Addis Ababa University

College of Business and Economics

Department of Project Management

A Study of Causes of delay in Construction Projects: Case Study of Modjo Dry Port Construction Project.

A Project work submitted to the School of Graduate studies at Addis Ababa University College of Business and Economics in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Project Management.

By: BeleteBoterMelka

Advisor: TemesgenBelayneh (PhD)

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ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF PROJECT MANAGEMET

Analyzing the Causes of Delay of Construction Projects: Case Study of Modjo Dry Port Construction Project

A Project Work Submitted to Addis Ababa University College of Business and Economics School of Commerce in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Project Management

By: BeleteBoter

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Advisor signature date

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Internal Examiner signature date

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External Examiner signature date

_____ _____

Declaration

I,BeleteBoter, hereby declared that this research project work entitled “Analyzing the Causes of delay of Construction Projects: Case Study of Modjo Dry Port Construction Project” has not been previously submitted to any institution and it is my own work to the best of my knowledge and belief.

BeleteBoter _____ _____

Name signature: date

Certification

This is to certify that this project work entitled “Analyzing the Causes of Delay Construction Projects: Case Study of Modjo Dry Port Construction Project” is under my supervision. This work is original and suitable for the submission in partial fulfillment of the requirement for the award of Master of Arts Degree in Project Management.

TemesgenBelayneh (PhD) _____ _____

Advisor signature Date

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Acronyms and Abbreviations

BoQBill of Quantity

CDSCO Construction and Design share Company

EEA Ethiopian Economic Association

ESLSE Ethiopian Shipping and Logistics Services Enterprise

EWWCE Ethiopian Water Works Construction Enterprise

GDP Gross Domestic Product

GTP Growth and Transformation Plan

KSA Kingdom of Saudi Arabia

M & E Monitoring and Evaluation

MoFEDMinistry of Finance and Economic Development

MoWUDMinistry of Works and Urban Development

PFDD Port and Facility Development Department

PM Project Manager

PMBOK Project Management Body of Knowledge

PMI Project Management Institute

PTSS Port and Terminal Service Sector

RE Residential Engineer

RoRoRoll- on and Roll- Off

SPSS Statistical Package for Social Science

UAE United Arab Emirates

USA United State of America

Abstract

This study is primarily aimed at analyzing the causes of delay of ModjoDry Port Construction Project. The study identifies the perceptions of the major stakeholders (client, contractor and consultant) who have direct link to the issue of delays. Relevant literatures have been used to identify 49 potential causes of project delay. Toexaminethese causes of delay this study has used questionnaires and interviews to gather appropriate data and to answer the research questions. The data are both quantitative and qualitative. A total sample size of 40 respondents was targeted in the questionnaire and 8 respondents for interview. The respondents included contractors, consultants and client staffs who engaged in the project accomplishment. The questionnaire used Likert scale of 5 points to gather the perceptions of the respondents on causes of delay and four scales Likert to have information on frequency occurrence of the causes of delay. The Cronbach's alpha is used to test the internal consistency or reliability of Likertscale. To analyze the data, severity index (SI) and frequency index (FI) were used to rank the perceptions of stakeholders. The product of the two indices was also employed to generate Importance Index (II) in order to rank the overall degree of influence of the causes of delay to the project. The results have shown that the project has delayed due to designing(preparing design without adequate information, slow in preparing design, delay in approving revised design, and frequent design change), planning & scoping(deficiency in planning and lack of scope definition); consultant related issues(slow in design revision &design approving, poor communication, drawing without detailed data),contractor related(ineffective planning and scheduling, poor schedule management, under estimating activity cost and duration, poor activity sequencing, poor resource planning and poor time management);and the client related causes of delay such as slow in decision making, problem in contract administration, lack of skilled manpower, imposition of unrealistic contract duration & late issuance of change orders. The recommendations were forwarded to frontline players (client, consultant and contractor) in project to put their efforts on the project designing, planning & defining scope by the three stakeholders, as per their magnitudes of influence in order to realize the way in which the project would be completed in stipulated budget and time.

Key words*: project, delay, construction, causes, stakeholders, dry port*

CHAPTER I: INTRODUCTION

1.1. Background of the Study

The demand for infrastructure in Ethiopia is high, because of fast economic growth. Massiveconstruction projects such as hydroelectric powers, roads, housings, ports, bridges and social infrastructures (such as schools and hospitals) are widely undertaking activitiesin Ethiopia. The Dry Port Project is one of projects in the country aimed to solve the disadvantages of physical isolation (land lockedness), supply chain related barriers from sea and the high costs of foreign trading with the rest of the world. To mitigate the high cost problemof imported and exported goods in domestic and world markets related to sea port services(such as demurrage, storage, parking, etc), the concept of DryPortsestablishment was evolved. As a result, Ethiopia had decided to construct dry port and terminal at different regions of the countryto reduce demurrage, sea port services and storage costs. One of the dry ports is ModjoDryPort and terminal that was established, east of Addis Ababa, at ModjoTown, in 2009.The project is undertaking under the ownership of Ethiopian Shipping and Logistics Services Enterprise (ESLSE).The project includes Full Container Terminal, Empty Container Terminal, General Cargo Container Terminal, and RoRo Terminals, Warehouses, Truck Parking, Access Roads and Office Buildings.

However, this projecthas extensively delayed, on averaged, 436% of agreed date of completion. In Ethiopia, studies have indicated that projects are delayed for variousreasons.According to Karlsson(2011) the causes of project delay are problem of early planning process and management. In addition, Werku and Jha,(2016)asserted that contractor's difficulties in financing project; Materials price escalation; ineffective project planning; poor scheduling or resource management; and lack of skilled professionalsinthe field of construction management in the organization are the major causes of project delay.

Delays have costs, risks and undesirable consequences on project success in terms of time, cost, quality and safety (Sunjka and Jacob, 2013). The effect of delay not only confined to the construction project but it influences the overall economy of a country (Divya and Ramya, 2015) and thus it has received much attention in economic development endeavor of a country.

To minimize adverse consequences of delay of a project, the root causes must be known. The causes of delay vary from project to project. Hence, it is impossible to generalize the causes of delay for all projects. Concerning theModjoDry Port and Terminal construction projectthe root causes of delay are poorly understood by the stakeholders. Consequently, this study is to identify the causes of delay of the project in order to minimize further adverse effects of delay couldbe happened to the project.

1.2. Statement of the Problem

It is widely recognized that the construction industry has a positive role to accelerate the wheel of economic growth in any country. Itplays key role in increasing employment and economic infrastructure that significantly contribute to economic development. However, construction projectsare delayeddue to various uncertainties. The problem of project delay has not solved yet even today, when the world istechnologically advanced, and when understanding of project management techniques is higher than ever (Sweis et al., 2008, Yang et al., 2013).

Hence, several researchers have given attention to the problem and conducted many studies. Various studies to project delay identified different causes of delay. According to Nyoni and Bonga (2017) study conducted in Zimbabwe has identified the causes of delay related to owner are delay in progress payment, delay in revising and approving design document, delay in shop drawing& sample materials, and suspension of works. Some causes of delay related to contractorare also difficulties in financing the project, poor qualification, poor site management, inadequate planning, and reworks due to errors during construction. The consultant related causes of delay arealso delay in test approval & inspection, inadequate experience, poor contract management, lack of quality control and late approval of drawing. Other delay factors are also unskilled labor, not using advanced designing knowledge and technology, problem of contract administration, and shortage of material supply. Other study conducted in Nigeria(the Niger Delta region) bySunjka and Jacob(2013) also indicated that the most important causes of project delays areinadequate planning by the contractors, delay or non-payment of compensation to the communities, wrong choice of consultants and contractors by the clients, poor contract management by the consultants, late identification and resolution of drawings and specification errors and omissions by the consultants, poor contract management and inappropriate design by the consultants, unrealistic contract duration by the clients and poor coordination of

subcontractors by the contractors. In addition,the study of Parakash and Joseph (2014) showed that the most critical causes of delay in Pakistan related to contractor are ineffective planning and scheduling of project, delays in site mobilization and delay in sub-contractors work; andrelated to client are alsofurnishing and delivering the site, late revising and approving design documents.

Studies in Ethiopia, on the other hand, indicate that most projects have problems because of poor construction techniques, poor management system, financial limitation, low quality, and inability to complete on schedule (MoWUD, 2006). In addition, according to Werku and Jha (2016) the causes of construction project delay are financial difficulties, escalation of materials, ineffective planning and scheduling by contractors; and delay in progress payments for completed works, lack of skilled professional in construction project management in contractor's organization. Furthermore, according to Zinabu(2016) the internal causes of delay include improper planning, cash flow problem during construction, slow decision making, mismanagement, late delivery of materials and equipmentby the contractor.

As a result, projects are extensively delayed in Ethiopia. The study of Abdissa (2003) conducted on 15 completed projects in different regions of Ethiopia has shown that projects were delayed from 20.66% to 500% of original contract time. While the study of Werku and Jha(2016) indicated that about91.75% of projects in Ethiopia have delayed 352% of its contractual time.

The documents indicated that Modjo Dry Port Construction Project has delayed, on average 436% of its agreed contractual time. To the researcher's best knowledge no study has conducted to investigate the root causes of delay of thisproject. As a result the researcher is highly believed that this study is necessary to investigate the causes of delay of the project. Therefore, the purpose of this study is to investigate the causes of delay of Modjo Port and Terminal construction project.

1.3. Objective of the Study

1.3.1. General Objective

The main objective of this study is to investigate the main causes ofdelay of Modjo Port and Terminal construction project.

1.3.2. Specific Objectives

The specific objectivesare:

- To identify causes of delay to the project from perspective of client, contractor and consultant;
- To investigate level of severity, frequency occurrence and importance indices of the causes of delay to the project;
- To examine the level of agreement on the causes of delay of project among client, contractor and consultant.

