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St. Mary's University, Ethiopia

ST. MARYS UNIVERSITY

SCHOOL OF GRADUATE STUDIES

ASSESSEMENT OF DELAY FACTORS IN CONSTRUCTION PROJECT: THE CASE OF TANA BELES SUGAR FACTORY

BY TIRUALEM TAFESSE

A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTERS ARTS DEGREE IN PROJECT MANAGMENT

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ABSTRACT

The government of Ethiopia has invested significant sums to build the countries sugar production capacity with the underlying goal of becoming one of ten largest global producers by 2023. Despite putting this as one of development goal for a country, the construction of the sugar projects is still lagging far behind the targeted goal of solving the sugar shortage of the country and becoming a source of foreign currency earning. Taking this into consideration time and cost overruns is one of the major problem of sugar construction projects. Therefore, the goal of this research is to make assessments on the factors that cause delay on one of the sugar project named Tana Beles sugar factory with respect to time and cost overruns on the project, and to recommend resolutions.

The research uses desk study and questionnaire survey for data collection. The analysis are made in two parts desk study on one part and questionnaire survey on the other. Poor feasibility study and site investigation, Improper planning and designing, Capacity limitation, Poor procurement system, Contract management problem are among the main time and cost overrun contributing factors obtained from desk study. While Improper planning and scheduling, Unrealistic contract duration, Improper and poor project feasibility study etc. are some of time overrun factors and Poor project (site) management/, Wastage, etc. are among the list of the main cost overrun factors from questionnaire survey. And effects like; less return on investment for client, high price of sugar for end user, Abandoned and termination of project are observed on the project due to the problem of time and cost overrun. Finally, feasibility study related, Service and infrastructure related, design and planning related, stake holder management related, procurement and contract management related, and Human resource management related recommendations are given.

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LIST OF ABBREVATIONS

GoE ---------- Government of Ethiopia

HVA ---------- Handlers -Vereeniging Amsterdam

MCPs ---------- Mega Construction Projects

NPC ---------- National Planning and Commissioning

ESC ---------- Ethiopian Sugar Corporation

GTP ---------- Growth and Transformation Plan

USDA ---------- United State Development Association

MoUDC ---------- Ministry of Urban Development and Construction

WWCE ---------- Water Works Construction Enterprise

ADSWE ---------- Amhara Design and Supervision Works enterprise

AWWCE ---------- Amhara Water Works Construction Enterprise

MPEMI&AEU ------- Ministry of public Enterprise Manufacturing Industries and Agricultural Enterprises Unit

METEC ---------- Metal and Engineering Technology Corporation

COMPLANT --------- China National Complete Plant Import and export Co. Ltd.

JJIEC ---------- Jiangxi Jianglian International Engineering Co. Ltd

CAMC ---------- China CAMC Engineering Co. Ltd

SOFRECO---------- Social Francaise de Realization D'Etudes et de Conseil

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The Ethiopian sugar corporation (ESC) was established in 2010 as the sole organ for directing, coordinating, supervising, and controlling the expansion of the sugar industry in Ethiopia. It took over operational responsibilities for the country's sugar industry, which had been jointly administered by the Ethiopian Sugar Development Agency (ESDA) and the Ethiopian Electric Power Corporation. Ethiopian sugar corporation has entered into construction of different mega projects in different part of the country. From different sugar factory industry that controlled by Ethiopian sugar corporation as a client, Tana Beles sugar development project **(I, II &III)** is the one that located at Awi Zones Jawi district of Amhara region. Its head quarter is at Fendika Town 650Km from Addis Ababa and 225Km from Bahir Dar town. Tana Beles sugar factory projects are among the ten green field sugar projects that Ethiopian sugar corporation has envisioned to develop three factories in the next 3 to 5 years starting from beginning of GTP -I (2010_11) which have a crushing capacity of 12000TCD each. The total investment cost of the project is estimated at Birr 42.54 billion or USD 2.12 billion (B-I = Birr 13.93 billion, B-II = Birr 13.75 billion and B-III = Birr 14.85 billion) (MPEMI&AEU, 2016). The construction of all three factories were given to METEC and at the moment (2017) only B-I is active and on progress. However, B-II was abandoned due to poor performance of the contractor and B-III has been post ponded to GTP-III.

An agreement was signed between sugar corporation and metal and engineering corporation(METEC) June 2010, to build the sugar development project. Later on the agreement had been improved in June 2012. According to later agreement the project was supposed to be completed and begun production in 18 months. However, due to the delay of construction the government terminated the agreement in 2018. At the time of termination factory construction had reached 65% according to Ethiopian sugar corporation. In the way forward construction of factory would be completed by an experienced foreign contractor. when complete and operate in full capacity, the factory will crush 12000 tons' sugarcane a day. Current practice of the construction industry shows that it is uncommon event most construction projects are completed on the scheduled time, budgeted cost and preferred quality. The main reason behind is that

construction projects are unique in nature, time consuming, cost demanding and they are full of doubts. As a result, claims and disputes become common phenomena especially on huge civil engineering contracts.

Generally, in Ethiopia and particularly in metal and engineering corporation the number of construction projects is increasing from time to time. However, it became very difficult to complete a project in agreed time and cost given in the initial contract document. Time and cost overruns are the common phenomenon in almost all construction projects. Number of unexpected problems and changes from original design arise during construction phase, leading to time and cost overruns.

Frequent causes of time and cost overruns which lead to delayed of the projects such as inappropriate choice of site, changes in design, delayed approval of payments, excessive change orders and absence of site staff are some faults happen in side of consultant arise in construction projects. Delayed overheads of payments to the contractor, additional work order, shortening of contract periods, finance and payment arrangements and client initiated variations are found to be causes for which the project owners are responsible. Causes for which the contractors are responsible include setting of unrealistic time schedule, shortage of materials on site, failure to update schedules on time, poor qualification of staffs and communication with consultants.

Time and cost overruns would be extremely significant and serious problem in METEC projects, and also in other construction companies in Ethiopia compared to other countries. Most of the projects exceed their completion time and cost higher than their allocated contract time and budget.

Table below shows the time performance of ten new factory construction projects relative to the base schedule. But the analysis was only considering the factory construction no other main related works like irrigation infrastructure work, land development & cane plantation and house & infrastructure work were included. As we see in the table, in the projects there are time overrun. Among the listed factory projects, the highest time overrun is seen on Tana Beles project especially on Beles-II which have time overrun of 1588%.

Table 1. 1 Time overrun on the tena beles mega sugar factory construction projects in Ethiopia

Project name	Contractor	Consultant	Project start date	Project Completion date	Contract time duration	Execution physical (%)	Time overrun (%)
Tana Beles-I	METEC	SOFRECO	March 2011	Aug 2012	18 Month	77.0%	448%
Tana Beles-II	METEC	SOFRECO	March 2011	Aug 2012	18 Month	25.0	558%
Tana Beles-III	-	-	-	-	-	-	-

Source: (Different projects feasibility report of ESC; Dept, 213; ESC, 2017)

The cost overrun of the project is determined by comparing the revised investment demand of the project with the initial budget from the feasibility study. As table below shows in Tana Beles-I the cost of the project increases from 13.93billion birr to 22.72 billion birr which is by 8.79 billion birr (63.1%). It shows that Tana Beles-II (34.47%) decreases from their original budget. In the above table Beles-II have the highest time overrun, but on the contrary the budget decreases from the initial plan which possibly shows decrease of scope from the planed scope.

Table 1. 2 Cost overrun on the ten-new mega sugar factory construction projects in Ethiopia

Project name	Total investment demand as feasibility study (billion birr) (1)	Total investment demand as revised study in June 2016 (billion birr) (2)	Difference in (billion birr) (3) = (2-1)	Cost overrun (%) $= \frac{(3)}{(1)} x100$
Tana Beles-1	13.93	22.72	8.79	63.1
Tana Beles-2	13.75	9.01	-4.75	-34.47
Tana Beles-3	-	-	-	-

Source: (Different projects feasibility report of ESC; ESC; Dept, 213; ESC, 2017)

The higher expectation of the society and the long delay of the projects attract the attention of many peoples and become the idea for many researches beginning from the foundation of projects. Many researches are done addressing the reason for delayed factors in construction projects and also there were researches done on shortage of sugar and the sugar projects under construction. While, many of the researches concern on the implementation practices and challenges of different projects. Based on getayawkal abreham (2016), research on the challenge of implementing kuraz sugar project land management problem, ineffective participation of stakeholders, corruption and communication problems are the challenges of the project implementation and the reason for the delay, which can be related with poor management of selection and identification works. Other researches done on Tendaho sugar project and Wenji Shewa sugar project the concern of researchers revolves towards the same circle. This research will be passes through all those stages and try to link those processes with the present challenges in accordance with country situation.

1.2 Statement of the problem

Project delays can wave any industry, any team and any individual project. A project delay can represent a costly occurrence for any organization. Therefore, it is important for an organization to understand what causes a delay and how to prevent from occurring. Many construction projects in Ethiopia facing serious problems due to which construction projects cannot be completed in time. The most adverse impact is that it leads country to downward trend of national progress. The construction of mega projects in developing countries including Ethiopia are not completed within the time schedule and allocated budget. Due to these problems, they lose so many revenue, job opportunities and other economic and social benefits. Delays often occur due to poor management of various factors related to contractor, clients, consultant, materials, labor and equipment of the projects. The case of Tana Beles sugar factory projects delayed much more than the expected time of completion due to several reasons. Therefore, the aim of this research is in order to fill problem address due to delay in construction industry of Ethiopian sugar factory the case of Tana Beles sugar project, and the study will sight factor that cause the project delay on the project. The Tena Beles sugar factory construction projects are among the lists which are highly exposed to such problem of time delay and cost overrun. This project was scheduled to complete within GTP-I (2010/2011-2014/2015) and start operation at

the end of the period (2014/2015). But up to now (2020), these projects are not completed yet. The status of projects is described as follows in Table

Table 1. 3 Execution plan and physical progress of Tana Beles the new mega sugar projects in Ethiopia

Project name	Project start date	Project Completion date	Contract time duration	Total investment demand as per feasibility study (billion birr)	Physical execution amount of factory construction at mid-2017 (%)
Tana Beles-I	March 2011	Aug 2012	18 Months	13.93	77.0%
Tana Beles-II	March 2011	Aug 2012	18 Months	13.75	25.0%
Tana Beles-III	-	-	-	-	-

Source: (Different projects feasibility report of ESC; Dept, 213; ESC, 2017)

1.3 Research Objective and Research question

1.3.1 General objective

The main objective of this project is to determine the factors that causes time and cost overrun in Tana Beles sugar factory projects, and to mitigate their impacts associated with delay factors claim.

1.3.2 Specific objective

This study is undertaken with the following specific objectives. To achieve the above main objective, the following specific objectives are formulated:

- Assess the presence and extent of time and cost overrun in mega sugar industrial construction projects with respect to contract agreement
- Identify the key factors that contribute to time and cost overrun in Tana Beles sugar industrial construction projects in Ethiopia

1.3.3 Research questions

Major questions that need to be raised are:

- What are the factors behind the delay in the construction projects in tana beles sugar factory project?
- What is the impact of delaying factors on the construction projects in the construction industry of tana beles sugar factory project?

1.4 Research hypotheses

Hypotheses are tested to determine the difference between groups of the main causes of delay in the tana beles sugar factory construction projects and the characteristics of the respondents and the institutions.

The Null Hypothesis (H_O): -There is no agreement in the ranking between two groups of respondents.

The Alternative Hypothesis (H_A): -There is agreement in the ranking between two groups of respondents.

1.5 Significance and Purpose of the study

Over many years, delay has emerged as one of the most significant problem in construction industry, so that causes have been examined in several studies in different developing country. Poor project management practice could be one that has been cited by a number of investigators as the main reason. However, despite such consensus, there are usually no clear recommendations demonstrating how project management implemented. Moreover, the majority of recommendation made in the existing studies are general in nature and do not lead to a focus on a specific area. None of them are devoted to solving the difficulties associated with particular

causes. So The purpose of the paper is to identify causes of delay on the existing project and to contribute on improvement in construction delivery.

The primary objectives of construction projects are to optimize quality, cost and time; and hence this thesis will assess the causes and presents the resolutions of delay of projects. It also assesses how to minimize or avoid the factors that cause delay in the construction project of tana beles sugar factory projects. To make the issue specific and to assess broadly, only one of sugar project constructed by metal and engineering corporation are considered. Consequences of delays in construction projects are discussed and hence identification of causes, their relative impact in delaying projects based on contract time and cost are analyzed in detail.

Therefore, the significance of the research will be recommending practices, procedures and methods that can be used to minimize or avoid the factors that cause delay of construction projects; and to deliver construction projects to the client within the given time and cost entitled on the contract document and to survey the main problems behind the delays in the sugar projects.

1.6 Scope and limitation of the research

The research paper focuses only on Tana Beles sugar construction projects planned to construct within GTP-I (2010/11-2014/15) by ESC. This study focuses on identifying the main causes that lead to time and cost overrun and analyzing their impact on those projects as well as on the possible recommendations to minimize those problems. The research will be focused on the group of respondents for this research involves client, consultant, contractor and engineer's that are involved in the construction of Tana Beles sugar factory project.

