring delay factors in the construction projects. Lack of timely decision making and inadequate planning, scheduling and coordination were the second and third significantly factors of the project delay respectively.

Delay in preparation and approval of drawing and design change; and failure to update scheduling on time were the fourth and fifth factors which are occurring in the road construction projects; while conflict between contractors and other parties was the least occurring factors.

CHAPTER FIVE

5 CONCLUSIONS AND RECOMMENDATIONS

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 cause and frequency of delay in the case of Road Construction Projects in Addis Ababa City Administration. Accordingly, 15 delay factors were identified and questionnaire survey was developed to collect respondent's perception on the causes of delay and its frequencies. Finally, survey questionnaires were sent to the respondents, the data was analysed 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. Perspective of each group participated in projects owned by AACRA was first analysed and then the overall result was computed. According to the overall results, contractors' financial difficulties was the most cause of delay and frequently occurring factor in the road construction projects of Addis Ababa City Administration.

In separate scenario, delay in preparation and approval of drawing and lack of timely decision making were the leading cause of delay from the perspectives of clients. Contractors' agreed that owner's financial difficulties was the main perceived cause for the delay in the road construction projects, and the contractors' financial difficulties was also agreed as the main cause of delay in the road construction projects from the consultants perceptions. The overall frequency of delay in the construction project was because of contractors' financial difficulties.

5.3 Recommendations

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

- Contractors' financial difficulty was a main contributing factor for delay road construction project. A serious attention must be paid to project feasibility. A vivid mechanism for selecting the contractors who are financially capable to run the projects without incurring delays is a must.
- Delay in design documents preparation and approval by consultant is also ranked by parties as an important delay factor. Therefore, consultants should avoid delays in reviewing and approving design documents.
- 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.
- 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.
- 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.
- 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.

5.4 Future research

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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ANNEX

Annex I: Questionnaire

JIMMA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

M.A. IN PROJECT MANANGEMENT AND FINANCE

Questionnaire to be filled by Clients, Consultants and Contractors

Dear respondents,

This questionnaire is prepared to conduct a study in the partial fulfilment of a Master's Degree in Project Management (MA) program entitled with "***Assessment of the cause of delay and frequency among Road Construction Projects in Addis Ababa City Administration***." Hence, you are kindly requested to give the necessary information for the research questions. There is no need to write your name and address; and the information that you provide will be kept confidential and will only be used for academic purpose. The accuracy, honesty, and fairness of your response will have a great impact on the outcome of the research. Your cooperation and prompt is highly appreciated.

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

"Thank you very much in advance"

SECTION A: GENERAL BACKGROUND DATA

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

Q.2 Gender

Male ☐ Female ☐

Q.3 Respondents designation

Client ☐ Consultant ☐ Contractor ☐

Q.4 Relevant work experience (in years)

Up to 3 ☐ 3-5 ☐ Above 5 years ☐

Q.5 Educational qualification

Diploma ☐ 1st Degree ☐ Master's ☐ PhD ☐

Q.6 Number of project(s) involved.

Up to 3 ☐ 3-5 ☐ Above 5 years ☐

SECTION B: FACTORS AFFECTING TIME OVERRUN OF ROAD CONSTRUCTION PROJECTS

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

E.S. = Extremely Significant (**5**)

V.S. = Very Significant (**4**)

N = Neutral (**3**)

S.S. = Slightly Significant (**2**)

N.S. = Not Significant (**1**)

AN ASSESSMENT ON THE EFFECT OF TIME OVER RUN ON ROAD CONSTRUCTION PROJECT IN ADISS ABEBA CITY

No.	Hypothesized Variables (causes) of Time overrun	ES	VS	N	SS	NS
1	**ENGINEERING RELATED**					
1	Delay preparation & approval of drawing					
2	Incomplete design at the time of tender					
3	Design change					
4	Rework due to wrong work					
5	Unexpected engineering problems (e.g. sub soil conditions)					
2	**RESOURCE RELATED**					
1	Contractors financial difficulties					
2	Owner's / executor financial difficulties					
3	Payment delay for contractors					

4	Material shortage in the local market					
5	Lack of experienced (skilled) labor at the project location					
3	**MANAGEMENT RELATED**					
1	Lack of timely decisions					
2	Failure to update schedules on time					
3	Inadequate / deficiency in planning, scheduling & coordination					
4	Bureaucratic procedures					
5	Conflict between contractors & other parties (consultant and owner)					

SECTION C: FREQUENCY OF OCCURRENCE OF THE CAUSES OF TIME OVERRUN OF ROAD CONSTRUCTION PROJECTS IN ADISS ABEBA CITY

E.F. = Extremely Frequent (**5**)

V.F. = Very Frequent (**4**)

N = Neutral (**3**)

S.F. = Slightly Frequent (**2**)

N.F. = Not Frequent (**1**)

No.	Frequency of occurrence of the causes of Time overrun	VF	HF	N	SF	NF
1	**ENGINEERING RELATED**					
1	Delay preparation & approval of drawing					
2	Incomplete design at the time of tender					
3	Design change					
4	Rework due to wrong work					
5	Unexpected engineering problems (e.g. sub soil conditions)					
2	**RESOURCE RELATED**					
1	Contractors financial difficulties					
2	Owner's / executor’s financial difficulties					

3	Payment delay for contractors					
4	Material shortage in the local market					
5	Lack of experienced (skilled) labor at the project location					
3	**MANAGEMENT RELATED**					
1	Lack of timely decisions					
2	Failure to update schedules on time					
3	Inadequate / deficiency in planning, scheduling & coordination					
4	Bureaucratic procedures					
5	Conflict between contractors & other parties (consultant and owner)					