1.4. Research Questions

- What are the causes of project delayinModjoDry Port and Terminal construction projectaccording toperceptions of client, contract and consultant?
- How the causes of delay to the project are severe, frequently repeated and important to the project delay?
- To what extent the client, the contractor and the consultant agree on ranks of the causes of project delay?

1.5. Significance of the Study

This work has significant contribution to project stakeholders. It providesinformation to project stakeholders (client, contractor and consultant) on the major causes of delay and help avoid cost andtime overruns. The client as well as the government will be beneficial from this study by taking action against identified causes of delay.Furthermore; this study will help other researcher as a resource to make further research in the area.

1.6. Scope of the study

The study was limited only to ModjoDry Port and Terminal Construction Project. The study only focused in identifying the causes of delay of the project and ranking the causes of delay. Data for

the study were collected from only three parties: owner, contractor and consultant. This study also limited to only 49 causes of delay specified under six major groups of causes.

1.7. Limitation of the Study

The main challenge of this study was shortage of time. This study was conducted under much stress of works and lesser time. The number of respondent is small as the study focuses on the case of one project. On the other hand, the study tried to examine the causes of delay of ModjoDry Port and Terminal, exclude many other projects with similar delay problems in the country.

1.8. Organization of the paper

This project work has five chapters. The first chapter of the study deals with introduction, statement of the problem, research objectives and research questions, significance of the study, scope of the study, and limitation of the study. The second chapter addresses review of related literature. The third chapter concerns with the research design and methodology, sources of data, target population and sampling technique, and tools of data collection and method of analysis. The fourth chapter deals with data analysis and interpretation of the results. The last chapter contains the summary of the findings, conclusions and recommendations of the study.

1.9. Definition of Terms

Construction Industry-The construction includes three sectors buildings(includesresidential and non-residential), infrastructure (ports & terminals, dams, bridges, highways, railways, etc.,)and industrial(refineries, process chemical, power generation, mills and manufacturing plants).

Dry port:A dry port (sometimes inland port) is an inland intermodal terminal directly connected by road or rail to a seaport and operating as a center for the transshipment of sea cargo to inland destinations.

Project Delay: is a lag of project work or slow down of project schedule without stopping construction entirely but leads to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project.

Construction Project Management**:** is a professional service that uses specialized, projectmanagement techniques to oversee the planning, design, and constructionof a project, from its beginning to its end.

Project Scope:-is part of project planning that involves determining and documenting a list of specific project goals, deliverables, tasks, deadlines and costs of the project. In other words, it is needs that haveto be achieved and the work that must be done to deliver a project.

CHAPTER II: REVIEW OF RELATED LITERATURE

2.1.Definitions, Concepts, Management and Project Delay

2.1.1. Definitions and Concepts of project

A project can be defined in a number of ways. Some commonly used definitions of a project is that a project is a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end, usually have time, budget or resources constraints, undertaken to meet unique goals and objectives(PMI, 2012).Wysocki (2014) also defined the project as "a sequence of unique, complex, and connected activities that have one goal or purpose and must be completed by a specific time, within budget, and according to specification."

Each definition capturesthe essential and common features used to identify what a project is. The summaryof the most distinguishing features of a project designates that a project has a starting and finishing time, has boundaries, a one-time effort, usually requiring finite time undertaken by an individual or team to meet specific objective within defined time, cost and performance parameters. Project must have clear, definitive goal or objective. The objective is specific, identifiable, and can be accomplished.

A project consists of number of activities which produce quantifiable deliverables when added together to accomplish the overall objective of the project. The activities must be arranged in sequences based on inputs and output relationship. The activities are unique each time the project is repeated; but are interconnected logically or technically. They are a series of inter-related activities managed by a single individual, designed and organized to accomplish a specific goal, within a limited timeframe, frequently with specific budgetary requirements.

2.1.2. Concepts of Project Management

Several scholars defined project management in different ways. Summarized definition of project management as defined by Kerzner(2003) is the application and integration of modern management and project management knowledge, skills, tools and techniques to the overall planning, directing, coordinating, and motivation and control of all dimensions of a project from its inception to completion. In addition, according to PMI (2000) project management is "the application of knowledge, skills, tools, and techniques to project activities to meet project requirement; project management is accomplished through the use of the project management processes such as: initiating, planning, executing, controlling, and closing."

2.1.2.1.Project Management Process

Project management is a process of leading a team of capable people in planning and implementing a series of related activities that need to be accomplished on a specific date with a limited budget. Coordinating all these activitiesrequire a process must be listed, evaluated, its risks assessed and contingency plans developed. It also requires a close monitoring of the budget, scope and schedule to deliver the project objectives under the expected quality. Each one of these elements needs to be managed in a systematic manner with the development of plans to identify the roles and resources needed. The project management process is scoping, planning, launching, monitoring & controlling and closing (Wysocki, 2014).Similarly, the five foundations (processes) of project management, according to Project Management Body of Knowledge includes: initiating, planning, executing, controlling and closing.

2.1.2.1.1. Project Initiating (Scoping) processes

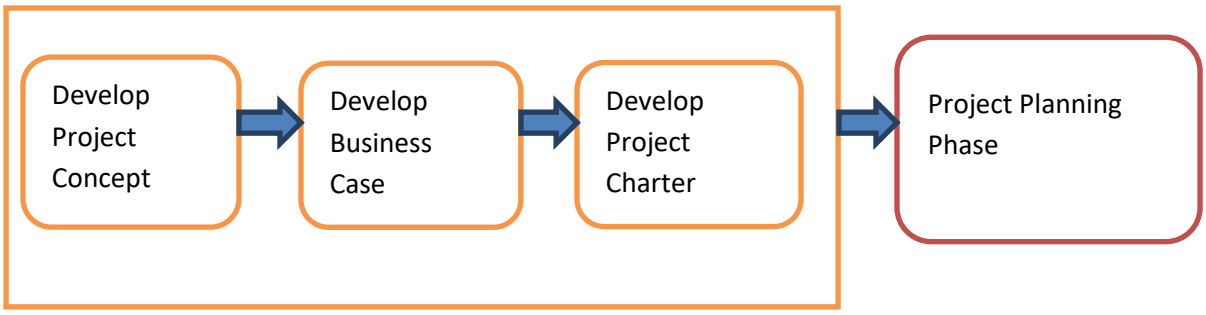
Project initiation is the conceptual element of project management. Itdeals with the basic processes that must be performed to get a project started. Accordingly, the purpose of the project initiation phase is to specify what the project should accomplish. At this stage, if customer's needs could not be specified adequately, the goals and objectives will poorly be formulated. In this phase, a high-level discussion on deliverables must be made and all barriers, potential problems, and roles and responsibilities of project initiation should be summarized, all stakeholders and owner should be convinced. Elements of project initiation phase include the following basic processes of initiation phase:

i. development of the Project Concept,
ii. development of the Business Case,
iii. development of the Project Charter.

The Project Concept Document is used to identify of the existing problem/ business needs; overview of the project approach and product description; and identification of potential and recommended solutions. It clarifies an understanding of what the project, if initiated, is designed to accomplish or to produce. It involves an in-depth understanding of why the owner is interested in spending money and applying resources to undertake the project. The Business Case Document is also a tool that supports planning and decision-making. It answers the question

"What are the financial benefits, opportunities, or weaknesses of approving the project?" A good business case shows expected financial consequences of the project over time and includes the methods and rationale that were used for quantifying benefits and costs. Project Charter Document, on the other hand, is used to indicate the purpose and objectives of the project; development of project scope; and identification of project authority and roles &responsibilities.

Fig.2.1.Project Initiating Process



Source: adapted from Wysocki, 2014

In general initiation phase is the base for good performances of the project throughout project life. Some advantages of initiation phase are:

i. initiation stage is highly instrumental in the life cycle of a project as it defines the boundaries of the project and gives clarity to all participants about the objectives, scope, cost and timescale of the project;
ii. it sets the baseline for scope, cost and schedule;
iii. identifies the right people to involve ;
iv. defines what is included in scope
v. identifies items not included in scope;
vi. breaks project into manageable pieces ;
vii. defines major project deliverables;
viii. define key project risks;

After defining the project and appointing the project team, we are ready to enter the detailed Project Planning phase.

2.1.2.1.2. Project planning processes

The purpose of project planning phase is to kick off a new project and establishes an accurate plan and schedule. The infrastructure that is established during the planning phase is critical to effectively manage the project success.