Limitation: The following are some list of limitations on the research:

- ✓ The researcher couldn't asses each contract documents, letters, reports etc. in desk study due to the political sensitivity nature of the project and anticorruption act of the government during data collecting time.
- ✓ Detail analysis (like cost analysis) on the effects of time and cost overrun is not included.
- ✓ Identification of the responsible parties for the problem of time and cost overrun is not included.

1.7 Organization of the Study

This thesis is divided into five chapters that organize, illustrate, and describe the steps taken to meet the defined research objectives. This thesis was organized as follows: The research paper encompasses five parts in which part one contains the introduction which tries to give information concerning the study area and some background information on it.

Part one; -Statement of the problem discussed specific details on the major problems of the study. The need for the study stating about the significance of the study, whereas objective of the study forwards the general and specific goals of the study. Research questions are made and scope of the study is stated on part one.

Part Two; - deal with literature review in which concepts on related topics is raised and discussed, in addition to this a detailed information concerning the research topic were given well in this section of the study.

Part three; - deals about research design and methodology

Part Four; - Which is all about presentation, analysis and interpretation of data that will be devoted on presenting the required sufficient amount of data and then analysis of this data has been made properly and finally based up on the presentation and analysis of those data interpretations were given at last. This chapter also include case study result.

Part five; - Which is the final part of the research report which emphasis on giving conclusions and finally pointing possible recommendations.

2 CHAPTER TWO: REVIEW OF LITERATURE

2.1 Theoretical literature review

The project may have a simple objective that does not require many people or a great deal of money, or it may be quite complex, calling for diverse skills and many resources. But the bottom line is that every one of us manages projects! Project success can be defined as meeting goals and objectives as prescribed in the project plan. A successful project means that the project has accomplished its technical performance and maintained (Yaw et al, 2003). Delay could be defined as an act or event that extends the time required to perform the tasks under a contract. It

usually shows up as additional days of work or as a delayed start of an activity (Sweis et al, 2007).

2.1.1 What is a Project?

While there are several definitions of projects in the literature, one of the best has been offered by Tuman (1983), who states:

"A project is an organization of people dedicated to a specific purpose or objective. Projects generally involve large, expensive, unique, or high risk undertakings which have to be completed by a certain date, for a certain amount of money, with some expected level of performance. At a minimum, all projects need to have well defined objectives and sufficient resources to carry out all the required tasks."

In lines of the definition provided by Pinto & Slevin (1988), and accepted for the purpose of this research, a project can be defined as possessing the following characteristics:

- A defined beginning and end (specified time to completion)
- A specific, preordained goal or set of goals (performance expectations)
- A series of complex or interrelated activities
- A limited budget

Diallo & Thuillier (2003) reviewed the project management literature outlined a set of evaluation dimensions which appear regularly although not with the same occurrence:

- Respect to the three traditional constraints
- Satisfaction of the client
- Satisfaction of the objectives as outlined in the logical framework
- Project impacts
- Institutional or organizational capacity built in the organization by the project

As defined in A Guide to the Project Management Body of Knowledge (PMI, PMBOK® Guide, 2000), a project is a temporary endeavor undertaken to create a unique product or service. Temporary means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all other projects or services.

Project is an activity for which money will be spent in expectation of returns and which logically seems to lend itself to planning, financing, and implementing as a unit. It is a specific activity, with a starting point and a specific ending point, intended to accomplish specific objectives. Usually it is a unique activity noticeably different from preceding, similar investments, and it is likely to be different from succeeding ones, not a routine segment of ongoing operations. It will have a well-defined sequence of investment and production activities, and a specific group of benefits, that we can identify, quantify, and usually determine a money value for. Often a project will have a partially or wholly independent administrative structure and set of accounts and will be funded through a specially defined financial package.

As maintained by Nilsson & Söderholm (2005), planning and plans are intrinsic features of projects. Plans are meant to constitute and guide project team members as they work on realizing what ever project goals that have been set out for them. A plan can, however, only have a certain degree of sophistication. When project management practices on a day-to-day basis are examined, plans seem to dissolve and become less prescriptive.

2.1.2 Characteristics of a Project

Typically, most projects share most if not all of the five characteristics listed below.

- A start and a finish
- A time frame for completion
- An involvement of several people on an ad-hoc basis
- A limited set of resources
- A sequencing of activities and phases

❖ Classification of Projects within Categories and Sub-Categories

- Project size
- Project complexity
- External or internal customer
- Degree of customer involvement in the project
- Levels of risk in projects
- Major and minor projects within a category

According to Gareis and Huemann (2000) the Project-oriented Company (POC) is an organisation which defines “Management by Projects” as an organisational strategy, applies

temporary organizations for the performance of complex processes, manages a project portfolio of different project types, has specific permanent organizations to provide integrative functions, applies a "New Management Paradigm", has an explicit project management culture, and perceives itself as being project-oriented. Thus POCs do have specific processes, such as assignments of projects and programs, project management, programme management, quality management of projects and programs, project portfolio co-ordination, networking between projects, personnel management in the POC and organizational design of the POC.

Project management is a specialized branch of management which has evolved in order to co-ordinate and control some of the complex activities of modern industry. The changing business environment of the twenty first century increases the range of activities coming under the periphery of project management techniques and the way projects are managed. Projects are open systems because they exist in an open environment and have to respond to the ever changing dynamics of situations requiring it to become much more adaptive than ever.

2.1.3 Project Life Cycle

There are a variety of definitions that generally reflect different industry practices. The generally accepted sequence is: pre-feasibility validation of concepts); feasibility (detailed investigation of viability) design; contract (procurement); implementation; commissioning; handover and operation.

Project life cycle generally defines:

- The tasks to be accomplished in each phase or sub- phase
- The team responsible of each of the phases defined

As advocated Archibald & Voropaev (2003), there is a general agreement that the four broad, generic project phases are (common alternative terms are shown in parentheses):

- Concept (initiation, identification, selection.)
- Definition (feasibility, development, demonstration, design prototype, quantification.)
- Execution (implementation, realization, production and deployment, design/construct/ commission, installation and test.)
- Closeout (termination, including post-completion evaluation.)

It is generally better in planning projects to analyze successive increments or distinct phases of activity; in this way the return to each relatively small increment can be judged separately. Like products follow a product life cycle, projects follow a project life cycle that has certain phases of development.

Dividing a big project in manageable chunks makes the complex task of managing projects easier, these chunks in a sequential form can be termed as project phases which can further be divided into sub-phases and a collection of these phases makes what is called as a project life cycle. Each project phase is marked by completion of one or more deliverables. Although many project life cycles have similar phase names with somewhat similar deliverables required, few are identical. Most have four or five phases, but some have nine or more. Sub-projects within projects may also have distinct project life cycles. Importantly, these phases are not always consecutive in nature but are more simultaneous. Though researchers have suggested certain representative project life cycles, for example, the waterfall model and Muench et. al's (1994) spiral model for the software development life-cycle, Morris's (1994) construction project life cycle and Murphy's (1989) representative life cycle for a pharmaceutical project.

As per Kulkarni et al. (2004), the projects, especially the ones having a longer lifecycle, could be categorised into many phases depending on the functions. For convenience and simplicity points of view, the three commonly known phases is utilised, namely:

- Procurement phase: From inception to the financial closure and beginning of works (tendering; dealing with governments, lenders, insurers, pressure groups, experts)
- Execution phase: Project execution (site installation till routine processes are reached, significant completion)
- Operation and handover phase: From significant completion till the end of defect liability period and handover

As said by Flaatten, McCubbrey, O'Riordan and Burgess (1992), 'project execution' (also known as 'project implementation' phase) is the phase where project manager is responsible for allocating work to the various team members, making sure that the team resources are used where most needed, and ensuring that the workload is balanced. As intermediate deliverables are completed, they are reviewed for verification (that they are correct and abide by project standards) and validation (that they conform to previous work). Therefore, we can summarize

that projects are unique in nature and much depends on the industry, size, location, nature, complexity, business environment etc. in which they operate. The truth appears to be that the concept of 'one size does not fit all' is a good point to start with in certain cases.

2.1.4 Project Management Body of Knowledge

The project management body of knowledge (PMBOK) guide contains the standard for managing most projects most of the time across many types of industries. A Knowledge Area represents a complete set of concepts, terms, and activities that make up a professional field, project management field, or area of specialization. The ten Knowledge Areas listed on PMBOK (Sanchez, 2013) which are used on most projects most of the time. The Knowledge Areas are:

- project integration management
- Project scope management
- Project time management
- Project cost management
- Project quality management
- Project human resource management
- Project communication management
- Project risk management
- Project procurement management and
- Project Stakeholder Management

From this knowledge areas, the paper focuses and try to discuss about project time management and project cost management which are more related to the objective of the paper.

Time management

Project time management is the effective and efficient use of time to facilitate the execution of project, which starts from planning, scheduling and controlling the project to achieve the time objectives. Project time management includes the processes required to ensure timely completion of the project (Jemal, 2015). Overviews of the major processes in project time management are as follows:

- Activity definition; identifying the specific activities that must be performed to produce the various project deliverables.

- Activity sequencing; identifying and documenting interactivity dependencies.
- Activity duration estimating; estimating the number of works periods which will be needed to complete individual activities
- Schedule development; analyzing activity sequences, activity durations, and resources requirements to create the project schedule.
- Schedule control; controlling changes to the project schedule.

Techniques that are usually used in time planning (scheduling) are as follow:

- Bar Chart; it's the simplest project management technique for scheduling, planning and controlling. It shows graphically or in tabular form the daily costs and accumulated costs over a designated period. In projects of normal delivery or stable performance, the general contractor creates the bar chart once an award is made and each bar represents the beginning, duration and completion of some designated segment of total project. Together, the bars make up a time schedule for the entire job.
- Line-of-balance (LOB): The LOB technique was originated by the Goodyear Company in the early 1940's and was developed by the U.S. Navy in the early 1950's. The technique is widely used for repetitive unit projects such as railroad tracks, roads and tunnels.
- Critical Path Methods (CPM); Calculated a single, deterministic early and late start and finish date for each activity based on specified, sequential network logic and a single duration estimate. The focus of CPM is on calculating float in order to determine which activities have the least scheduling flexibility.
- Program Evaluation and Review Technique (PERT); uses sequential network logic and weighted average duration estimate to calculate project duration. Although there are surface differences, PERT differs from CPM primarily in that uses the distribution's mean (expected value) instead of money likely estimate originally used in CPM.
- Precedence diagram method (PDM): it is activities on nodes (AON)or boxes network method and goes beyond the critical path method by including other inter-activities relationships such as Start-to-Start (SS), Start-to- Finish (SF) and Finish-

to-Finish apart from the conventional Finish-to-Start (FS). It also includes the possibility of adding “lags” or “leads” (negative “lags”) between activities.

2.1.5 Cost management

Project cost has been defined as the amount of commitment in terms of money that is required to produce a construction product such as building. It can be concluded that project cost is the amount of money that is required to complete all project activities (Jemal, 2015)**.**

Managing construction costs includes estimating, scheduling, accumulating and analyzing cost data, and finally implementing measures to correct construction cost problems (Nega, 2008). Throughout a project’s planning, design, and construction phases, cost management is employed as a means of balancing a project's scope, expectations of quality and budget.

The approach can be summarized as requiring the following three steps:

a) Define the scope, the level of quality desired, time for completion and the budget,
b) Ensure that the scope, quality, time and budget are aligned,
c) Monitor and manage the balance of these components throughout the life of the construction project.

Project cost management begins with the identification of the owner’s objectives and ends when those objectives have been met. Similar study conducted in Ethiopia showed severe delay in construction projects (Zinabu, 2016). Effective time control is challenged by different factors. According to Olawale and Sun (2010) the top five factors inhibiting effective project time control in descending order are: design changes, inaccurate evaluation of projects time/duration, complexity of works, risk and uncertainty associated with projects and ill-performance of subcontractors and nominated suppliers. Kasimu and Abubakar (2012) discussed that conducted delay study in the Nigerian construction industry and identified the top five factors that influence delay in ascending order as improper planning, lack of effective communication, design errors, shortage of supply like steel, concrete and slow decision making. Mengistu (2010) discussed that project controlling supportive techniques and software are not applied well for the control of actual and planned activities in the Ethiopia construction sector and recommends the significance of training requirement for the concerned project staff. Similarly, Abadir (2011) found out that

among the knowledge areas of project in Ethiopia, project time management is considered the critical one with only 24% projects managed well.

2.1.6 Project success for construction projects

The success of any project depends on many factors such as the experience of project manger the stability of project team and level of each of planning, monitoring, supervision, case flow, and control of the project etc. Many researchers agree that the properties of a successful project significantly associated with good administration good management including (planning, monitoring, control, specific and clear target and provide motivation for project employees)

Abdul Rahman(1993) said success factors for construction projects must have successful management that achieve three main goals which are time, cost and quality. these goals are interrelated and any change in one of them could affect others.

Robins, Stephen, and kotze (1988), and boseneneh(2010) stated that success factors are achieved through

a) End the project at less period
b) End the project at less cost
c) End the project with high quality

In Ethiopian construction industry it is rare that the three goals are combined in a single project. Cost is usually associated with quality and speed of execution, as the cost is less, it leads to reduction in the required quality and slow in implementation. On the other hand, when the cost is high or well estimated it lead to high quality and speed in implementation.

Scott (1991) define time is period to finish the project according to the planned schedule, the project varies in the duration from project to project to another according to the nature, type, size of project.

Since time equals money, it is the most important factor in the success of any project.

Time is also connected to quality since good quality cannot achieved generally with little time.

For this thesis, Delay can be defined as the added time required to finish the project than initially planned

$$\text{Time Overrun (\%)} = \frac{\text{Actual time Spent} - \text{Estimated planed time}}{\text{Estimated planed time}} * 100 \text{ ----------}$$

Time is the essence of a construction contract. Typically, a time period is specified as the contract duration. The contractor obliged under the contract to achieve substantial completion within the specified period. Unfortunately, unexpected events can happen during the life of the construction project and can affect the construction time necessary for the completion of the work. When a contractor fails to complete the project within the contract period, delay becomes the reality of the project. The contractual remedy for the owner is to deduct liquidated damages. Obtaining an extension is the contractual release for the contractor against liquidated damages. Based on the responsibility, delays are generically categorized as excusable compensable, excusable noncompensable, and inexcusable (Shi, et al., 2001)

The cost necessary to execute the project, it is an important factor, when the cost of the project decreases, the project profit increases, project managers must take this objective into account when they are assessing contractors bids to choose the best price, this price is (the estimated cost) of the project(jdedo.1999).

It is difficult to estimate the cost of the project with high accuracy because it rarely matches the budget of the project with an initial estimate for the project with an initial estimate for the project, here appears the term named (case flow management) focuses on the relationship between the time and the cost, this spending commensurate with the project budget(scott,1995)

Cost overrun is also called “cost escalation,” “cost increase,” or “budget overrun” (Memon, March 2013). Memon also describe Cost overrun as a measure of a percentage of actual costs over the estimated costs of the project as expressed bellow

$$\text{Cost Overrun} = \frac{\text{Actual Cost} - \text{Estimated Cost}}{\text{Estimated Cost}} * 100 \text{ ----------Eq.2}$$

Actual costs are defined as real and accounted construction costs determined at the time of project completion. Estimated costs are defined as budgeted or forecasted construction costs

determined at the start of projects (Memon, March 2013). Therefor for this thesis cost overrun is the amount in which the final cost or expenditure of the project exceeds the original estimation.

Defined by quality engineers as conform to specifications, do product specification conform to required specification or not are the service achieved the stated requirements of the project or not quality of implementation of project depends on the quality of its resources (equipment, materials, skilled workers, the parties operating in the project (contractor, consultant, and owner) and project management (peter, morris, and houph, 1979).

2.1.7 Concept of project delay

2.1.7.1 Definition of Delay

Definition of delay stated by various scholars in different ways. Delays are defined as events or occurrences that affect the time required to complete a particular task. Assaf and Al-Hejji (2006) defined construction delay as the time over run either beyond completion date specified in a contract or beyond the date that parties agree upon for delivery of a project [1] It is slipping over its planned schedule and is considered as common problem in construction projects. Delay was also defined as an "act event which extends required time to perform or complete works of the contract manifests itself as additional days of work" by Zack (2003).

2.1.7.2 Classification of Delay

Delay in construction can be classified in different ways. Ahmed et al. (2003) classified delays into two groups. These are: internal causes and external causes. Internal causes arise from the parties to the contract. External causes arise from events beyond the contract of the parties.

Bolton (1990) classified delay as follows: 1. Excusable but non-compensable delays; these are delays caused by occurrences which are not attributable to any of the parties. 2. Compensable delays; these delays result from acts or omissions of the owner or someone for whose acts the owner is liable. 3. Inexcusable delays; these delays result from an own fault of the contractor, his subcontractors or material suppliers.

Delays can also be grouped into three types (Bramble and Callahan, 1987): 1. Excusable delays which occur for reasons beyond the contractor's control. These can be further divided into compensable and non-compensable delays. 2. Non-excusable delays; these occur due to the contractor's weakness or not caused by the contractor but should be anticipated by the contractor

under normal conditions. 3. Concurrent delays; these delays are due to the combination of two or more independent causes of delay during the same period. These delays may lead to disputes between the contractor and the client.

Causes of Delay in Public Construction Projects in Iraq, Ghanim A. Bekr identified delay factors in public construction projects with respect to clients, consultants and contractors. The study included public sector projects only. The participants representing the clients working in ministries of public works and Housing, Education, Health, Higher education and scientific Research, Industry and Trade and municipals affaires.

Based on Ghanim A. Bekr assessment, causes of client related factors include low performance of the lowest bidder contractors in the government tendering system , design changes by the owner ,delay in progress payments by the owner ,owners' lack of experience in construction ,Poor qualification of supervision staff of the owner's engineer ,uncooperative owner with the contractor or consultant ,lack of coordination with contractors ,inadequate early planning of the project, breach or modification of contract by the owner ,delay in the approval of the contractor submittals to the owner ,insufficient available utilities on site contract duration to construction of project is too short ,slow decision making process of the owner ,mistakes in soil investigation ,changes in the scope of the project ,delay in delivering the site to the contractor and difficulties in obtaining work permits from the authorities

Causes of contractor related factors include poor qualification, skills and experience of the contractor's technical staff, poor controlling of subcontractors by contractor (relationships, payments...) , cash flow problems faced by the contractor ,slow preparation of change order requests by the contractor ,poor planning and scheduling of the project by the contractor , poor site management and supervision by the contractor ,improper construction methods implemented by the contractor ,material quality problems ,delay in site mobilization, shortage of construction material ,equipment availability and failure, delay in preparation of shop drawings ,delay of material supply ,difficulties in obtaining work permits from the authorities concerned and poor manpower productivity**.**

Causes of consultant related factors include design changes , inadequate qualification of the consultant to the project ,deficiency in drawings ,poor qualification of supervision staff of the consultant engineer ,absence of consultant's site staff ,delay in giving instructions ,delay in

approval of shop drawings ,design errors made by the designers due to unfamiliarity with local conditions and environment ,poor communication and coordination by the consultant engineer and documents not issued on time.

Causes of delays due to external factors include security measures , government change of regulations and bureaucracy , official and non-official holidays ,problems with local community ,economic conditions; local or global, lack of communication between different parties , unforeseen site conditions and geological factors , rise in the prices of materials , delays in resolving contractual issues , conflict between contractor, owner and consultant ,weather conditions effect on construction activities ,external work due to public agencies (roads, utilities and public services).

From those determinate factor the researcher was found that the top 10 factors causing delay are:

- security measures
- government change of regulations and bureaucracy
- official and nonofficial holidays
- low performance of the lowest bidder contractors in the government tendering system
- design changes by the owner,
- design changes by the consultant
- delay in progress payments by the owner
- problems with local community
- owner's lack of experience in construction and
- economic conditions; local and global.

In various studies the factors highlighted by the researchers which may result into delayed completion of the project included availability of high quality material, Availability of equipment in the domestic market areas, lack of material delivery schedule, delays in the approval of the design and drawings, climatic changes, fluctuation in the cost of production factors, delays in the contractual agreements for the land and property deals, long distances between the site locations, improper logistic planning and redoing of the work due to non-fulfillment of the standards. In order to reduce and eliminate the adverse impact of the above-mentioned factors it is significant for the managers of projects and companies to address each of

the factor and design, plan and implement strategies in a way that may help in the proper and timely completion of the construction project.

2.1.7.3 Factors that cause project delay

Construction 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. There are several factors that cause delay in construction. Delay may be caused by Clients, Users, Consultants, Designers, Owners, Contractors and Suppliers.

In a study of the significant factors that cause delay of construction projects (Alaghbari, Kadir, Salim and Ernawati, 2007), classified the factors into four major groups, these are contractor factor, consultant factor, client factors and external factors. Financial problems, shortage of materials and poor site management practices were considered the top most factors. Client related factors included delayed payments, slow decision-making, frequent change orders, bid award for lowest price and contract scope changes. The most important factors by consultant were provision of incomplete design, poor supervision, slowness to give instructions and lack of experience. External causes identified included shortage of materials availability, poor site conditions and lack of equipment and tools in the market. In a related study of the causes and effects of delay in Malaysia construction industry Sambasivan & Soon (2007) found poor site management, inadequate experience' and poor subcontractors among the major causes of time delays on construction projects.

Projects can be delayed for a large number of reasons and usually impact on cost and time. Battaineh et al. **(2002)** studied causes of construction delay in Jordan. Results of the survey indicated Contractors and Consultants agreed that Owner interference, inadequate Contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and Sub-contractors are among the top ten significant factors.

Mansfield et al **(1994)** studied the causes of delay and cost overrun in construction projects in Nigeria. The results showed that the most important factors are financing and payments, poor contract management, changes in site conditions, shortage of material, and improper planning. Similarly, Aibinu et al **(2002)** made a research on effects of construction delays in Nigeria. The findings showed that time and cost overruns were frequent effects of delay. Delay had significant

effect on completion cost and time of 61 building projects studied. Client-related delay is significant in Nigeria.

Assaf et al. **(2006)** conducted a survey on time performance of different types of construction projects in Saudi Arabia to determine the causes of delay and their importance according to each of the project participants, i.e., the Owner, Consultant and the Contractors. The survey included 23 Contractors, 19 Consultants, and 15 Owners. Seventy-three causes of delay were identified during the research. 76% of the Contractors and 56% of the Consultants indicated that Average of time overrun is between 10% and 30% of the original duration. The most common cause of delay identified by all the three parties is "change order". Surveys concluded that 70% of projects experienced time overrun and found that 45 out of 76 projects considered were delayed. Neal **(2007)** in his study showed that 40% of the projects studied in the UK have over-run their original contract period.

Ogunlana et al. **(1996)** studied the delays in building project in Thailand, as an example of developing economies. He concluded that the problems of the construction industry in developing economies could be nested in three layers: (1) problem of shortages or inadequacies in industry infrastructure, mainly supply of resources; (2) Problems caused by Clients and Consultants; and (3) Problems caused by incompetence of Contractors.

Sambasivan et al. **(2007)** surveyed causes and effects of delays in Malaysian construction industry. The study identified 10 most important causes of delay from a list of 28 different causes and 6 different effects of delay. Ten most important causes were: (1) Contractor's improper planning, (2) Contractor's poor site management, (3) inadequate Contractor experience, (4) inadequate Client's finance and payments for completed work, (5) problems with Subcontractors, (6) shortage of material, (7) labor supply, (8) equipment availability and failure, (9) lack of communication between parties, and (10) mistakes during the construction stage. Rizwan et al. **(2007)** conducted a research on delays in construction industry of Pakistan. A delay criticality index was used to identify the major delay causes in the industry which, in descending order of criticality, were found to be: change orders, labor productivity issues, poor site management and supervision, inspections/audits, poor cost estimation and control, inadequate project scheduling, defective design, inefficient construction methods, delayed payments, and incomplete construction drawings. In addition, the percentage allocation of responsibility for

overall delay causes, according to Contractors' perceptions, was as follows: Contractors=48.75%, Consultants=17.5%, Owners=16.25 %, government=8.75%, and shared =8.75%.

Kumaraswamy et al. **(1997)** carried out a study on causes of time overruns in Hong Kong construction projects. He revealed that the five principal and common factors of delays are: (1) poor risk management and supervision, (2) unforeseen site conditions, (3) slow decision making, (4) Client-initiated variations, and (5) necessary variations of works.

Shakeel et al. **(2006)** made an investigation of significant causes of delay in the UAE construction industry. In the study, they indicated that the effects of construction delays are not confined to the construction industry only, but influence the overall economy of a country like UAE, where construction plays a major role in its development and contributes 14% to the GDP. Thus, it is essential to define the most significant causes of delay in order to avoid or minimize their impact on construction projects. The research disclosed that 50% of the construction projects in UAE encounter delays and are not completed on time. The top 10 most significant causes of construction delays have been identified by this research. Approval of drawings, inadequate early planning and slowness of the Owners' decision-making process are the top causes of delay in the UAE construction industry.

2.1.7.4 Construction time and cost overruns

Time overrun and cost overrun in construction projects can also be called is "slippage of project schedules". Time overrun can also be defined as the time increased to finish the construction project after scheduled date which is affected by internal and external causes surrounded the construction project.

Cost overrun can also be termed as budget overrun, cost increase, or cost escalation. Cost overrun is a variance between initially estimated or projected cost and final cost at the completion of the project. Final costs are described as the total costs actually spent on construction project as determined at the project completion time while, projected or initial costs is known as the planned or predicted costs at the project approval time.