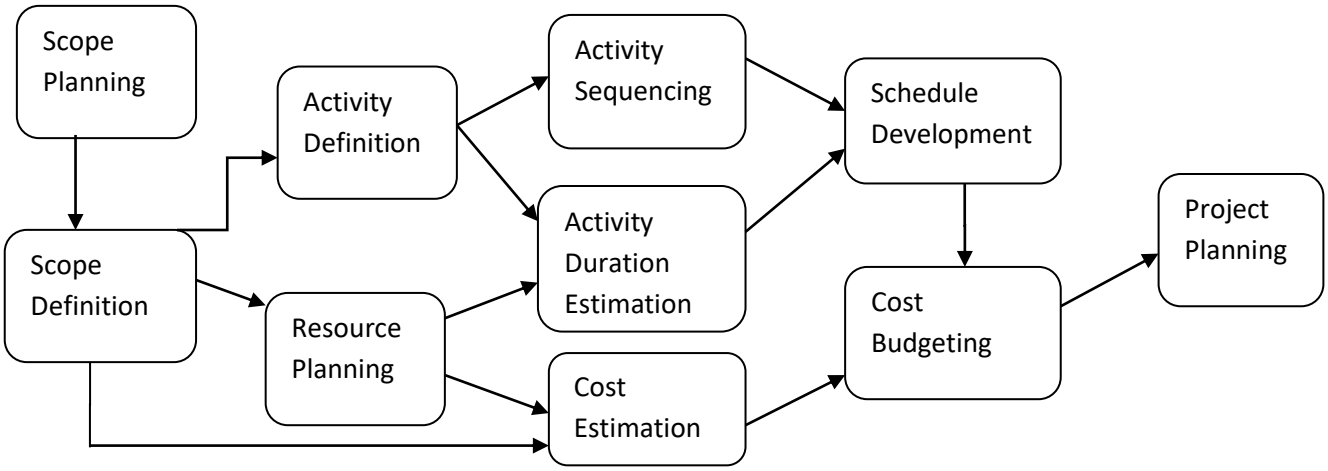
Planning process group is where we decide what we want, how to do, when to do, who to do, money needed, time needed, and so on. Once these are done, we have documents for everything and get every one's agreement and move to the next phase of the project. The planning process formalizes and confirms the project goals and objectives. Planningcovers all project's subsidiary planning areas, such as budget, activity definition, scope planning, requirement planning, schedule development, risk identification, procurement planning, quality planning, communication planning, etc. The output of these processes is the project management plan which describes how the project will be executed, monitored and controlled. It integrates and consolidates all of the subsidiary plans and baselines from the planning processes.

A project with good plan would finish earlier than a project with poor plan .The project with a higher plan has a higher probability of finishing successfully than does the poorly planned project (Wysock,2014).To not plan is exposing ourselves to significant pain later as project proceeds. Planning ensures that the project addresses the organization's needs. In addition, according to Naoum et al. (2004) project is one of the key tools in which stakeholders use to ensure that the needs are successful. A project having a smart plan can convince the stakeholders.Chatzoglou and Macaulay (1996) also stated planning is the extent to which timetables, milestones, workforce, equipment, and budget are specified or estimating the effort, time, and cost and staff resources needed to execute the project. Furthermore, according to Faniran et al. (2000) planning is the systematic arrangement of project resources in the best way to achieve project objective. Kerzner (2006) in his book stated that the primary driving force of planning is to reduce uncertainty. Therefore proper planning is a key project driver for success. The success of any organization's project implementation depends on thoughtful planning. According to Wysocki (2014) project plan "is a statement of intent, not a statement of fact. We expect it to change. A complete plan will clearly state the tasks that need to be done, why they are necessary, who will do what, when the project will be completed, what resources will be needed, and what criteria must be met in order for the project to be declared complete and successful''.

Planning is very important tool in project management. It contributes to the performance of other management functions. Future uncertainty and change make planning a necessity. Even when the future is highly certain, some planning is usually necessary. In the first place, there is the necessity of selecting the best way to accomplish an objective with conditions of certainty. Hence planning is important to offset uncertainty and changes, to focus attention on objectives, to gain economical operation (minimize cost, efficient operation & consistency), and to facilitate control.

A project plan is a dynamic and indispensable action. Not only is it a roadmap to how the work is scheduled, but it is also a tool to aid in your decision making. The plan suggests alternative approaches, schedules, andresource requirements from which you can select the best alternative.

Fig.2.2. Planning Process



Source:PMI, 2013

The Project Planning Phase involves creating of a set of plans to help guide project team through the execution and closure phases of the project. The plans created duringthis phase will help us to manage time, cost, quality, change, risk and issues.

However, in most case planning is not given much attention and nor do the owner consider the value of planning. Some common problems of project planning are:

i. Failure to plan – diving into the performance and execution of work without first slowing down to think;
ii. The underestimation of complexity;

iii. Working under constant and excessive schedule pressure
iv. Planning is seen as the Project Manager's responsibility rather than a team activity;
v. Failure to break a large scale master plan into more manageable pieces that can be delivered incrementally
vi. commitment to a schedule without first getting corresponding commitments from other groups and stakeholders who also have to commit to the schedule;
vii. Unclear roles and responsibilities led to confusion and gaps;
viii. Requirements are never prioritized resulting in team focusing energies on lower priority items instead of high priority work;
ix. Poor estimates based on not understanding the totality of the work;
x. Lack of scope change management because scope was not properly defined to begin with.
xi. Issues occurring because of poor risk management;
xii. Missing work because the schedule is not thought out;
xiii. Not understanding all the stakeholders involved.

2.1.2.1.3. Executing Process

The Project Plan Execution Process ensures that planned project activities are carried out in an effective and efficient way while ensuring that measurements against project plans, specifications, and the original project feasibility concept continue to be collected, analyzed and acted on throughout the project lifecycle. Without a defined project execution process each project team would execute projects using their own best practices, experience, and methods; allowing certain control, tracking and corrective action activities to be missed. It is important to note that project execution relies heavily on the plans developed in the Planning Phase.

Before beginning the execution of the work, it is necessary to take the time to break the project down into tasks in order to plan the performance of these tasks and determine what resources need to be mobilized. Execution is the act of carrying out planned activities. The execution of the project plan is simply the act of performing task and activities that result in the production of the project deliverables. Task and activities performed must be completed effectively and efficiently. The project plan serves as a road map and a common frame of reference for all members of the project team. The project plan is therefore, the foundation for successful delivery of projects. In a

perfect world, plans are executed precisely as written. In reality, no plan is ever performed with such precision. Plans are forward looking documents that cannot anticipate all eventualities. During execution, the project team must continuously monitor its performance in relation to the baselined project plan. By measuring and evaluating the actual execution of project activities against the baseline plan, the project team and stakeholders can gauge the progress of the project.

2.1.2.1.4. Controlling Process

According to PMI (2004) control process is "A project management function that involves comparing actual performance with planned performance and taking appropriate corrective action (or directing others to take this action) that will yield the desired outcome in the project when significantdifferences exist. In the construction industry, the aim of project control is to ensure the projects finish on time, within budget and achieving other project objectives. It is a complex task undertaken by project managers in practice, which involves constantly measuring progress; evaluating plans; and taking corrective actions when required (Kerzner, 2003).

The processes used to observe and control the project execution in order to identify potential problems, and take corrective action, are included in the Monitoring and Controlling Process Group (PMI, 2004).When the project's performance is observed and measured regularly, differences against the project management plan is quickly identified and problems in the project are investigated and can result in an update of the project management plan.

2.1.2.1.5. Closing Process

At this stage all projects reach an end either the objectives being achieved as planned. The project closure phase is an important element of the project activities and needs to be completed with deliberate efforts. Projects are intended to create a precise exclusive result, and on achieving this outcome, the end is reached, and culminates in the project closure. Project closure involves releasing the final deliverables, handing over project documentation, terminating supplier contracts, releasing project resources and communicating project closure to all stakeholders. Acceptance of deliverables is the most important action that is taken during the project closure. The project deliverables are reviewed by the customer according to the agreed acceptance criteria, and formally accepted. Lesson learned during the project are formally completed in the project closure phase, before project team is assigned to other projects. The difficulties

encountered and the actions taken to avoid the problem should be explained. This information will be an important guide for subsequent project.

The project closure process is the last of the process groups, and is considered important for the project's success. All projects have a definite start and a specific end. A project closure process indicates the formal closing of a project, and lists the key activities required to be undertaken at this stage of a project. Project Management Institute provides the following two procedures to be performed in order to close out an entire project or project phase: Administrative closure and Contract closure. The benefit of these procedures is that we can use them to help transition the project to the business and realize true project success. Contract Closure or Procurement Closure is done before the project can be closed completely. It may be done multiple times (once for each contract) during the lifecycle of a project. Administrative Closure is only done once per phase, or for the entire project. Project closure is not complete without procurement closure.

2.1.2.2.Project Management Knowledge Areas

A project is defined with a boundary, limited/defined extent, finite resource requirement, and identifiable end. To meet the objective of the project with limited resource a project management, which is the application of knowledge skills, tools and techniques to project activities to meet project requirements are accomplished through the use of initiation, planning, execution, monitoring and controlling and closure process. These processes have been organized into ten knowledge areas; these are Project Integration Management, Project Scope Management, Project Time Management, Project Quality Management, Project Human Resource Management, Project Communications Management, Project Risk Management, Project Procurement Management and Project Stakeholder Management (PMI, 2013).

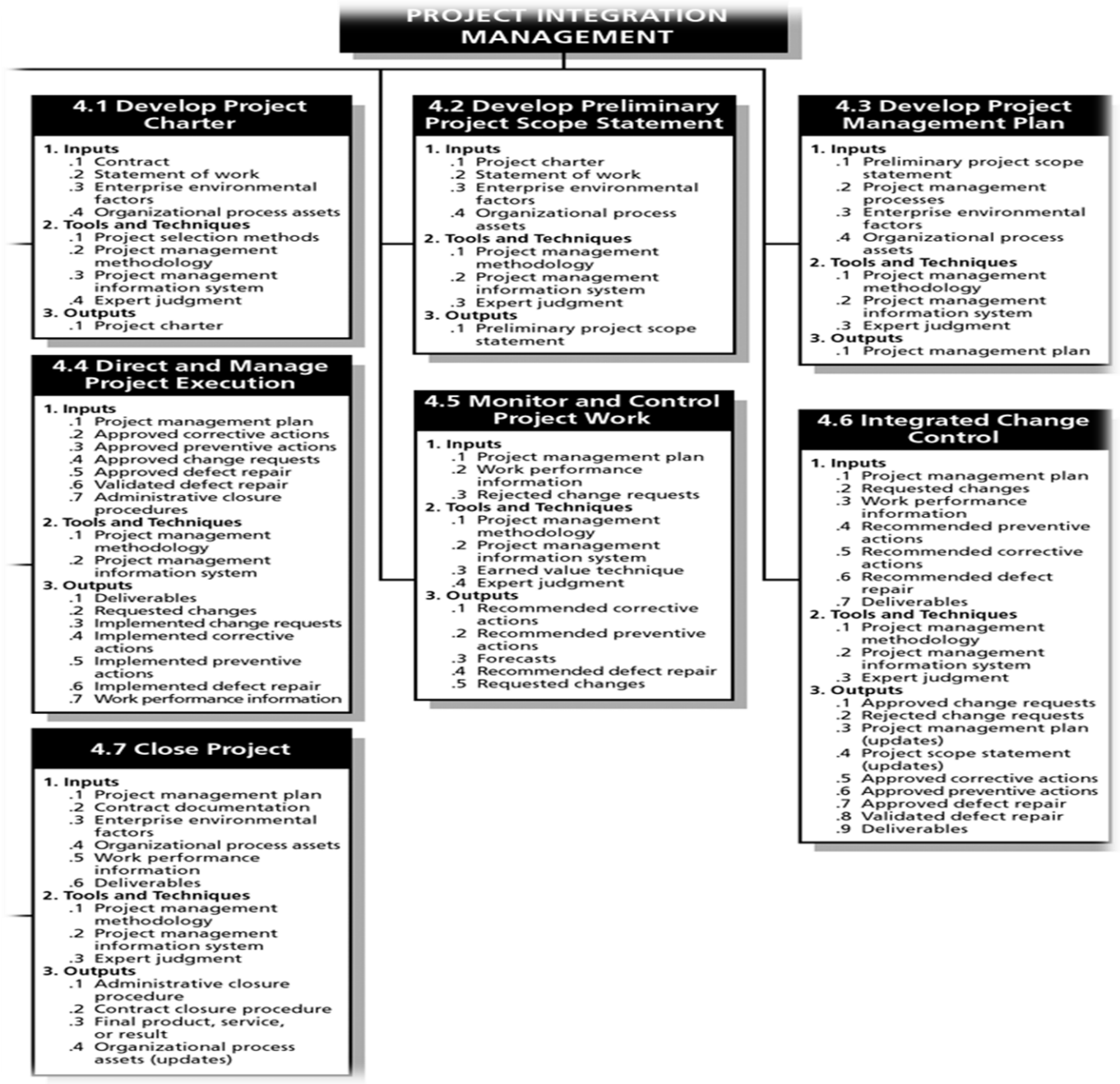
2.1.2.2.1. Project Integration Management

It describes the process required to ensure that the various elements of project are properly coordinated. Project integration management includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the project management process groups. In the project management context, integration includes characteristics of unification, consolidation, communication, and integrative actions that are crucial to controlled project execution through completion, successfully managing

stakeholder expectations, and meeting requirements. Project integration management includes making choices about resource allocation, making trade-offs among competing objectives and alternatives, and managing the interdependencies among the project management knowledge areas (PMI, 2013)

Project integration management processes interact with each other and with processes in knowledge. The five Process/foundation/phases of project management, according to Project Management Body includes: initiating, planning, executing, controlling and closing knowledge areas as described below.

Fig.2.3.Project Integration Management



Source: PMI, 2013

There is no single way to manage a project. Project Management involves project management knowledge, skills, and required processes in order to achieve the desired project performance. In this processes project and project management can be clearly understood the activities will be performed during project execution. Some of these activities perform by project management include:

i. developing, reviewing, analyzing and understanding the scope;
ii. transforming the collected data in to management plan
iii. performing project activities to produce deliverables;
iv. measuring and monitoring project progress and taking appropriate action to meet project objectives;

2.1.2.2.2. Project Scope Definition

Scope refers to the detailed set of deliverables or features of a project. Scope management techniques allow project managers and supervisor to allocate just the right amount of work necessary to complete a project successfully. It is concerned with controlling. PMBOK defines project scope as the "The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions". The definition of scope follows from the decision of setting out the work to be completed during the lifecycle of a project. Project scope management refers to the set of processes that ensure a project's scope is defined and mapped accurately.

The scope of a project is a clear identification of the work that is required to successfully complete or deliver a project. Scope management includes defining the needs (establishing project timeline, allocating resource and setting project goal), understanding the project objectives, goals, tasks, resources, budget and schedule.

In general project scope management is what we make sure that our project includes all the relevant to achieving the project's objectives. The process includes: planning scope management, collecting requirements, defining scope, creating work breakdown structure, validating the scope and controlling the scope (PMI, 2013).

The scope baseline for the project is the approved version of project scope statement, work breakdown structure (WBS) and its associated WBS dictionary. A baseline can be changed only through formal change control procedures and is used as a basis for comparison while performing validate scope and control scope as well as other controlling processes(PMI,2013).

2.1.2.2.3. Time Management Process

Project time management includes the processes required to manage the timely completion of the project It includes plan schedule management, define activities, sequence activities, estimate activity resources, estimate activity duration, develop schedule, and schedule control (PMI, 2013).

Time Management Process is the method by which we calculate total time spent and total staff cost to perform each task, to control the level of resources allocated to each task, to identify the percentage of each task completed and required time to complete remaining tasks. Time management is undertaken through the completion and approval of timesheets. A timesheet is a document which records an allocation of time against a set of project activities listed on the project plan (Westland, 2006).

Project time management(PTM)includes a number of planning and controlling processes that are recommended for complying with requirements related to project time(Solis-Garcaño et al.,2015). Effective time management is entirely related to planning, scheduling, monitoring, control, and reporting as well as decision making on changes. Poor planning, lack of updated project plans and failures to apply a critical path analysis technique affect project performance and results. The most common to design project plan for construction project is using Gantt chart which is developed from precedence network diagram indicating a critical path of the project.

Time management is important in any construction project management. Without proper time management, many problems will occur such as extension of time or time overrun. The time overrun happens when the actual progress of construction project is slower than the planned schedule (Memon, et al., 2014).

2.1.2.2.4. Quality Management

A quality management process is a method by which the quality of the deliverables and management processes are assured and controlled during a project. The process involves undertaking a variety of reviews to assess and improve the level of quality of project deliverables and processes (Westland, 2006).

PMI (2013) project quality management is the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project

will satisfy the need of the customer. Project quality management uses policies and procedures to implement organization's management system, and ensure that project requirements are met.

2.1.2.2.5. Cost Management Process

Cost is defined as the monetary valuation of effort, material, resources, time consumed, risk and opportunity forgone in production, delivery of goods or services. It is simply the amount of money paid or given for something to be acquired. The management of cost is the process of planning and controlling the budget of the project.

A project cost management process is a method by which costs of labor, equipment, material and administration are formally identified, approved and paid. PMI (2000) Project Cost Management processes required to ensure that the project is completed within the approved budget. It includes resource planning such as people, equipment, and materials; cost estimation which develops the estimate of cost of resources needed to complete project activities; cost budget that allocating overall cost estimate to individual work activities and finally cost control is controlling changes to project budget. Project cost management determines planning of cost management, estimate of cost, determining budget and controlling of costs.

2.1.2.2.6. Human Resource Management

Project Human Resource Management includes processes that organize, manage, and lead project team. Project team comprises individual with assigned roles and responsibilities for completing the project (PMI, 2013).Project human resource management includes the processes required to make the most effective use of human resources in the project. Human resources involve the management project team development, getting project staff assigned, and documenting, identifying and assigning responsibilities in the project.

2.1.2.2.7. Communication Management

Communication is an essential skills and managerial tools for the construction industry. Literatures indicate that project managers' much time is expended with communication. Communication management process comprises main three areas: communication planning, communication management, and communication controlling (PMI, 2013).

Project communications management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information. Effective communication on construction project optimizes the outcome. Excellent communication in day-to-day project decision matters the most.

2.1.2.2.8. Risk Management

Project risk management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project. The objective of project risk management is to increase the likelihood and impact of positive events, and decrease the likelihood and impact of negative events in the project (PMI, 2013).

Project risk is uncertain event or condition that may occur in project that may have positive or negative impact on project scope, schedule, cost, and quality. Risk management is a very important activity made to reduce the consequence of the risk to project.

2.1.2.2.9. Procurement Management

Project Procurement management includes the processes required to acquire goods and services from market in order to attain project scope from outside organization. The processes include procurement planning, solicitation planning, source identification, solicitation, contract administration and contract closeout. These processes interact with each other and with the other areas of knowledge.

Procurement planning process uses to identify as to which needs of project is met best by answering whether to procure, when to procure, how to procure, how much to procure and what to procure that relate to project scope. Solicitation planning is also the preparation of bidding documents that support solicitation. The suppliers of the goods required for the project is identified and the procurement would be taken place and contract administration through the life of the project will be properly administered.

Table 2.1.The Interaction of Process Group and Knowledge Areas

	Phases (Process Groups)

Knowledge Areas					
Knowledge Areas	Phases (Process Groups)				
	Initiation	Planning	Execution	Monitoring & Control	Closure
Integration Management	Develop Project Charter Develop Preliminary Project Scope Statement	Develop Project Management Plan	Direct and Manage Project Execution	Monitor and Control Project Work Integrated Change Control	Close Project
Scope Management		Scope Planning -Scope Definition Create WBS		Scope Verification - Scope Control	
Time Management		Activity Definition -Activity Sequencing Schedule Development- Activity Resource Estimating -Activity Duration Estimating		Schedule Control	
Cost Management		Cost Estimating , Cost Budgeting		Cost Control	
Quality Management		Quality Planning	Perform Quality Assurance	Perform Quality Control	
Human Resource Management		Human Resource Planning	Acquire Project Team Develop Project Team	Manage Project Team	
Communications Management		Communications Planning	Information Distribution	Performance Reporting Manage Stakeholders	
Risk Management		Risk Management Planning -Risk Identification Qualitative Risk Analysis- - Quantitative Risk Analysis Risk Response Planning		Risk Monitoring and Control	
Procurement Management		Plan Purchases and Acquisitions Plan Contracting	Request Seller Responses Select Sellers	Contract Administration	Contract Closure

Source: PMI, 2013

2.1.3. Construction Project Management

Construction is the process of preparing and forming building and building systems. Construction process starts with planning, design, and financing until the structure is ready for occupancy. Therefore, construction project management is the overall planning, coordination, and control of construction process from beginning to completion; with the aim of client's requirements in order to produce a functional project.