2.1.7.4.1 Previous studies on causative factors of time overrun

In Malaysia, various studies were conducted to figure out the main causes of time overrun in construction projects. Memon examined the major causative factors of time overrun in building construction projects by conducting a questionnaire survey. Results of the survey revealed that most significant causative factors of time overrun were repeated changes in design, modification in the scope of the project, financial problems of client, delays in process of decisions making, unexpected site conditions, delay in the progress of payment by client, shortage of site workers, inaccuracies and errors in design, very slow process of preparation and approval of drawing documents, and incapable subcontractors.

Mydin et al. investigated the influential causes of time overrun in Malaysian private housing projects through a questionnaire survey. Top 10 common and highly severe factors of cost overrun were unpredictable weather conditions, poor management at the site by contractor, incomplete design documents, and lack of contractor's experience, financial difficulties, slow process of approval of major changes, changes in contract agreement, lack of contractor coordination with other construction stockholders, mistakes in construction, and poor quality works.

A questionnaire survey was performed by Azlan et al. among construction practitioners to determine main factors contributing to time overrun construction projects in state of Kedah, Malaysia. Results of the survey showed that top ten root causes of time overruns as observed by the three key construction parties comprises delay in sub contractor's work, improper arrangement and scheduling of project, problems in financing project, shortage of labors, delay in process of decision making, slowness in progress payment by owner, delay in material delivery to site, late procurement of materials, escalation in raw material prices, and delay in process of approving major variations in scope of work. Shehu et al. found out that the main causative factors of time overrun were cash flow and financial problems of contractor, delay in payments by owner, delay in payment from contractor to sub-contractors and materials suppliers, late permits by local government authorities, unproductive planning and scheduling of the project, improper control of the project progress by the contractor, bureaucracy in government organizations and delay in decision making process by the owner.

Ramanathan et al examined the factors that cause time overrun in construction projects and identified that key factors of cost overruns were rain effect on construction activities, shortage of labors, contractors' poor site management and control, unqualified workforce, lack of contractor experience, late progress payments by client, lack of communication and coordination of contractor with other stakeholders, low productivity level of labors, and delay in decision making process by client.

Rahman et al. investigated the causative factors of time overrun or schedule overrun in MARA construction projects from perspective of "project management consultant" and found that dominate factors were poor site management by contractor, lack of contractor experience, lack of site labors, escalation of material prices, practice of awarding contract to lowest bidder, problems with subcontractors, lack of communication among parties, and change management. To identify the factors that affects timely completion of building construction projects, a questionnaire survey was conducted by Alaghbari et al [26] in Klang Valley, Malaysia. The study found that financial problems and lake of coordination among construction parties are main factor initiating time overrun in construction projects.

2.1.7.4.2 Previous studies on causative factors of cost overrun

A Study conducted by Ali and Kamaruzzaman identified 13 major causes that influenced cost overruns in building construction projects in Klang valley, Malaysia. A questionnaire survey was conducted among construction project manager, quantity surveyor, Civil & Structure Engineer, and other related respondents. The survey discovered that the causes of overrun in budget of building construction projects were attributed to incorrect / poor estimate of original cost, underestimation of construction projects duration, inappropriate planning, contractor poor project management, poor contract management, lack of contractor experience, increase in project costs, fluctuation in cost of heavy machineries, variation in price of materials, unexpected site situations, inadequate funds for project financing, obsolete construction equipments. /unsuitable construction methods, mistakes in design.

Memon et al. determined 15 main factors effecting cost performance in large construction projects of MARA. Based on the project management consultants surveyed the most important cost overrun factors were: financial problems experienced by contractors, inadequate site management, lack of monitoring of work progress by contractor, incapable contractors,

unavailability of site labors, indelicate planning and arrangement by contractors, instability in costs of construction materials, practice of allocating contract to lowest bidder, lack of communication and coordination among key construction stakeholders, underestimate project duration, and late material procurement. Further, Memon et al. conducted another study on cost overrun in Malaysian building construction projects. The result of his research specified that the core factors of cost overrun in building construction projects were errors in design, slowdown in design preparation, impractical contract duration, incapable contractor, delay in delivery process of materials & equipments to construction site, poor relationship between top management & labors, delay in preparation of drawings, slowness in approval of drawing documents, insufficient planning and scheduling, and errors during construction process resulting reworks.

A quantitative research carried out by Ramanathan et al. on cost increase in construction projects in Malaysia identified 18 causes of construction cost overrun. The findings of his research showed that the main causes of cost overrun were extension of time, fluctuation in cost of raw materials, design changes, unpredictable weather conditions, insufficient project preparations and planning, delay in delivery of raw materials and equipment to site, lack of cost plan / improper monitoring of pre and post contract stages, monopoly by some suppliers in project materials, deficiency of coordination at design stage, and re-measurement of provisional sum.

To investigate the factors that contribute to increase in scheduled budget of large construction projects in Malaysia, a study was conducted by Rahman et al. A questionnaire with 35 common causes of cost overrun was precisely designed from initial investigations. The questionnaire form was directed towards three groups: clients of the large construction projects, consulting offices, and contractors handling large construction projects. The questionnaire form was circulated to a random sample of 150 client firms, 150 contractor firms and 30 consultant personals. The results of the survey revealed the key factors of cost overruns or budget overrun in large construction projects: variation of cost of raw material, ineffective site management and supervision by contractor, lake of contractor experience in handling large construction projects, construction mistake resulting schedule delay, improper planning and scheduling, unskilled subcontractors, errors in design, regular variations in design, , financial difficulties faced of owner, poor financial control on site unavailability of construction materials, inaccurate cost estimate, and underestimate of project duration.

A survey was carried out by Jamaludin et al. on the factors inducing the cost variance during the construction stage amongst the building contractors registered under Class 'A' within the Klang Valley, Malaysia. The results of the survey showed that the important causes of cost increase were imperfect design drawings and specifications at tendering phase, alterations in client requirements, cash flow and financial problems faced by the contractors, fluctuation of material prices, poor planning, scheduling and monitoring, increasing of labour salaries, fluctuation of plant and heavy machineries cost, lack of coordination and communication among the stakeholders, scrape and rework, lack project team's experience.

Research conducted by Ismail et al. studied risk level of several factors which cause cost overrun throughout the life cycle of a construction project. The study revealed that 6 causes have a high risk on cost overrun, which were ineffective site management & monitoring, unskilled subcontractors, construction mistakes, incomplete.

2.2 Review of empirical literature on construction projects delay

Delays in construction projects are very common in most parts of the world even with the introduction of current management techniques. Studies conducted on the causes of construction project delays in different countries of the world have been examined as follows.

According to international journal of managing projects business published by youcef J., Bjorn Andersen, 2018, top ten universal delay factors in construction projects are poor planning and scheduling , slow or poor decision making process, internal administrative procedures and bureaucracy within project organization, resources shortage(human resources, machinery, equipment), poor communication and coordination between parties, design changes during construction change orders , poor labor productivity and shortage of skills, improper design, delay in payment of contractors, poor site management and supervision, inadequate contractor experience, contractor financial difficulties.

Assessment of Project Identification and Selection Practice of Ethiopian Sugar Corporation by Sewagegnehu Dagne, pointed out many problems and challenged which happened while selection the projects problem begins with the Shortage of time to select effective projects because the government was in a hurry, the projects were selected without a clear feasibility study, there was unnecessary political influences and interference, including regions in the

projects were must , low capacity of the corporation and the consultants , and lack of experts and stakeholders' participation was the main challenges identified by the respondents.

As study of Micheal Chala 2017, the major causes of delay in Construction of Condominium Project at Bole Arabssa Site were late delivery of construction materials, Shortage of construction materials , low skill of labors on construction site, late procurement of materials , late in revising and approving design documents , poor communication and coordination of project parties , Poor qualification of contractor's and technical staff, lack of effective planning and scheduling of project, unclear and inadequate drawings by consultant and inadequate experience of consultants are stated as major causes of delay on project.

As tadesse tulu 2017, identified that among the six delay factors (poor project initiation, poor project planning, improper implementation, poor project monitoring, evaluation and controlling system, poor communication and improper project closure), poor project initiation was identified and concluded as the determinants with highest influence on project completion delay.

As conducted by Mered Taye, 2016, the top main significant causes of time and cost overruns are less emphasis to planning, poor contract management and poor pre planning process. The top ranked effects of time and cost overruns identified by this research were the contribution of the construction industry to the growth of national economy of the country will be less, delayed payments to contractor and inability to deliver value for money.

Dr. Ashraf Samarah1, Dr.Ghanim A. Bekr, examined on causes and effects of delay in public construction projects in Jordan in which the study conducted on public sectors only. The case examined on delay due to client, contractor, consultant, and external factors on project. They analyzed top ten factors causing delays for public sector projects in Jordan. These are inadequate management and supervision by 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 contractor documents, progress payments are not made in time by the clients, rework due to mistakes during construction, changes in the original design and low level productivity. The research revealed that the delay of projects will cause time overrun, cost overrun, disputes, arbitration, litigation and total abandonment.

According to recently published goldstrong literature (2019), he sorts out top eight reasons for delay in construction projects. The following are the main reasons for delays in construction

projects. With proper management, technical knowledge and techniques these delays can be reduced to the minimal level.

- **Change in Project Scope -** change in project scope can produce project delay. The scope of work in a construction project defines as the deliverables that are expected at the end of a project. Poor scope definition at the start can be a result of cost overrun and time delay of any construction project. Therefore, all the project plans, schedule, cost, and quantity estimation, procurement and quality mechanism are usually calculated from the initial project scope. Change in project scope could be due to poor initial project scope definition, miscalculation of inherent risks and uncertainties, project funding issues, change in the interest of the client or force majeure, etc. Thus, any modification/change within the project scope throughout execution will cause the whole initial project set up to be revised the i.e. revised budget, construction methodologies, construction schedule, procurement plan, quality assurance plans, etc. which will lead to more time, resources and cost against the initial baseline to complete the works.
- **Project Complexity-** Project complexity is one of the major factors for project delay and cost overruns. Complexity might be outlined in terms of the scale of the project, most mega construction projects i.e. dams, motorways, skyscraper, nuclear power station, etc. tend to possess comparatively long implementation duration in comparison to the small construction project i.e. residential houses, shops, non-commercial buildings, etc. This might result in a change in material prices, changes in exchange rates and inflation rates such that the initial proposed/allocated budget needs to be supplemented for the project to be completed. The result might be increased in cost and long chains of negotiation which eventually will cause the delay in the overall duration of the construction project.
- **Inadequate Planning -** is one of the top reasons for construction project delays. Planning is one of those aspects that affect the outcome of so many different things in life. To plan a project means to identify/distinguish the tasks or work activities to be performed to obtain the desired outcome in minimum time and cost, this starts the day the idea to put up a project is conceived. During the construction phase, the planning means calculating all the plants, types of equipment, materials suppliers, human resources, time and cost required to complete the curtain phase of the construction. With proposed planning

deliverables and inadequate planning outcomes in delayed project completion, cost overruns, and poor quality work among other things.

- **Impropriate Project Schedule -** Scheduling is a method in which the work activities are arranged in a sequential logical order to achieve the project within the stipulated time frame Scheduling shows not only the logical order in which the activities are intended to be carried out, but also enable the participants of that project to monitor progress. In addition, the schedule depicts the project future work while providing historical data that could be useful in analyzing the past. With impropriate project schedule the precious project resources will be diverted to the activities which are not critical and as a result, the critical activities will suffer and the delay will occur in over construction time frame.
- **Design Variation -** Design variation/error is a major factor for delay and cost overrun in a construction project. It is vital to notice that accurate representation of the employer's demand and therefore the blueprint to achieving better technical input to project execution area typically sort out base on project designs and specifications. A faulty design means insufficient or inaccurate project deliverables during the execution of the project. This will lead the incorrect application of techniques in achieving successful results, such because the actual execution section of the project unfolds these design errors in the later stage, attempts to correct it will cause a time delay and value cost overrun.
- **Inaccurate Engineering Estimate -** Before the execution of any project, the Employer assesses the initial size of the investment required to incur in the project by an Engineer estimate. Based upon the Engineer Estimate all economic benefits and calculations are done that's why engineer estimate needs realistic cost figures. The detailed investigation study, extensive design expertise, a clear scope of work, accurate quantity calculations and proper planning with complete modus operandi is required to obtain the Engineer estimate. Inaccurate/error in estimation will cause the cost overrun and subsequently will result in a delay in the duration of the project.
- **Inefficient Material and Equipment Management -** Material and equipment management is also an integral component during the execution of the project. Both represent a major cost expense in any construction project and material accounts for 60% to 70% of the direct cost of a building project. So minimizing the total

procurement/purchase or rental cost can hugely influence the overall cost of the project. The materials and equipment management system commits to make sure that the appropriate quality and quantity are selected, purchased, transported, delivered and handled on-site in a timely manner and at a reasonable cost.

- **Improper Post Execution Phase Management -** Slow project closure is reason for construction project delays. Finally, the closure or post-execution phase of any construction project is an extremely crucial stage which contains several potential factors that can ultimately lead to the cost overrun and delay. As it's the last phase of any project life cycle and often ignored or less valued by even the large organizations. Slow closure can lead to dragging the final handing over of several milestones by unresolved disputes/claims linked with client's final approval, variation order issues, acceptance of final payment certificate, issuance of retention money, issuance of performance security/bond and failing to close out these works will cause unexpected delay and extra cost to all stakeholders of the project.