Management of construction project is quite different from the management of other projects. The differences mainly stems from the nature and characteristics of construction projects. Considering these differences is very important for successful management of construction projects. The construction projects are usually capital intensive, complex; and require significant management skills, involvement and coordination of a wide range of experts in various fields (Chartered Institute of Building, 2002); and it is relatively labor intensive that consume large amount of materials and physical tools (Wubishet, 2004). Moreover, construction projects are subjected to a variety of laws and regulations that aim to bind all parties involved in the play and to ensure public safety and minimize environmental impacts (Bennett, 2003).

On the other hand, the construction industry is the sum of all economic activities related to civil and building works starting from conception, planning, execution, and maintenance. Such works normally comprise capital investment in the form of roads, railways, airports, ports and terminals, dams, power generating stations, irrigation schemes, health centers and hospitals, educational institutions, warehouses, factories, offices and residential premises. Construction is widely acknowledged as the most important sector in a developing country's investment program. Because of such a high contribution, the construction industry has a major influence on the economic growth of a country.

2.1.4. Definitions of Construction Project Delay

A project is made up of a number of activities that have beginning and ending time set during planning. The cumulative effect of having not done each activity as per the plan may results in project delay. The demand and will of the owner is to have timely delivered, completed within budget and expected quality of project. However, project delay is inevitable problem worldwide. This situation has attracted researchers. Hence, a number of authors have defined project delays in different studies. According to Pickavance (2005) the project delay refers to something happening at a later time than planned, expected, specified in a contract or beyond the date that the parties agreed upon for the delivery of a project. In addition, Kikwasi (2012) stated as a prolonged construction period .Lo, Fung and Tung (2006) also definedas the slowdown of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project. Similarly, Abdullah et al. (2010) has further stated project delay as the time overrun beyond the

contract date or the time extension ofa project to complete remaining works. On the one hand,Tawil et al. (2014) and Afshari et al. (2011) defined as a situation in which the client and contractor attributed to the delay of project so that the project may not be complete on the date of agreement or within the contract terms.

Moreover delays are the result of unexpected act or event that determine required time to complete the tasks under contract (delayed activity even within contract) or beyond the date agreed by parties to deliver the project (Ramanathan et al., 2012). Therefore, project delay can either be extra days of work for an activity or late start of an activity (Yang et al., 2013)

In general the definitions imply that project delays are circumstances of which the genuine advancement of a project performances are slowed ,either by one of the parties, or both of them and external factors, as compared to initially arranged plan for completion. Consequently, delay is a situation in which agreed project schedule date of completion is compelled to be conveyed. Anyway, delay in any cases results in additional cost of a project.

Project delaying factors can be categorized in several ways. Different delays have different areas of impact on activities of a project. In his study, Williams (2003) categorized project delay in two basic ways: Excusable delay and Non-Excusable Delay. Excusable delays can further be classified in to excusable with compensation and excusable without compensation. Excusable delay with compensation is caused by the client's action or inaction. When the contractor encounters this type of delay (forinstance, owner denies access to the site once the notice to proceed is given) s/he is entitled to time extension as well compensation due to delay. This delay is sometimes due to unexpected factor but is not because of mistake of the contractor. On the other hand, excusable delay without compensation is delay where neither the client nor the contractor (for instance, strike, unexpected weather, late material or equipment delivery) is deemed to responsible. When this type of delay is happened, only a time extension will be warranted since there are no grounds for damages. In addition, non-excusable delay is attributable to contractor. The client can claim the losses as per the contract agreement. Some of factors that contribute to this delay type are: fail to manage according to work schedule, fail to fulfill owner specification, lack of labor, financial difficulty, subcontractor's cause of delay, and inefficient contractor management.

On the other hand, Scott (1993) classified delays in to three types as employer's responsible delays, contractor's responsible delays and neither party responsible delay. He described employer's responsible delay would result into variation and failure to provide site information. While the contractor's responsible delay includes inability to the contractor to proceed with project diligently and effectively as the result of variation and failure to provide site information. Lastly, neither responsible delay is due situations beyond the capacity of either the contractor or the client-such as strike, riot, exceptional adverse weather, force majeure and acts of God, loss and damage due to fire and storm, and some situation beyond control of contractor.

Furthermore, Enshassi,et al.,(2010) and Alaghbari et al.,(2007), divided project delaysbased on their contractual operation as: compensable and non-compensable delays, excusable and non-excusable delaysandConcurrent delays. The compensable and non-compensable delays are caused by owner or its agents directly or indirectly and the contractor is not responsible for delays. Most common forms of compensable delays are lack of drawings and specifications, late response from the owner/agent to contractor's requests, change in the design, material, sequence of activities, etc. In compensable delays, contractor is eligible for both additional money and time (Alaghbari et al., 2007). Non- excusable delays are caused by contractor, sub- contractor, and suppliers; but not by the owner. According to, Levy (2006) and Kelleher (2005) excusable delays ;however, are due illness or death of one or more of the contractors, transportation delays over which the contractor has no control, such as epidemics, and quarantine restrictions. In this case, the contractor either causes or assumes the risk for the delay. The contractor might bedesignated to compensate for the delay (Alaghbari et al., 2007). Whereas excusable delays are known as force majeure and they are not faults of any specific parties. According to Trauneret al., (2009) an excusable delay, isowing to an unforeseeable event beyond the contractor's or the subcontractor's control. Some excusable delays include war, acts of god, labor strike, fire, flood, owner-directed changes and errors & omission or concealed condition, differing site conditions or concealed conditions, unusually severe weather, and intervention by outside agencies. In the case of excusable delays contractor are eligible for time extension but not extra finances. According to Enshassi et al (2010) decision on excusable delay differ based on contractual circumstances.

Finally, the concurrent delays are usually easier to handle a factor that leads to delay. There are typical and complicated situations that causemore than one factor of delays to the project during the same period. This is called concurrent delays (Enshassi et al., 2010, Alaghbari et al., 2007). Concurrent delays are more significant delayfactors because they are caused by different parties.

2.2.Importance and Challenges of Construction Projects

2.2.1. Importance of Construction Projects

The construction industry is a fundamental economic sector which permeates most of the other sectors as it transforms various resources into constructed physical economic and social infrastructure necessaryfor socio-economic development. It embraces the process by which the physical infrastructure are planned, designed, procured, constructed or produced, altered, repaired, maintained, and demolished. So, construction industry in developing countries is an important sector due to its enormous contribution to their economic development. All infrastructure facilities needed for development such as road, telecom, electricity, power projects, and socioeconomic facilities such as school, hospitals, factories etc. are being undertaken by the construction industry. Construction industry plays a decisive role in economic development of developing countries. According to Wubishet (2004), in many developing countries, major construction activities, for instance, account for about 80% of the total capital asset, 10% of their GDP and; more than 50% of the wealth invested in fixed assets.

However, construction project management practice is relatively young; and its impact is quite remarkable. According to Voropajev (1998) construction project management is much more important in developing economy (transitional economy) than it is in developed economies as risks and changes are extremely high in the developing countries. In developing countries, construction project management processes have been extensively used by many public and private organizations to solve their problems, to manage scarce resources and, to achieve desired objectives (Andersen, 2008).The potential benefit of construction project management, for developing countries, is extremely high and thus its proper application is even critical as resources are extremely scarce. As the majority of projects in the developing countries are development related, failures of a project usually have a far reaching effect beyond financial losses; as many projects are related to solving critical socio-economic problems such as health,

education, water and poverty reduction. Hence, Project success mean in developing countries is saving or improving the lives of many people.

Ethiopia is largely infrastructure deficient and thus presents huge potential in terms of infrastructure development, increasingly in housing, energy, transport and logistics expansion programs with strong government support. The Construction industry has given special attention in the policies of the country since the current government. During first GTP plan implementation, Ethiopiahas achieved remarkable economic growth, on average, 10.1percent (NPC, 2016).The Construction industry in Ethiopia has been the largest beneficiary of this plan. In other words, GTP-I provides large opportunities to contractors in housing, electricity(dam constructions), inland ports, air ports, road, rail ways,etc.,infrastructures construction that are increasing the capitalstock of the country.

Zewdu&Aregaw(2015) indicated that the GDP contribution of the industry has been raised to 5.6% and approaches to the sub Saharan average (6%). Meanwhile, the Gross Domestic Capital Formation (GDCF), which was about 60 percent in 1996/97, has reached nearly 75% in 2002/03. Beyond its contribution to the nation, the industry is also the 6th major contributor of the content infrastructure stock.

The construction industry in Ethiopia is a sector that opens the door for the growth of many additional industries. The sector requires many inputs such as metal products, clay works, and cement and cement products, etc. The growth of these industries will surely follow the growth of the construction industry. Similarly, when the construction and renovation of housing increase, the demand for household furniture increased; thereby, indirectly, opening the door for the growth of the furniture industry. EEA (2006/07) concluded that the sector stimulates the growth of other sectors through a complex system of linkages. In relation to this linkage revenue generation to government from corporate income taxes of companies, the rental income, sales tax, capital gain tax and employees' income tax from those employed in the construction industry, which in turn goes to the financing of public services such as schools and health institutions among others.

2.2.2. Challenges of Construction Project in Ethiopia

Since recent, Ethiopian government has been assigning substantial amount of budget to hydroelectric power development,roads,railway, airport, dry port, housing and other building, water works, social infrastructure development,etc. that involve significant construction works ofprojects. Because of tremendous infrastructure development in the country, Ethiopian government has spent about 51.4% of its total budget in 2007/08 for capital project (MoFED, 2008).

Despite the fact that construction industry is very important for economic development of developing countries, it faces many challenges. According to Wubishet (2004), the construction industry in many developing countries is characterized by "too fragmented and compartmentalized; public sector dominated market; considerable government interventions; considerable foreign finance dependency (for public construction), and low development of indigenous technology". In his study, Adams (1997) also indicates that the construction industry in developing countries depend on imported input such as construction materials, machinery, and skilled manpower. In addition, the industry is dominated by foreign construction firms; which execute almost exclusively all the major construction works.

In addition, Ofori(2012)in his study concluded that construction industry everywhere in the world faces problems and challenges. However, these difficulties and challenges are linked with socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues, in developing countries. In developing countries construction projects are operated by government that most formally through contractors and consultants. This process poses problem to the development of private construction industry; inappropriate and inequitable contract conditions would stunt the development of the industry. On the other hand, potential contract and the financial provisions; unfair risk allocation between public employers and domestic contractors; unforeseeable shortage of materials; the claim substantiation & dispute settlement procedure; and contract administration practices are major challenges to domestic construction industry development

In addition, Solomon (2015) in his study indicates that the management and execution process problems are employing extra-fragmented approach to project delivery; project delivery are not

adequately tailored to the specific nature of the project, and weak project quality assurance measures and performance monitoring and evaluation, whichare self serving type; and the poor supply chain, unconsolidated knowledge base and negligent and slack practices in the industry.

According to Tadesse et al., (2016) recent study conducted by Centre for Economic Performance at the London School of Economics in UK has rated countries on three management practices: lean operation, talent management and performance management, in which Ethiopia stood the second from the last among seven African countries included in the study. In addition, Ofori(2006) as cited as inTadesse,et al.(2016) though extensive efforts has been made to improve the performance of construction industries in many developing countries, the industries continue to face problems in cost, time and quality performance; lack of work opportunities and poor professionalism. The main reasons for project failure in developing countries include: lack of advance planning, a holistic approach, lack of a comprehensive engineering and management strategy, in consistency in monitoring and follow-up, lack of coordination and communication and above all absence of methodical approach.

In general, many literatures indicate that construction industry in Ethiopia is incapable though its boom triggered by the rapid and continuous economic growth of the country. Hence, problems of performances, delays, quality, etc of the project in Ethiopia are common to all projects. Some of causes of these problems are summarized as follows:

i. lack of conducive environment in promoting competitiveness, supply of construction machineries and fragmented development of key stakeholders within the sector.
ii. unethical and rent-seeking behavior coupled with weak regulation system.
iii. lack of a transparent, accountable, effective and efficient construction managementsystem with a strong and sustainable competitive environment.
iv. absence of a strong construction industry development council and promoting public private partnership.
v. the sector is considered technologically traditional.

2.3.Causes of Delay of Construction Project

The occurrence of delay is common in most construction projects before and during execution phase of the project. It frequently occurs in all phases of construction project whose consequence results in cost and time overrun. However, the demand of the client is timelydelivery of the project with a stipulated budget and expected quality of the project.

However, the project is delayed due to various reasons. Severalstudies have identified different causes of project delaysindifferent countries have come up with different results. Marzouk,et al.,(2013) in their study summarized the causes of delays suggested by different researchers in different countries as follows: poor site management, materials related delays, contractor's poor performance, owner's contract maladministration, inadequate early planning &design, government regulations, site & environment condition and poor site supervision(in Saudi Arabia),harsh Weather, shortage of labor supply, and delay related to sub-contractors (in USA),poor risk management, poor supervision, unforeseen site conditions, slow decision making involving variation, and necessary variation works(in Hong Kong), design changes, poor labor productivity, and inadequate planning & resource(in Indonesia); difficulties in financing & payment for completed work, poor contractor management, change in site condition and shortage materials(in Nigeria).Similarly, the causes of project in Egypt include poor contract management, unrealistic scheduling, financial difficulties of owners for completed work, design modification during construction, and shortages of materials such as cement and steel.

Causes of project delays vary in different situations such as construction environment, working cultures, management style, project characteristic, methods of construction, local construction practices, geographical condition, stakeholders, the government policy, economic situation, availability of resources, political situation and also different perspective of researchers are some of the reasons of delay variation in literature (Asnaashari et al., 2009, Yang et al., 2013, Khoshgoftar et al., 2010).

Different causes of delay have different significance and frequency in different countries. Change work order, for instance, is one of reasons of delay as is mentioned in the study of Yang et al.,(2013) from Taiwan; while change work order is ranked differently in the study of Sweiset

al., (2008) from Jordan. Consequently, Venkatesh et al.,(2012),in UAE,KSA and Lebanon delay in approval, owner's slow decision making and shortage of materials are common factors of project delay; but high ranked delay factor in UAE had no significant impact in KSA construction project; and thus they concluded that construction delay can't be common across the countries. In addition, Ramanathan et al. (2012) on their study concluded that there is no root cause of project delay that can be generalized.Nevertheless,Toor and Ogunlana (2008) asserted that the factors causing construction delays in construction projects are mostly identical across developing countries even though they have different rankings.

Table-2.2.SummaryCauses of Delay in Construction Project in Developing Countries.

R. No	Country	Author(s)	Major findings(Causes of Delay)
1	Rwanda	Amandin&Kule (2016)	delayed payments, financial deficiencies on the partof the client or contractor, material procurement, poor supervision and change in the drawing design
2	Libya	Elharare,Elhaniash &Stevovic (2016)	Causes of delay depends on types of the project, its nature, size and complexity of the project, external influences-include economic, social, politicalphysical environment, and Human Factors-include project manager, client, contractor, consultants, subcontractor, supplier, and manufacturers.
3	Vietnam	Van,Sang and Viet (2015)	Information delays, and lack of information exchange betweenthe parties, Incompetent owner, incompetent supervision consultant, inadequate contractor's human resources, difficulties in financing project by owner, incompetent design consultant, difficulties in financing project by contractor, shortage of equipment of contractor,etc
4	Iran	Alavifar,&Motamedi (2014)	Insufficient data collection and survey before design, Improper construction methods implemented by contractor, Difficulties in financing project by contractor, delay in progress payments by owner, Change orders by owner during construction, Rework due to errors during construction, Late in revising and approving design documents by owner, Original contract duration is too short, legal disputes b/w various parts, Delay in progress payments by ownerand poor communication and coordination by owner and other parties
5	India	Prakash& Joseph (2014)	Identified seven factors as: Client related, contractor related, consultant related, materials, equipment, labor and external factors
6	Uganda	Alinaitwe, Apolot, &Tindiwensi(2013	Delayed payment, inadequate &inefficient equipment, rework due to poor quality, bureaucracy, change in work scope, high

R. No	Country	Author(s)	Major findings(Causes of Delay)
		)	inflation & interest rate, poor Monitoring & control, fuel shortage.
6	Uganda	Alinaitwe, Apolot, &Tindiwensi(2013)	Delayed payment, inadequate &inefficient equipment, rework due to poor quality, bureaucracy, change in work scope, high inflation & interest rate, poor Monitoring & control, fuel shortage.
7	Nigeria	Ibronke,Oladinrin, Adeniyi&Eboreim e(2013)	Insufficient amount of equipment, inaccurate time estimate, monthly payment difficulties, change order & inaccurate cost estimate
8	Nigeria	Mohammed &Isah(2012)	Improper planning, Lack of effective communication, Designerrors, Shortage of supply like steel, concrete, Slow decision making, Financialissues, Shortage of material,etc
9	Singapore	Ayudhya(2011)	Contract and specification category, Insufficient working drawing details, Inaccurate bill of quantities, Inability of main contractor to sublet the contract during bidding, Violating condition of the contract, Poorly written contract, Mistakesand discrepancies in design documents, Changeorders, Shop drawing approval, Delay in progress payment by owner, Main contractor financial problems,etc.,
10	---	Owolabi et al.,(2014)	Lack of funds to finance theproject, changes in drawings, lack of effective communication among the parties, lack of adequate information from consultants, slowdecision making, project management problem, mistake and discrepancies in contact document, Equipment availability and failure, fluctuation in prices,etc.,

Source: Literatures

In Ethiopia the causes of delay are contractor's financial difficulties, escalation of materials, ineffectiveplanning and scheduling by contractors, delay in progress payments for completed works, lack of skilled professional in construction project management in contractor organization(Werku and Jha, 2016).However, according to Zinabu(2016) the internal factors of delay are improper planning, cash flow problem during construction, slow decision making, mismanagement by the contractor and late delivery of materials and equipment.

The causes of project delay variables are related to complexness; environment; size; and scope (Hampton et al.,2012); changing climate conditions, unanticipated conditions, accessibility of resources and incomplete design details(Lowsley and Linnett ,2006); the major causesof time overrun are delay in getting permission from council, poor estimation of project cost, underrating the complications of a projects, bank transaction challenges, inconsistency in price of materials

and poor site supervision in Ghana(Fugar and Agyakwah-Baah ,2010); on the other hand, Sweis et al.,(2008) in their research on the causes of construction delay in Jordan concluded that financial problem encountered by the contractor and client's inability to finalized decision are the primary causes of project delay.

Ayman (2000) in his study also listed reasons for delays are related to the design engineer, change in the used of the proposed building, bad weather condition, logistic, financial conditions, and changes in the quantity of materials needed to execute the project. The possible factors that delay construction projects in India are due to lack of dedication, incompetency of site manager, poor coordination, lack of understanding of project scope and communication problem.