The author finally concluded that, although time delay and cost overrun are very common in construction projects but it can be reduced or eliminated by adopting a proper performance monitoring mechanism and control system that will be integrated with all the key aspects and activities of each phase of the construction project. Better communication among all the stakeholders of the projects with a clear understanding of the project success criteria and will lead to the successful completion of the project without delay and cost overrun but providing the best quality.

2.2.1 Delay factors in construction projects

Causes of Delay in Public Construction Projects in Iraq, Ghanim A. Bekr identified delay factors in public construction projects with respect to clients, consultants and contractors. The study included public sector projects only. The participants representing the clients working in ministries of public works and Housing, Education, Health, Higher education and scientific Research, Industry and Trade and municipals affaires.

According to Ghanim A. Bekr assessment, delay cuases identified as client related factors, contractor related factors, consultant related factors.

a) Client related delay factors

- low performance of the lowest bidder contractors in the government tendering system,
- design changes by the owner,
- delay in progress payments by the owner,
- owners' lack of experience in construction,
- Poor qualification of supervision staff of the owner's engineer,
- uncooperative owner with the contractor or consultant,
- lack of coordination with contractors,
- inadequate early planning of the project,
- breach or modification of contract by the owner
- delay in the approval of the contractor submittals to the owner, insufficient available utilities on site contract duration to construction of project is too short,
- slow decision making process of the owner,
- mistakes in soil investigation,
- changes in the scope of the project, delay in delivering the site to the contractor
- difficulties in obtaining work permits from the authorities

b) Causes of contractor related delay factors

- poor qualification,
- skills and experience of the contractor's technical staff,
- poor controlling of subcontractors by contractor (relationships, payments...)
- cash flow problems faced by the contractor,
- slow preparation of change order requests by the contractor,
- poor planning and scheduling of the project by the contractor,
- poor site management and supervision by the contractor
- improper construction methods implemented by the contractor,
- material quality problems,
- delay in site mobilization,
- shortage of construction material,
- equipment availability and failure,
- delay in preparation of shop drawings,
- delay of material supply,

- difficulties in obtaining work permits from the authorities concerned and
- poor manpower productivity**.**

c) Causes of consultant related delay factors

- design changes,
- inadequate qualification of the consultant to the project
- deficiency in drawings
- poor qualification of supervision staff of the consultant engineer
- absence of consultant's site staff
- delay in giving instructions,
- delay in approval of shop drawings
- design errors made by the designers due to unfamiliarity with local conditions and environment
- poor communication and coordination by the consultant engineer and
- documents not issued on time.

d) Causes of delays due to external delay factors

- security measures,
- government change of regulations and bureaucracy
- official and non-official holidays
- problems with local community
- economic conditions; local or global,
- lack of communication between different parties,
- unforeseen site conditions and geological factors,
- rise in the prices of materials,
- delays in resolving contractual issues,
- conflict between contractor, owner and consultant,
- weather conditions effect on construction activities,
- external work due to public agencies (roads, utilities and public services).

From those determinate factor the researcher was found that the top 10 factors causing delay are:

- security measures
- government change of regulations and bureaucracy
- official and nonofficial holidays

- low performance of the lowest bidder contractors in the government tendering system
- design changes by the owner,
- design changes by the consultant
- delay in progress payments by the owner
- problems with local community
- owner's lack of experience in construction and
- economic conditions; local and global.

2.3 Conceptual framework

This is also captured in the conceptual framework which is a tabulated relationship between the independent variables and dependent variable. The conceptual framework of the study was developed from different authors findings (Chan and Kumaraswamy 1997; Wambugu, 2013; Theodore, 2009; Dainty et al, 2003; Bilczynska and Wojcik, 2014; Oyetunji and Anderson, 2006). The study was guided by conceptual framework.

Table 2. 1 Classification of items (variables) of delay factors as perceived by the client

Item	Factor Label
Project complexity (Project type, project scale, etc.) Improper conflict resolution process adopted Improper project feasibility study Frequent project scope/Design changes Improper contractor/Consultant selection Slow decision making process Ambiguous project requirements Unrealistic contract/project duration	Contract related Delays (F1)

Poor site access Lack of client representatives at site Severe weather conditions at site Geological problems on site Change/Transfer of project personnel during project execution	Site related Delays (F2)
Delay in progress payments Price fluctuations due to Inflation Lack of project funding Global/National Economic crises	Financial related delays (F3)
Change in government policies affecting project Law and order situation/Security threats/Local Agitations Delay in Center/State government document clearance process/ bureaucratic delays Change in political power at State/ Center	Political related delays (F4)
Issues in client procured materials Lack of competent/expert project domain people Land acquisition problems Delay in selection of PMC/contractors/suppliers	Resource related delays (F5)

Table 2. 2 Classification of items (variables) of delay factors as perceived by the Consultants

Item	Factor Label

Delay in quality check inspections/approvals of materials at site Delay in RA bill certifications leading to contractor's fund shortage Staff shortage due to holidays/staff leaves/absenteeism Lack of monitoring of availability of equipment at site	Delays due to Resource management issues(F7)
Lack of consultation with client/contractor Unclear lines of responsibility Delay in issue of EOT/Approvals to contractor Lack of participating in site meetings Poor project planning/project tracking by consultant	Delays due to communication related issues (F8)

Table 2. 3 Classification of items (variables) of delay factors as perceived by the contractors

Item	Factor Label
Inappropriate construction methods used Rework due to errors during execution Improper Geological study Poor site supervision and control Frequent Equipment Breakdowns Accidents during construction/Safety not followed Low labor productivity	Delays due to execution related issues (F10)
Improper selection/Change of sub-contractors Unrealistic project schedule bided by the contractor team Delay in request for approvals of Documents/drawings	Delay due to Planning Deficiency (F11)

Poor site mobilization Failure to utilize Project management tools (MSP, P6, EVM, etc.) Delay in work permits to sub-contractors/Labors Delay in provision of utilities at site (Water, electricity, etc.) Poor manpower planning/lack of expertise	
Lack of poor communication with clients or consultants Lack of timely decision and corrective actions by the contractor team Bitter relationship with consultant/Client Unclear lines of responsibility/authority	Delays due to communication related issues (F12)
Conflict on ambiguous contract clauses framed Poor project technical feasibility study during bidding stage Improper project design/constructability Disagreement on design/specifications with consultants	Delays due to contract related issues (F13)

After an in depth review of theoretical and empirical literatures which provided different factors affecting project completion is conducted in the preceding parts of the chapter. The student researcher has reached up on a conclusion that critical delay factors in project completion due to different independent variable and dependent variable are the appropriate theories to construct this study up on. These studies have been carried out and published. From the mentioned delay factors in review above, the six most significant success factors in determining of project delay identified by different author in different countries have been chosen for this study to be independent variables. The dependent variable of the project is time. Time is the adopted project

completion measure the delay level of project. However, there is no literature available on the factors influencing completion of projects in Ethiopian Country especially for industrial project.

3 CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. As data and methodology are highly interdependent, the methodology to be used for a particular research problem must always take into consideration the nature of the data that will be collected to resolve the research problem (Kothari, 2004).

This chapter comprises of the method and the design that was used to conduct the research. It was a qualitative research in which the data was collected using questionnaires. The population was made of clients, contractors and consultants. There was collection of both primary and secondary data. The primary data was obtained using questionnaires while the secondary data was gathered from the literature. In addition, this chapter also presents the questionnaire design, the different sections of the questionnaires, the scale as well as the pilot study that was conducted to ascertain their liability of the questionnaire.

The research methodology chosen for this study comprised of intensive literature review, questionnaire to building construction stake holders in (Tana Beles Sugar Factory) and a statistical analysis of the Survey.

- Literature gathering
- Literature review
- Questionnaire preparation
- Questionnaire Survey
- Data collection
- Data analysis

3.2 Research Approach and Design

Research design is defined as a framework of methods and techniques chosen by researchers to combine various components of research in reasonably logical manner so that the research

problem is efficiently handled Bhat (2019). It is the blueprint for conducting the study that maximizes control over factors that could interfere with the validity of the findings. Designing a study helps the researcher to plan and implement the study in a way that will help the researcher to obtain intended results, thus increasing the chances of obtaining information that could be associated with the real situation (Burns & Grove, 2005).

The research was designed to get opinions from clients, consultants and contractors of construction companies in regard to cause of delay factors in the construction project.

The study intends to assess the determinants of project delay factors of the case tana beles sugar factory. The cause and effects (causal) relationship between variables are assessed throughout the study. This makes it appropriate for the study to implement explanatory research design.

3.3 Study population

Study population is composed of those people who directly affected by the problem of thesis (delay in construction project).

Study sample

- Study sample (consultant offices)

This sample represents the consultant's office party, the researcher chooses a sample of study population, which includes consulting engineering offices which actively participate in construction project.

- Study sample (contracting offices)

this sample represents the contractor party include only the companies the take full contact which is contracted by metal and engineering corporation (METEC) and sub-contracting companies, Amhara water works and Afrotsion construction company, depending on their size of executed project, capitals and staff qualifications.

- Study sample (client's offices)

A number of owners who have experienced in construction projects which include (managers, owner's engineers, supervisor's).

3.4 Sampling method and Sample size

The sample size of this research paper was selected from sugar building construction projects that were under construction in Tana Beles in jawi district. For the selecting criteria of sample size, the researcher gathered information from those that directly participate on sugar construction project. The information was collected from Ethiopian sugar corporation bureau, metal and engineering corporation bureau, Amhara water works construction bureau, Afrotsion construction bureau and Meles Hail Consulting (MH engineering) bureau. From this technique a purposive sampling method was adopted to select the sample for the study as it involves selecting a sample based on experiences or knowledge of the group to be sampled. Therefore, this study was planned to be conducted on three building construction projects that are being constructed by construction firms of grade one and one consulting office that directly involve on the project. The target respondents to the questionnaires on the various sites in this research include Contractors (project manager), Supervisors' or Quality controllers, Consultants (resident engineer) and Client currently working on building project and those worked on the project and currently terminated the work **Study area**

Tana beles sugar development project is the one that located at Awi Zones Jawi district of Amhara region. Its head quarter is at Fendika Town 650Km from Addis Ababa and 225Km from Bahir Dar town.

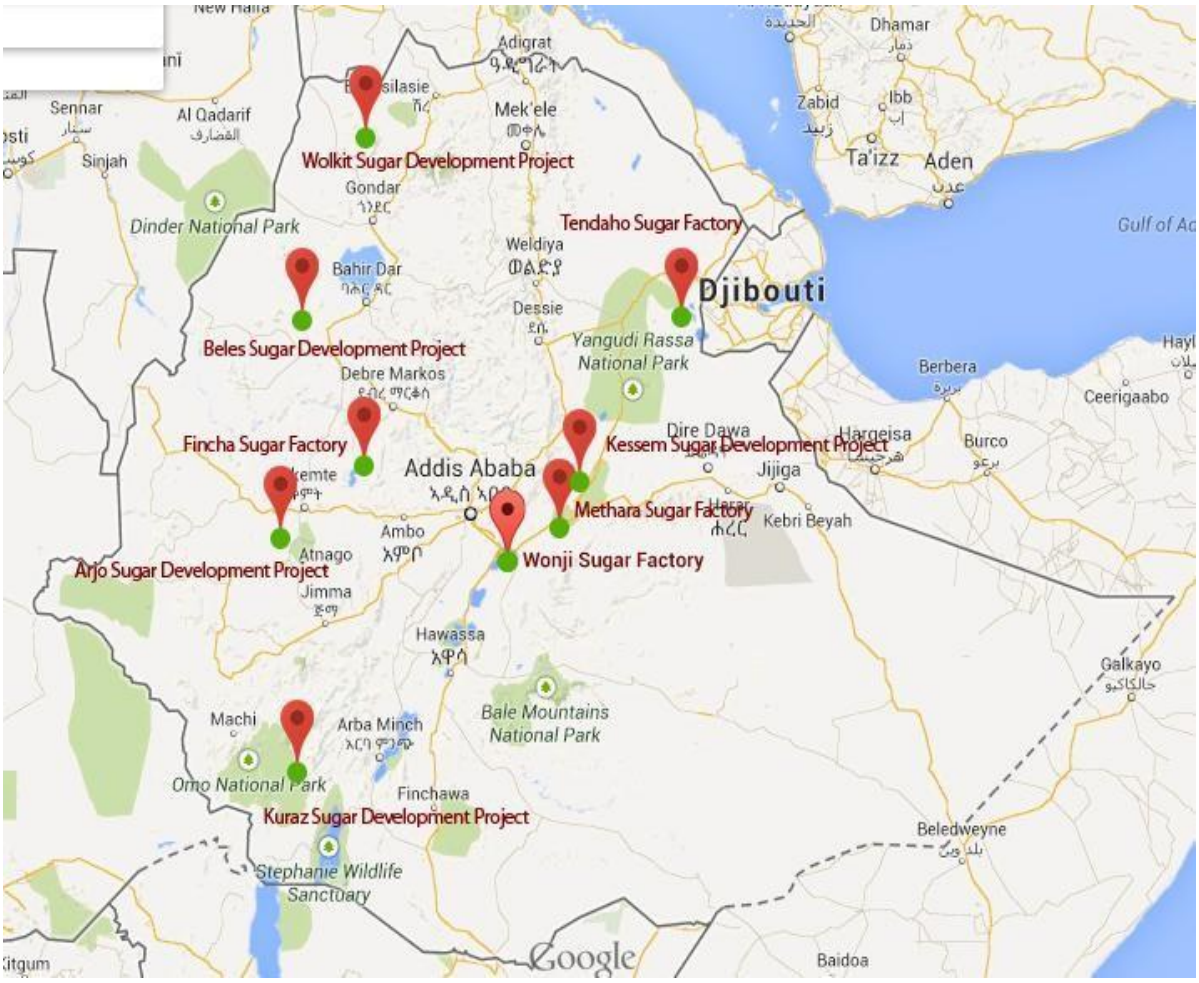

Figure 3. 1 Location of sugar factories in Ethiopia (Source: ESC)

3.5 Data collection method

The data for the study was obtained from the primary and secondary sources. The data from the primary sources were collected through questionnaire and case study. A detail literature review was conducted on books, codes of practices, specifications, and relevant websites to compare and analyze the current (existing practice) in tan abeles sugar construction project. Project managers, site engineers, office engineers, site quality controllers and resident engineers were the source of information for the primary data. Both close ended and open-ended questions were developed to collect relevant data to the study.

The study employed both qualitative and quantitative data collecting tools. The use of mixed methods approach for this research was intended to drive the benefits of both quantitative and qualitative approaches. The bulk of the data were collected through administering questionnaires

survey (closed and open-ended questions). The quantitative data obtained from the questionnaire survey is organized, coded and categorized using the SPSS software; which facilitates analysis and testing; and the presentation of the statistical outcomes.

3.6 Questionnaire design

Questionnaire design from the literature reviewed, relevant information that could aid the study objectives were collected and reviewed. A first draft of the questionnaire was developed on the basis of a review of the literature. The questionnaire form consists of four main parts: The First part includes information about the respondent particulars such as position and number of years of experience. The second part of the questioner dealt the cause of delay factors in Tana Beles sugar factory, the third part is about effects of delay handling practice and the fourth part consists of the resolution methods to overcome the delay factors. Closed questions required the respondents to rate (using Likert Scale) their opinions on issues relating to delay factors in the project and also from their experience in building projects in tan abeles sugar factory.

3.6.1 Questionnaire validity

The objective of literature review includes many of relevant materials from text books, professional journals, papers, research report, and internet to develop a framework for the research study and to prepare structured interviews and Questionnaire survey. The identified causes have been verified through literature review and series of interviews with a number of selected experts in construction projects such as managers, engineers, owners, academic and contractors.

3.6.2 Questionnaire distribution

Questionnaire was distributed in several ways to increase the number of response research sample and theses methods include

- Distribution of questionnaire by hand, by contacting them and making an appointment to meet, finding out their address and then going to their office and their companies.
- Distribution of questionnaire by phoning, by making calls to sample search to obtain their email.it was difficult to get their office to be delivered by hand due to several reason, there is no enough time for some people to meet personally and due to world global

pandemic case. Therefore, it has been sent their emails and through telegrams phone application, with a demand to fill the questionnaire.

Questionnaire was distributed to 80 contractor companies, 20 consultant offices and 60 owner institution, Questionnaire was distributed as follows

- 35 contractor engineers from metal and engineering corporation, 23 from Amhara water works corporation and 17 from Afrotsion construction company.
- 30 owners from Ethiopian sugar corporation
- 8 consultants from Meles Hail (MH ENGINEERING) consulting office.

3.7 Ethical Considerations

This study was conducted according to the ethical guidelines of research requirements. The privacy and confidentiality of the respondents of this study was protected by keeping in secrecy the information collected. Deception was avoided by informing construction companies about the purpose of the research and its implications on the respondents.

3.8 Data processing and analysis

The collected raw data was first sorted, edited, coded and then entered into a computer software. Two programs used where the excel sheet and statistical package for Social Science (SPSS). The method analysis combined both quantitative and qualitative types of data. The data collected using closed-ended questions of the questionnaire were analyzed using descriptive statistics. Data was analyzed by determining the mean score, percentages using the statistical package for social sciences (SPSS) software and appropriate graphical representations and tables were obtained to analyze the questions and to present the data more elaborately in accordance with their importance. The data were summarized, and content analysis was carried out using narrations and interpretations.

3.8.1 Reliability test

Cronbach's alpha (α) coefficient

The data gathered through questionnaires is checked by Cronbach's alpha (α) coefficient for reliability or consistency. Cronbach's alpha is a measure of reliability of the data on a questionnaire and ranges from 0 to 1.0. It indicates the extent to which the respondents rate the

same question. For example, if all respondents give same answer to all questions, the alpha for these questions would be 1.0. The minimum level for reliability when using Cronbach's alpha coefficient is 0.7 and any value below this indicates that the variables are inconsistent and unreliable (Fellows & Liu, 2007).

Cronbach's alpha is calculated using the following equation 3.3 (Boermans & Kattenberg, 2011)

$$\alpha = \frac{I}{I-1}\left(1 - \frac{\sum_{i=1}^{I}\sigma_i^2}{\sigma_X^2}\right)$$ ---------- [Eq.3.1]

Where I = the number of items in the scale.

σi2 = the variance of item i, and

σ2X = the variance of the observed total test scores

3.8.2 Correlation test

Spearman's Coefficient of Correlation

Spearman's coefficient of correlation (or rank correlation) was analyzed to test for agreements among the three main parties – government sector, private consultant and private contractor. Spearman's coefficient of correlation (or rank correlation) is a method of determining the degree of correlation between two variables where ranks are given to the different values of the variables. The main objective of this coefficient is to determine the extent to which the two sets of ranking are similar or not. Thus, government sector with private consultant; government sector with private contractor and consultant with contractor.

Spearman's coefficient of correlation (or rank correlation) is analyzed using the give formula (Kothari, 2004) (Kothari, 2004).

$$\text{Spearman's coefficient of correlation (or } r_s) = 1 - \left[\frac{6\sum d_i^2}{n\left(n^2-1\right)}\right]$$ ----------[Eq.3.1]

Where di = difference between ranks of i^{th} pair of the two variables;

n = number of pairs of observations.

3.9 Pilot study

A pilot study involves testing a questionnaire with a small group of people who represents target respondents. This will help pin point mistakes in the questionnaire and will also determine if the questions will be understood and easily answered by the respondents. A pilot study for the questionnaire was conducted before collecting the results of the sample. It provides a trial run for the questionnaire, which involves testing the wordings of the questions, identifying ambiguous questions, testing the techniques used to collect data, and measuring the effectiveness of standard invitation to respondents (Naoum, 1998).The piloting process was conducted by five respondents who are currently working in Addis Ababa who actively participate in sugar construction project, they were selected precisely because of their practice in the construction projects and nearness for the researcher. The five were invited to participate in the piloting process and were asked to review the questionnaire and give their advice. Important comments and some modifications have been done. The main comments could be summarized as follow:

- The name of the organization and Address removed from the questioner to keep the information of the organization secret.
- Some factors and sentences should be modified or represented with more details.
- Some factors and sentences should be modified in order to give more clear meaning and understanding.

4 CHAPTER FOUR: DATA ANALYSIS, PRESENTATIONS AND INTERPRETTATIONS

4.1 Introduction

This chapter provides explanations for data collection such as distribution of the questionnaire, collection of responses and subsequent analysis of the data acquired through the responses from professionals who are working for the client, consultants and contractors and involved in factory building projects in tana beles sugar factory construction project.

A questionnaire survey has been conducted to gather the required information from professionals who have been involved in factory building projects in tana beles sugar factory construction project, working on behalf of a client, consultant or contractor; towards answering the basic research question.

4.2 Questionnaire Response Rate

The questionnaire was prepared and distributed to three contractual parties i.e. contractors, client and consultants currently working on the factory building project sites in person and through technological accesses contact by going to all the project parties. In building construction project, the three main parties, the project owner, the consultants, and the contractor involved in the project have specific roles and tasks, which are all vital to the success of a project. Thus, the three main parties were targeted in the research. Seventy-four (74) questionnaires were distributed to the parties by considering the position of the respondents in the project.

- **Client**

Out of the total 30 questionnaires sent out to the clients; 26 questionnaires were received and considered valid for analysis. This represents 83.9% of the total number of questionnaires sent out to the Client.

- **Consultants**

A total of eight questionnaires were sent out to the consultants out of which six questionnaires were collected. This represents 75% of the total number of questionnaires sent out to the consultants.

- **Contractors**

Out of a total of the 35 questionnaires sent out to three different contractors, 62 questionnaires, which represents 80% were returned and found to be valid. An overall response rate of 81.1%was achieved. The questionnaire distribution and collection took one month and the response rate is as shown in the Table below.

Table 4. 1*Questionnaire response rate*

Contractual Parties	Questionnaire distributed	Questionnaire responded	Response Rate
Client	30	27	90.00%
Consultant	8	6	75.00%
Contractor	35	29	82.86%
TOTAL	73	62	84.93%

4.3 Respondents position in the organization

In terms of positions within the projects, 27.4% project manager, 40.3% Resident Engineers, 9.7% site engineer, 9.7% office engineer ,9.7% representatives and 3.2% Site Supervisors participated in responding the questionnaire. The percentage distribution of the various professionals indicates that most of the questionnaires was completed directly by professionals involved in the building construction project.

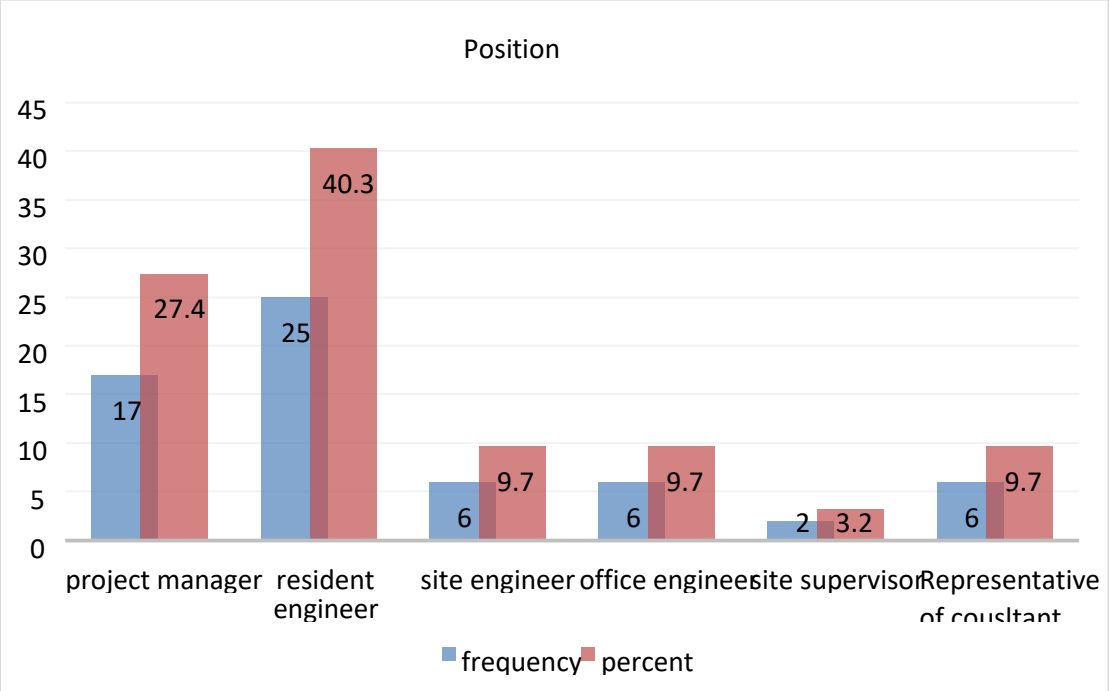

Figure 4. 1 *position of respondents*

Most of the respondents are project managers and resident engineers, which have overall responsibility for the most of the contractual issues of the project and have better knowledge about the research topic.

4.4 Educational level of respondents

The survey result shows that 26 percent of the respondents have MSc. Educational qualification and the rest 74 percent BSc. Degree Educational qualification. Therefore, the survey shows that it was well represented by better qualified professionals and these groups of respondents are expected to have better knowledge on the subject matter.