Furthermore,Odeh and Battaineh (2002) identified the most important reasons for project delays are owner interference, inadequate contractor experience, financing and payment, labor productivity, slow decision making, improperplanning, and subcontractorproject specific and vary from project to project. Inaddition, Hanna et al (2007) stated that any change or modification to original project scope, execution time and cost may results in errors in design, scope change or unknown effect. Moreover, Song et al (2005) described that poor project scope definition disrupt project normal flow, causes rework, increases project time and cost, and lowers the productivity and morale of workforce.

On the other hand, according to Iyer and Jha(2005) the causes of project delay are conflict among project participants, ignorance and lack of knowledge, presence of poor project specific attributes and non-existence of cooperation, hostile socioeconomic and climatic ,reluctance in timely decision aggressive completion at tender stage, short bid preparation time.

Planning is one of important tools that have effect on performance of the project. The entire process of project activities must be integrated to ensure that work flow is maintained and done effectively. According to Thomas et al (2008),"Planning is an essential function of project management "at which the types of activities are required, when the activities are performed and resourced needed at each time are clearly planned.

2.3.1. Client-Related Causes of Delay

Gardeziet al. (2014); Long et al. (2004);Abd El-Razek et al. (2008); Ahmed et al. (2003) and Alaghbari et al. (2007) identifiedsome client related factors of delay are financial problem, lack of working knowledge, suspension of work by owner, slowness in decisions making, slowness in making choice of material design to used, lack of coordination with contractors, and contract modification. In addition,Odeh and Battaineh (2002) stated that client's difficulty in settling project outstanding debt, client slow decision and impracticable (short) contract period inflicted by client.

In general, several studies identified causes of delays related to client are variation orders, slow decision making, and cash flow problem, late release of site to contractor, late approval, financial difficulties, contract administration responsibilities, change order, and interferences

2.3.2. Contractor-Related Causes of Delay

According to Ali et al. (2010), causes of delay related to contractor are shortage of materials on site due to inappropriate arrangement, ineffective communication, undependable suppliers andlate supply of material. In addition, Mochal (2003) indicated that improper planning is the first mistake in project management. Projects end dissatisfactory in situation where improper planningcould cause material shortage on construction site. However,Enshassi et al. (2009) asserted that cash flow at the time of construction and poor site administration were major causes of delay.

In general, some commoncauses of delay by contractor includes financial difficulties, material management,planning& scheduling problem, inadequate site inspection, equipment management problem, and shortage of manpower, failure to evaluate the site and design, construction defect, contractor management problem, and inadequate resource.

2.3.3. Consultant-Related Causes of Delay

Most of projects are undertaken under the consultation of consultants. The consultant is strictly controlling that the contractor isundertaking the project as per the agreement and scheduleand to meet the expected satisfaction of the client. In most case the consultants have common functions in project agreement.

According to Gardezi et al. (2014); andAlaghbari et al. (2007) the causes of project delay related to consultant are lack of consultant site engineer, lack of adequate knowledge on the part of the consultant, inexperience on the part of the consultant site staff, delayed in making decisions, insufficient documents, and slowness in passing information. However, Odeh (2002),asserted thatthe causes of delay related to consultant are contract administration, planning and endorsement of structural drawings and quality control.

Commonly consultant related causes of delay are incomplete drawing, slow response, variation order, late issuance of instruction and poor communication, design defects, slow correction of design errors, and tardy shop drawing review.

2.3.4. External Factors Related Causes of Delay

Several studies have attempted to identify those causes that contribute to delays. Some delays were found to be attributed to neither of contractor, client nor consultant. Such causes are said to be external factors that cause delays in construction projects. According to Aibinu and Odeyinka(2006)the external factors include price escalation, inclement weather, labor disputes and strikes, government regulations, slow permit by government, civil disturbances and acts of God were critical causes of project delay. Inaddition, Assaf and Al-Hejji(2006) identified external related delay factors as effect of project site conditions(such as soil, high water table, etc.), late response of municipality, weather condition (hot weather, rain),lack of utilities in project site (water, electricity, telephone, etc.), and changes in government regulations and laws. Moreover, the unavailability of materials ,construction equipment and tools on the market for purchase on the market for purchase, bad weather conditions, poor site conditions, poor economic condition such as currency or inflation rate, changes in laws and regulations, transport and logistics delays, and external work due to public agencies such as construction of public roads leading to the building site which may delay or restrict the movement of heavy duty trucks from transporting material to the site (Ahmed et al. 2003; and Alaghbari et al. 2007).

2.4.Techniques of Delay Causing Variables Analysis

Projects consist of a number of activities, each activity has scheduled time of ending; but not having completed the activities on time will affect completion of project, which may or may not have an impact on succeeding project. At the project level, analysis typically focuses on the

impact of activity delays relative to project completion (González et al., 2014).Delay is late in time of completion. Unless time is criticallymanaged, many projects fail to meet scheduled deadlines (Duran, 2006) and thus predicting the likelihood of schedule delays play key role in project success (Luu et al., 2009).

According to, Hoseini (2014) indicate that some authors have used quantitative methods like survey and questionnaires. But others use qualitative methods like interview to identify the causes of project delay. Hoseinistates that project delay analysis in most articles use the survey and questionnaire (quantitative) method to collect required data. This method uses a list of common delay causes; some apply only literature review to find delay causes; while some use interviews plus literature review. They use correlation, Kendall's coefficient of concordance, frequency and severity index to demonstrate the association among respondents, significanceand to rank delay factors.

2.4.1. Lean construction Techniques

Lean thinking is a shift in management's focus to differentiate between value (what customer is actually willing to pay) and waste (non-value). Lean construction applies the principles of and techniques of lean thinking to develop a better way to deliver the job. Lean construction is a method of production aimed at reducing costs, materials, time and effort. Using the principle of lean construction, the desired outcome would be to minimize the value and time delay. This outcome is produced when standard construction approaches are merged with a clear and concise understanding of project materials and information.

The construction wastes include:

- Correction(re-work)
- Performing work out of sequence
- Waiting for design comments
- Inefficient construction methods;
- Marshaling of materials on site;
- Redundant design/construction processes;
- Lack of Just In Time construction practices;

- Inefficient teamwork/communication;
- Slow down/stoppage in work processes.

2.4.2. Six-Sigma Construction

Six sigma is a statistics based on scientific method to make significant reduction in customer defined defect rates in an effort to eliminate defects from every product, processes quality, andtransaction (Sawant and Pataskar, 2014) .The six sigma principles uses the normal distribution curve of productquality when the mean is located at the center of normal distribution curve, the lower and upper limits of the curve range between negative 6 sigma and positive 6 sigma from the center line. In this range, 99.9997% defect free product, process or transaction or 3.4 per million as defect.

Six-sigma is a quality management technique that has being implemented in manufacturing industry. It is a new concept to construction industry. The critical objective of construction industry is to complete a project within a stipulate time and cost through process standardization, minimization of waste and organizational potential and efficient uses of resources by using six sigma, arecenttechnique (Desale&Deodhar, 2013).

Most of construction projects have problem of delay worldwide. The industry faces poor client satisfaction due to non-completion as per the required standard, and specifications.

Sigma can be very useful to broaden quality concept of construction industry to a more efficient from which should include financial parameters. As a quality initiative, aims to reduce defects and variations in processes using statistical measurements, process design and quality control analysis in order to increase (external/internal) customer satisfaction.

2.5.Minimizing Adverse Consequences of Delay

In order to avoid or minimize the negative consequences of delay causes, several studies have forwarded recommendations the way the clients, contractors, consultants and designers need to select appropriate strategies to avoid or mitigate the adverse consequences of delaythat could threat the project objectives in terms of time, cost and quality of the project.

According to Abdelnaser et al.,(2005) to minimize project delay one should emphasize on proper project planning. In other hands, Nguyen et al., (2004) identified the five project success factors in large construction projects in Vietnam in order to minimize delays are availability of resources; multidisciplinary/competent project team; competent project manager; accurate initial cost estimates and accurate initial time estimates. In addition, Aibinu and Jagboro(2002) were identified two methods of minimizing project delay are accelerating of site activities and contingencyallowance. On the other hand, Odeh and Battaineh(2002), suggested to minimizing project delays was enforcing liquidated damage clauses and offering incentives to contractor for early completion. The study of Koushki et al., (2005) identified that project delay could be minimized by ensuring adequate and availing adequate source of finance until project completion; selecting a competent consultant and a reliable contractor to carry out the work.