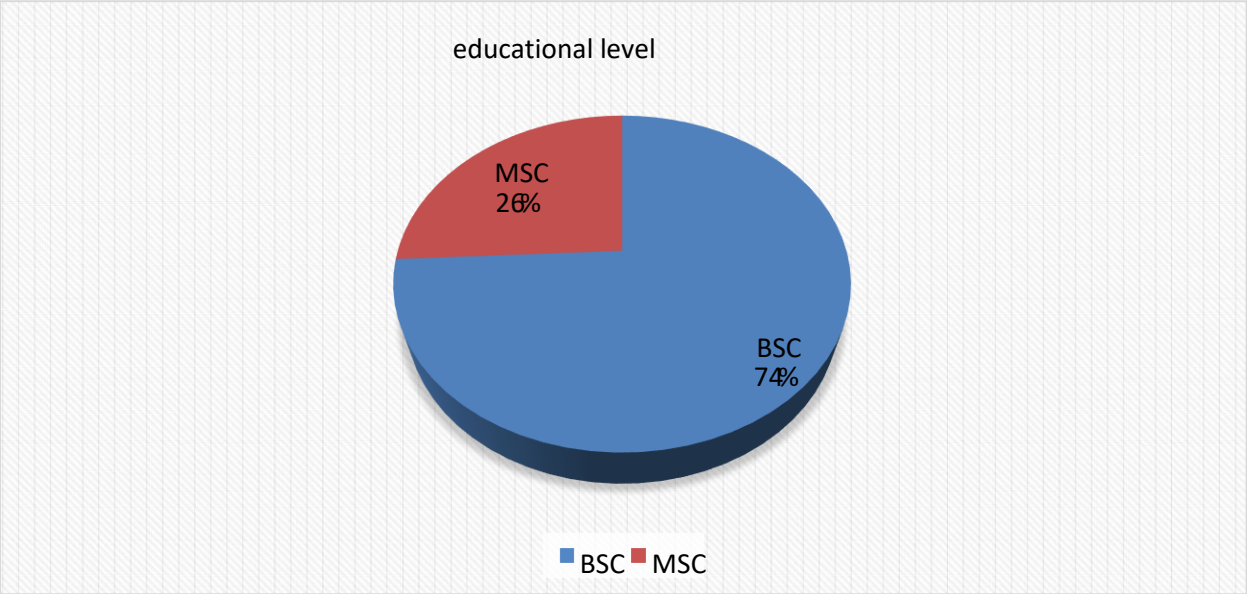

Figure 4. 2 Respondent's educational level

4.5 Work experience of respondents

The results below clearly show that out the 62 returned questionnaires, 22 (35.5%) of the respondents had less than 2-year work experience, 21(33.9%) respondents had 2-5 years of working experience, 15 (24.2%) had 5-10 years of working experience, and finally 4 (6.5%) had above 10 years of working experience. This shows that the results we will obtain will be valid. The overall profile implies that most of the respondents have adequate experience in the construction firms. This indicates that, the respondents could provide the required information for all items included in the questionnaire.

Table 4. 2 *Experience of respondents*

Experience of respondents	Frequency	Percent
<2 years	22	35.5
2-5 years	21	33.9
5-10 years	15	24.2
>10 years	4	6.5

4.6 Factors influencing time overruns at construction projects

This part consists of results and discussion of factors that influence time overruns. These factors include; project related factors, contractors' responsibility, consultants' responsibility, client's responsibilities, and external factors.

- ❖ Contractors view

Table 4.6 shows that the contractors ranked "Delay to deliver the site (Right of way problem)" in the first position with a mean score of 4.483. This indicates how right of way problem affect the project time. If there is a right of way problem in construction project it will lead to a significant delay in a project. As observed from study some projects delay for years only due to right of way problem. The suitable description of this agreement is that the delay to deliver the site (Right of way problem) has a high impact in delaying Ethiopian sugar corporation construction projects.

The second important factor ranked by contractors was "Financial problems" with a mean score of 4.207. This is a strong indication that financial problem will cause delay. The suitable description for this consensus is that cash is very necessary for contractor to construct the project within specified time. Any shortage of cash for the contractor will cause many problems such as slow progress and work decline in productivity. Also the contractors will not be able to purchase the needed equipment for work. The client pays advance payment before the project starts. So the financial problem is due to contractor's mismanagement. Improper planning is ranked by contractor as the third important factor that can cause time overrun with a mean score of 3.897. Proper planning is important for accomplishing the project successfully. If the contractors fail to

plan their work properly it will affect the project completion time and it will be a big loss for contractor and end users.

The respondents from contractors ranked “Weather condition” in the fourth with mean score of 3.845. since the construction site area of the project is extremely hot area, it challenges the worker to work effectively and efficiently. This will affect the project completion time significantly.

Site management problem is ranked as the fifth important factor that can cause time overrun with a mean score of 3.759. Poor management cause many constrains at the projects, such as poor following up of progress, incorrect distribution of works, un commitment of employees at the site, poor monitoring of project --etc. These factors above contribute to delay the project.

Table 4. 3 Factors influencing time overruns from point view of contractors, consultants and client

Factors affecting time overrun	Contractor		Consultant		Client		Weighted average	
	MSi	Rank	MSi	Rank	MSi	Rank	MSi	Rank
Delay to deliver the site (Right of way problem)	4.451	1	4.231	2	4.4	1	4.404	1
Financial problems	4.234	2	4.385	1	4.3	2	4.266	2
Improper planning.	3.874	3	3.962	5	4.3	2	3.958	3
Site management.	3.765	4	3.731	6	4	6	3.830	5
Weather condition	3.721	5	4.115	3	4.2	4	3.904	4
Unrealistic imposed contract duration.	3.233	6	3.423	8	4.1	5	2.895	7
Suspension of work by client or contractor	2.966	7	4.038	4	3.9	7	3.287	6
Contract Administration.	2.914	8	3.385	9	3.5	11	3.107	8
Change orders	2.914	8	3.577	7	3.6	8	2.723	8

Shortage in material.	2.69	10	3.269	10	3.5	11	3.107	11
Quality assurance/control.	2.69	10	3.038	17	3.5	11	2.872	12
Absence of consultant's site staff	2.622	12	3.115	6	3.3	15	3.149	10
Equipment availability and failure.	2.592	13	3.423	8	3.6	8	2.844	13
Labor productivity.	2.459	14	3.346	11	3.6	8	2.702	16
Unforeseen ground condition	2.424	15	2.962	12	3.2	16	2.760	14
Quality of material.	2.311	16	3	18	3	21	2.724	12
Lack of communication between the parties.	2.311	16	3.231	19	3.4	14	2.853	15
Waiting time for approval of tests and inspections.	2.269	17	2.962	13	3.1	20	2.670	17
Mistakes during construction.	2.152	18	2.831	14	2.7	24	2.450	24
Inadequate contractor experience.	2.152	18	2.846	15	3.1	20	2.568	23
Regulatory changes	2.136	19	2.538	21	2.5	27	2.532	21
Owner interference.	2.136	19	2.577	20	2.4	29	2.534	22
Preparation and approval of drawings.	2.136	20	2.731	16	2.4	29	2.532	19
Labor supply.	2.122	21	2.654	19	2.8	22	2.463	17
Major disputes and negotiations.	2.102	22	2.5	22	2.5	27	2.380	25

- Consultants view

Table 4.6 shows that the consultants ranked financial problems with a mean score of4.385 as the first factor that causes delay. This indicates the high importance of cash for the progress of project. Any shortage of cash for the contractor will cause many problems such as slow progress

and work decline in productivity. Also the contractors will not be able to purchase the needed equipment for work. More over the problem of cash also expanded to traders and suppliers, which in turn leads to slow the work, then to occurrence of project's delay.

The second factor that causes delay was "Delay to deliver the site (Right of way problem)" with a mean score of4.231. This directly delays site hand over. Domestic contractors tolerate delayed hand over of construction sites but foreign contractors do not tolerate delayed hand over of construction sites by employers; foreign contractors claim to be compensated for idle hours of man power and equipment's due to the delay. These are due to cultural differences between domestic contractors and foreign contractors; domestic contractors which suffered from delayed payments and late site hand over, say that such tolerance is to avoid adversarial relationship with the stakeholders on that project and hence to create conducive working environment [Fetene, 2008].

The third important factor ranked by consultants was Site management problem with a mean score of4.115. Poor management cause many constrains at the projects, such as poor following up of progress, incorrect distribution of works, un commitment of employees at the site, poor monitoring of project --etc. These factors contribute to delay the project.

The consultants ranked "the suspension of work by owner or contractor" in the fourth position with mean score of 4.038, which indicates the high importance of work continuity in order to complete the project on time. The suspension of work creates disputes between the parties of the project. The sequence of project activities will be affected, which lead to delay. The fifth important factor ranked by consultants was "Improper planning" with a mean score of 3. 962.This result shows the importance of planning and time scheduling to deliver the project on time. When the activities execution is without priorities of tasks and without knowledge of critical path activities, it certainly causes the delay of project.

- Clients view

Table 4.6 shows that clients ranked Delay to deliver the site (Right of way problem) as the first factor that cause delay with a mean score of 4.4. Late hand over of construction sites, sometimes may happen and substantially increase the cost of construction projects. In most international projects in Ethiopia late site hand over is a common form of claim source for compensation for contractors [Girmay, 2003]. But site hand over problem still a major reason for time overrun

according to contractors and clients while consultants ranked second. The second important factor was improper planning and financial problems with a mean score of 4.3. The first result is the same with the contractor, which support the importance of this factor. This result shows the importance of planning to deliver the project on time. When the activities execution is without priorities of tasks, it certainly causes the delay of the project. The fourth important factor was poor site management with a mean score of 4.2. This result is in full conformity with the contractors and client but in the case of consultant, the value of the mean score is higher.

The fifth factors ranked by client were "unrealistically imposed contract duration" with a mean score of 4.1. This is a strong indication of the importance of proper estimation of project duration. Sometimes the project duration determined roughly, therefore the project may be delayed. One of the important obligations of consultant is to determine the duration of project according to the volume of activates. The seventh important factor ranked by client was “Weather condition” with Correlation tests on causes of Time delay among different respondents

Table 32 presents the spearman correlation coefficient for “factors affecting time delay" among client, contractor and consultant. For this group, the correlation coefficient between client and contractor equals to 0.598 with P-value (Sig.) = 0.000. The P-value is less than the level of significance, $\alpha = 0.05$. As a result, the null hypothesis is rejected and the alternative hypothesis that is; there is a significant relationship in ranking of delay factors between contractor and owner is accepted. The correlation coefficient between contractor and consultant equals to 0.384 with P-value

(Sig.) = 0.005. The P value is less than the level of significance, $\alpha = 0.05$, so the null hypothesis is rejected and accepted the alternative hypothesis that is; there is a significant relationship between contractor and consultant. In addition, the correlation coefficient between owner and consultant equals to 0.299 with P-value (Sig.) = 0.030.

The P value is less than the level of significance, $\alpha = 0.05$, so the null hypothesis is rejected and accepted the alternative hypothesis that is; there is a significant relationship between owner and consultant in ranking the factors of time delay.

Table 4. 4 Correlation test on causes of time delay among client, contractor and consultant

Respondents	$= [\frac{(6\sum d^2)}{(n^3 - n)}]$ r_s	**P-Value**	**Significance for P < 0.05**	**comment on Hypothesis (accept or reject)**
Client Vs Contractor	0.598**	0.000	significance	Reject H_O and accept H_A
Contractor Vs Consultant	0.384**	0.005	significance	Reject H_O and accept H_A
Client Vs Consultant	0.299*	0.030	significance	Reject H_O and accept H_A

**. Correlation is significant at the 0.01 level.

*. Correlation is significant at the 0.05 level.

mean score of 4.00.

4.7 Factors influencing cost overruns at construction projects

Table 4.7 shows the rank of all factors of cost overruns that have been investigated in this research from contractor, consultant and client viewpoints. A total of 13 factors which influence cost overruns have been studied and discussed. The rank was based on mean score of the factors.

- ❖ Contractors view

Table 4.7 shows that contractors ranked "Design changes" in the first position with mean score of 4.207. There are many possible reasons for design changes. Some of possible reasons are; the client may need additional work, the quality of material may need change, the alignment may need change due to different reasons or omission of some work may be needed due to financial reason. Design changes in particular and contract change or modification in general is one of the important reasons that cause delay. As any modification in the technical specification, bill of quantities or replace any work with another one, it would lead to disputes between the contractor's and client's teams. Change order refers to changes that are generated by unanticipated causes, for example, scope changes from the owner, Incomplete/in consistent drawings, design error/defect, omissions of site conditions, and changes in codes and regulations. To solve these disputes and develop new agreements, it takes additional time that affects the project schedule and hence affects the total duration of the project. Therefore, design change would significantly affect the cost of the project.

Table 4. 5 Factors influencing cost overruns from point view of contractors, consultants and client

Factors affecting cost overrun	Contractor		Consultant		Client		Weighted average	
	MSi	Rank	MSi	Rank	MSi	Rank	MSi	Rank
Design changes	4.207	1	4.143	1	4.1	1	4.178	1
Inadequate review for drawings and contract documents by consultants.	3.897	2	3.714	2	3.7	3	3.825	3
Fluctuations in the cost of materials	3.845	3	3.714	2	4.1	1	3.836	2
Lack of cost planning/monitoring during pre and post contract stages	3.328	4	3.571	4	3.7	3	3.435	4
Indecision by the supervising team in dealing with the contractor's queries resulting in delays.	3.292	5	3.342	7	3.5	6	3.328	5
Contractual claims, such as, extension of time with cost claims.	3.224	6	3.286	8	3.5	6	3.271	7
Delays in issuing information to the contractor during construction stage	3.121	7	3.571	4	3.5	6	3.286	6
Technical incompetence, poor organizational structure, and failures of the enterprise	3.12	7	3.142	9	3.6	5	3.177	8
Project materials monopoly by some suppliers	3.035	9	3.142	9	3.2	9	3.082	10
Additional work at owner's request	2.914	10	3.429	6	3.2	9	3.087	9
Lack of experience of technical consultants,	2.914	10	2.857	11	3.1	11	2.918	11

Some tendering maneuvers by contractors, such as front- loading of rates	2.69	12	2.857	11	2.7	12	2.737	12
Unpredictable weather conditions	2.552	13	2.571	13	2.6	13	2.562	13

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

- ❖ Consultants view

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

Table4.7 shows that consultants ranked “unpredictable weather conditions” as the least factor that cause cost overruns with a mean score of 2.571. As discussed earlier Addis Ababa has good climatic conditions, so it isn't exposed to any hurricanes or great leaps in temperature or snow fall, therefore the weather condition does not have a significant impact on execution of construction project and to make any damages of these projects.

- ❖ Clients’ view

"Design changes" and “Fluctuations in the cost of materials” were the first factors to cause cost overruns with a mean score of 4.1. Design changes are considered as one of major factor for

increasing the cost of project. As any modification in the design will affect the budget allocated for the project, the volume of required materials, type of required materials and needed labor. Sometimes, design changes cause the rework of already completed items, which means the increase of project duration and to loose of materials. Thus the cost overruns will be present at this case.

"Inadequate review for drawings and contract documents" and “Lack of cost planning/monitoring during pre-contract stages” were ranked as the third factors of cost overruns with a mean score of 3.7. The fifth factor ranked by clients was "Indecision by the supervising team in dealing with the contractor’s queries resulting in delays" and “Contractual claims, such as, extension of time with cost claims” with a mean score of 3.5. Table 4.7 shows that clients ranked the "Unpredictable weather conditions" as the last factor with a mean score of 2.6.

4.8 Correlation tests on causes of cost overrun among different respondents

Table 34 presents the spearman correlation coefficient for “factors affecting cost overrun" among client, contractor and consultant. For this group, the correlation coefficient between client and contractor equals to 0.442 with P-value (Sig.) = 0.051.

The P-value is slightly greater than the level of significance, $\alpha = 0.05$ that is not that much greater from the level of significance, so reject the null hypothesis and accept alternative hypothesis that is; there is significant relationship in ranking of cost overrun factors between contractor and owner. The correlation coefficient between contractor and consultant equals to 0.459 with P-value (Sig.) = 0.042. The P value is less than the level of significance, $\alpha = 0.05$, so reject the null hypothesis and accept alternative hypothesis that is; there is a significant relationship between contractor and consultant. In addition, the correlation coefficient between owner and consultant equals to 0.544 with P-value (Sig.) = 0.013. The P value is less than the level of significance, $\alpha = 0.05$, so reject the null hypothesis and accept alternative hypothesis that is; there is a significant relationship between owner and consultant in ranking the factors of cost overrun.

Table 4. 6 Correlation test on causes of cost overrun among client, contractor and consultant

Respondents	$r_s = [\frac{(6\sum d^2)}{(n^3 - n)}]$	**P-Value**	**Significance for P < 0.05**	**comment on Hypothesis (accept or reject)**
Client Vs Contractor	0.442	0.051	significance	Reject H_O and accept H_A
Contractor Vs Consultant	0.459*	0.042	significance	Reject H_O and accept H_A
Client Vs Consultant	0.544*	0.013	significance	Reject H_O and accept H_A

*. Correlation is significant at the 0.05 level.

4.9 Summary of questionnaire results

The questionnaire survey identifies 53 contributing factors of time delay from literature survey and ranked based on their contribution and the following are top 10 factors of time delay based on the cumulative view of Clients, Contractors and Consultants. These are:-Improper planning and scheduling, Unrealistic contract duration, Improper and poor project feasibility study, Incomplete drawing, design details and documents, Slow response (Late instruction, inspection, Delay in approval), Late in Equipment delivery and mobilization, Poor in contract management, Inadequate contractor experience and delivery of ordered .Similarly, from the distributed 20 causative factors of cost overrun, Poor project (site) management/ Poor cost control, Wastage, Construction Cost Underestimation, poor site investigation and feasibility study, Lack of Experience, Quantity underestimation, Design change, High cost of machineries, Additional work/variation order and Poor procurement policy are top 10 contributing factors. Generally, contributing factors and effects of time and cost overrun and points to minimize the problems are identified in the questionnaire survey.

5 CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter includes the conclusions and recommendations that would help in solving the problem of delay and cost overruns at construction in Tana Beles sugar factory projects. The first objective of this study was to identify whether time and cost overrun exist or not and evaluate to what extent the time delay and cost increases Tana Beles sugar factory projects. The second objective was to identify factors influencing time and cost overruns Tana Beles sugar factory projects. Questionnaire survey was also used to identify the causes of time and cost overrun. Client, consultants and contractors were asked to identify the factors affecting time and cost overrun in Tana Beles sugar factory projects. The data gathered from the survey are analyzed using the mean score (MS).

5.2 Conclusions

This study is conducted to investigate the extent of Time and cost overrun; identify the key factors leading to Time and cost overrun; assess its effect and recommend possible measures in Tana Beles sugar factory projects in Ethiopia. In Tana Belles higher percentage of time overrun and cost overrun respectively were recorded based on the up to date work performance of main tasks in the project. For these poor time and cost performance of Tana Beles sugar factory projects, the research identifies key factors that lead to time and cost overrun trough different documents and by questionnaire from the key stakeholders participating on the project like clients (ESC), Contractors and Consultants. Trough searching of different documents Poor feasibility study and site investigation, Improper planning and designing, Capacity limitation (Contractor capacity limitation, Shortage of finance, Shortage man power, Shortage of machinery), Poor procurement system, Contract management problem are the main ones among the lists of contributing factors of time and cost overrun.

In the questionnaire, there are time overrun and cost overrun factors identified in literature review and distributed for respondents to rank them based on their contribution. The following are top 15 factors of time delay based on the cumulative view of Clients, Contractors and Consultants. These are:-Improper planning and scheduling, Unrealistic contract duration, Improper and poor project feasibility study, Incomplete drawing /design details and documents, Slow response (Late

instruction, inspection, Delay in approval), Late in Equipment delivery and mobilization, Poor in contract management, Inadequate contractor experience, Poor site management/ coordination on site, late delivery of ordered materials, Poor procurement method for contractor selection, Slow decision making, Delay in site mobilization, Material procurement problem and Lack of standardization and impractical design. Similarly, from the distributed causative factors of cost overrun, Poor project (site) management/ Poor cost control, Wastage, Construction Cost Underestimation, poor site investigation and feasibility study, Lack of Experience, Quantity underestimation, Design change, High cost of machineries, Additional work/variation order and Poor procurement policy are top 10 cost overrun contributing factors.

5.3 Recommendations

Based on the study findings, the following points are suggested in order to minimize and control time and cost overrun in Ethiopian mega sugar industry construction projects

- Give serious attention to the feasibility study and site investigation through participating the community and make sure that it is done carefully.
- Delivering appropriate infrastructure (electric power, telecom, water, and road) before the start of construction.
- Fulfill the required services (school, water supply, house, health care etc.) for community and employees in and around the company
- Pay serious attention to designing, planning and scheduling
- All stakeholders in government building construction projects are not discharging their responsibilities, therefore it is recommended to enhance capacities of stakeholders and all stakeholders should discharge their responsibilities to promote proper delay handling and reduce the effect that caused by poor delay handling practice.
- Contractors should submit intent for time claim on the time stipulated on the contract and the time extension request provide by the contractors shall be fair in order not to generate conflict between parties and to inform the owner or the contract administrator that a problem exists, which could entitle the Contractor to an extension of time claims and/or compensation, if it is provided for by the contract.

- Conditions of contract should clearly state about the limit for extension of time granted by employer in order to give a risk for the contractor in regard to duration of the project.
- If there are two or more factory projects in one area, award for different contractors and consultants rather than for one contractors to minimize the risk of poor performance of one contractor and increase competition. It is also recommended not to give one project for contractors and consultants coming from the same country.
- Provide projects for domestic contractors as sub-contract form foreign experienced contractors or form a joint venture with them.
- Ensure the availability of resources like land, water, finance, machineries etc.
- Give appropriate training for employees and share the experience of foreign company by blending the domestic with foreigners.
- It is highly advised to use top and senior managers with good level of related work experience and performance rather than appointing them based on their political view.
- Develop good organizational structure to ensure responsibility and accountability matrix.

5.4 Suggestions for future research

- Assessment of problems on feasibility study of mega sugar construction projects in Ethiopia
- Assessing the cost implication of time and cost overrun in mega sugar projects in Ethiopia
- Identifying the responsible parties for the problem of time and cost overrun in mega sugar industry construction projects of Ethiopia.
- And other further studies are recommended to be undertaken in other Mega construction projects in Ethiopia in order to come up with a nationwide mechanism for minimizing time and cost overruns in such mega projects and in construction industry in general.

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APPENDEX

APPENDEX I- QUESTIONNAIRE

Factor of Delay on Tana Beles Sugar Factory Project

To the respondents,

This survey is part of academic research that aim to assess the major factors that causes of delays on tana beles sugar factory project and its influence on the successful completion of the project. The primary objective is to identify the principal factors responsible for delays in tana beles sugar factory project, their effect on the progress as well as timely delivery.

With this survey, I would like to investigate the critical delay factors that currently exist in the tana beles sugar factory project in order to improve the public massive building construction project delivery process**.** To meet this research objective, it is necessary to have the response of contractors, client and consultants that currently working on the scheme project and those who worked in the early phase of the project work, hence you are one of the stakeholders recruited to respond this questionnaire. Accuracy in answering the questions included in the questionnaire is necessary to have reliable output of the data analysis. Moreover, your immediate response helps to finish the research timely. I confirm that your response will be used only for the purpose of this research looking forward to your soonest response. If you are unsure of an answer, please respond with your best estimate. I value your participation and thank you for the commitment of time, energy and effort. If you have any further questions, I can be reached at the address below.

Sincerely,

Tirualem Tafesse

Post Graduate Candidate, Project Management

Stmary university

Tel.: +251 912 33 36 35

Email: goodworldzbest@gmail.com

SECTION A PERSONAL INFORMATION

1) Name: (Optional)

_____

2) Company Name

_____

3) Email:

_____

1.1 what is the type of organization you are working?

☐ Client ☐ consultant ☐ contractor

1.2what is your position in the organization?

_____

1.3 What is your education level?

☐ Diploma ☐ BSC ☐ MSC ☐

PhD

1.4 Number of years in organization (in years)

☐ Less than 2 ☐ 2-5 ☐ 5-10 ☐ more than10

SECTION B: FACTORS AFFECTING THAT CAUSE DELAY IN THE PROJECT

Please indicate the significance of each factor by ticking the appropriate boxes. Add any remarks relating to each factor on the last column.

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

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

N.S. = not significant (1)

No	**Factor**	E.S. (5)	V.S .(4)	M.S. (3)	S.S. (2)	N.S. (1)	**Additional comment (If any)**
1	**Owner related**						
a	Delay to furnish and deliver the site (Right of way problem)						
b	Poor communication and						

	coordination						
c	Finance and payments of completed work.						
d	Owner interference.						
e	Slow decision-making by owners.						
f	Unrealistic imposed contract duration.						
g	Owners lack of experience in construction						
h	Additional work at owner's request						
i	Poor contract management						
2	**Contractor related**						
a	Financial problems						
b	Subcontractors						
c	Site management.						
d	Construction methods.						
e	Improper planning.						
f	Mistakes during construction.						
g	Inadequate contractor experience.						
h	Quality of material.						

i	Shortage in material.						
j	Labor supply.						
k	Labor productivity.						
l	Poor project management						
3	**Consultant related**						
a	Absence of consultant's site staff						
b	Lack of experience on the part of the consultant						
c	Contract management.						
d	Preparation and approval of drawings.						
e	Quality assurance/control.						
f	Waiting time for approval of tests and inspections.						
g	Deficiency in drawings						
h	Design changes						

No	**Factor**	E.S. (5)	V.S .(4)	M.S. (3)	S.S. (2)	N.S. (1)	**Additional comment (If any)**
4	**External factors**						

a	Equipment availability and failure.						
b	Major disputes and negotiations.						
c	Lack of communication between the parties.						
d	Weather condition						
e	Regulatory changes						
f	Unforeseen ground condition						
g	corruption						

If you have comments regarding to cause of delay factors in the project kindly request to write here

_____

_____

_____

_____

_____

_____

_____