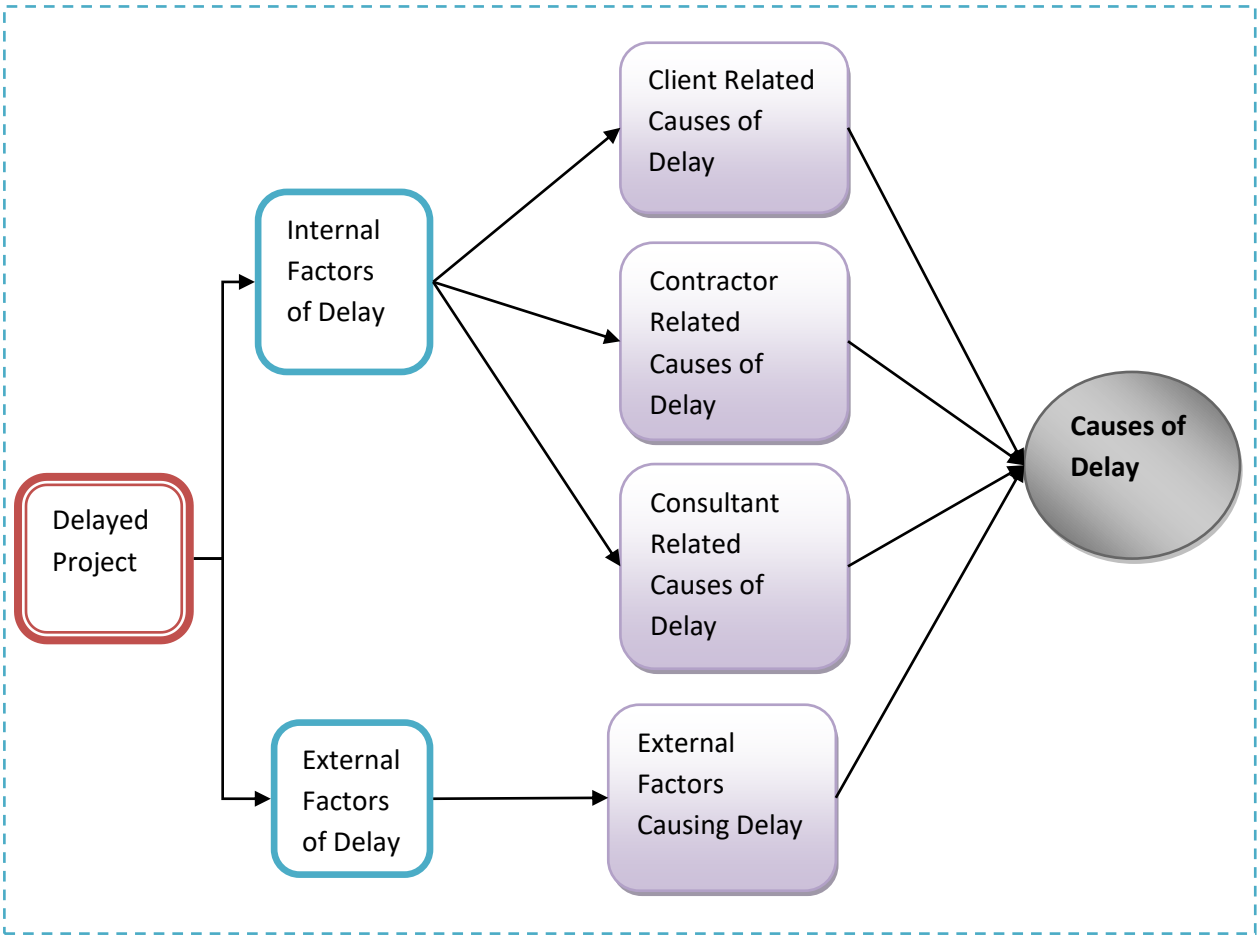
In Ethiopia, according to Zinabu(2016) to minimize the delay the contractor has to be sure that the finance is available in the client account in advance and get paid the late payment with interest, and the contractor has to employ competitive experts for financial management, for scheduling and claim compilation and should predict cash flow problem with its way out. In most cases, the contractor must submit project schedule for the sake of work, not forsubmission only, preparing outsource schedule by professional, who has much knowhow, integrating the schedule of subcontracted with master schedule, assure that the contractor has been licensed, has necessary materials and equipment, focus on documentation during project initiation.

In addition, WerkuandJha(2016) recommended that the design should be integrated and checked for harmonization before construction phase; the consultant should collect sufficient data and make detail site investigation before design tender and should prepare clear and adequate detailed drawing and BoQshould be without mistakes and discrepancies that should consider appropriate risk factor and escalation factor during cost estimation; fix reasonable time and schedule for project; define scope of work properly to avoid change work order; immediate approval of payments, variations and price escalation; the contractor should also the employ the rightprofessional for right position related to project manager, construction engineer and management.

2.6.Conceptual Framework

The findings from different literatures review and the causes of delay to the specific project are the basis for the development of this conceptual model. The below framework illustrates the hypothesized interrelationship among delay causing variables. Delay project is affected by internal and external causes of delay. The internal causes of delay includes client related, contractor related and consultant related.

Fig.2-4. Framework for Delay Causes of a Project



source: researcher

The variables under client, contractor and consultant related causes of delay are listed in questionnaire. The direction of the arrows represents hypothesized causes of delay in the framework.

CHAPTER III: RESEARCH METHODOLOGY

This chapter deals with research methodology of the study: research design, source & type of data, targeted population, sample size and sampling techniques, data collection methods and data analysis.

3.1. Research Design

Research design is the overall strategy of the study in order to integrate different component of the study in coherent and logical manner to properly address research problems. Research design is a blueprint or roadmap for data collection, measurement and analysis (Kothari, 2004).

In this study both quantitative and qualitative research methods (mixed approach) were employed. According to Creswell (2014) mixed research is a method of inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks.

The study employed primary data which were collected through questionnaire and interview from client, contractor and consultant. To get perception on causes of delay, questionnaire was used. Forty-nine possible causes of delays of a project were identified from literature and from peculiar nature of the project under study. They are categorized under six groups of causes of delay: planning and scoping, design related, client related, contractor related, consultant related and external factors related.

The interviews were also made to gather information through oral communication using a set of preplanned core questions. The interviews can be very productive since the interviewer can pursue specific issues of concern that may lead to focus on requested issue and thus it is a constructive suggestion. The interviews were made with client staff (engineers and M&E experts), contractor (PM & site engineers), Consultant (REs) to obtain detailed information from few relevant participants.

The data collected were analyzed using both descriptive and statistical method. Information obtained from interviews was used to reinforce the implication of survey data.

3.2. Types and Sources of Data

Primary data were used. The primary data are both quantitative and qualitative. Quantitative data were obtained through questionnaire; while qualitative data were acquired from interviews. The sources of data were project stakeholders (client, contractor and consultant).

3.3. Population and Population Size

The targeted populations selected for this research to evaluate and to analyze the causes of Modjo Dry Port Construction project delay areclient, contractor and consultant. The Client respondents consist of Port and Facility Development Department (Project Office) staff members. The staff members include Project Manager, Engineers with different professions, and Monitoring and Evaluation experts. Contractor respondents constitute project manager, site engineers and surveyor, and consultant respondents also include resident engineer, and other engineers (such as sanitary & water supply, electrical, hydrologist).

The total numbers of PFDD (serves as project office) staffs are 13. All 13 staff members are included. Among 13, ten of them are engineers (with different disciplines), one project manager, one capital investment study, planning and monitoring division manager and one M&E expert. Regarding consultant's all the ten professionals were quoted in agreement document (RE, civil engineers, hydrologist, and electrical) were also taken as population. Similarly, thecontractor's staff members have 22 professional individuals who have frequent contact with project work. The totals of 45 respondents' populations were targeted for this study.

3.4. Sample Size and Sampling Technique

Yamane's formula isused to estimate the sample size as follows:

$$n = \frac{N}{1+N(e)2}$$, where N= Population

n= estimated sample size

e= level of precision (0.05)

Calculated total sample size is found to be n=40.The total population of client and consultant are found to be appropriate respondents, as they have frequent contact with the project work. Concerning the contractor staffs, all except secretaries and IT professions were included in the

study. In other word, 17 individuals were taken as respondents. The respondents are purposively selected because they are relevant people to reason out the causes of delay of the project.

3.5. Data Collection Instruments/Tools

In this study, questionnaire and interview were used to collect data from client, consultants and contractors. To collect data through questionnaire, 6 grouping delay factors and 49 subsidiary factors were identified. In order to determine the perception of different respondents regarding factors causing delays in the project, a questionnaire was developed as main tool used to collect the data from targeted respondents.

Detailed potential causes of the delay for each group of delay factors were spelt out. This helped to capture all possible factors that contribute to the cause of delay under the categories of the group factors of delay. The questionnaire was designed based on 5 points ratingLikert type which measures the contribution and impact of each factor.

The second method of data collecting instrument was interview. The group of client, group of contractor, and group of consultant were interviewed separately. The interview was conducted using a qualitative method semi-structured interview. The aim is to explore the topical issues revealed after analysis of the questionnaire survey and experiences of practitioners in greater depth.

The interviews were recorded using hand writing and used to reinforce the survey data results. The interview was conducted by researcher on face to face approach. The information gathered through both instruments was used to answer research questions.

3.6. Methods of Data Analysis

Frequencies and percentages were used to demonstrate experience, education status, and sex of respondents. In addition, statistical analyzing method was employed to identify factors that affect project delay. Statistical techniques and indexingwere used to analyze collected data. The most frequent indices used for construction delays analyses are frequency index, severity index, and importance index in construction industry. Werku and Jha(2016),Assaf and Hejji, (2006), and Apolot et al. (2012) used Severity Index (SI), Frequency Index (FI) and Importance Index (II) data analysis methods to identify, to rank and to examine the importance of the root causes of

delay factors. The same method is adopted in this study to analyze and assess the research data collected. The following formulae are used to compute the indices for each factor that causes delay to the project.

1). The formula to computeSeverity Index (SI) for each factor of delay is:

SI (%) =$[\frac{\sum Wifi}{5\sum fi}]$x100%----------(1)

Where, w= is constant values of weight given to each response, it ranges from 1 forstrongly disagree to 5 for strongly agree;

f= is the frequency of the responses.

2). The Frequency Index (FI) for each of factor of delay is computed;

$$FI(\%) = [\frac{\sum_{i=1}^{4} Wifi}{4\sum_{i=1}^{4} fi}]x100\%\text{----------(2)}$$

Where, W= is the constant value of weight given to each response, it ranges from 1 for never to 4 for high;

f= is the frequency of the responses.

3) Importance Index (II) is computed as a product of both severity and frequency indices, as the following:

II (%) = [S.I (%) ×F.I (%)]/100----------(3)

The importance index (II) value is calculated using the values of frequency index and severity index.

4). The Kendall coefficient of concordance Analysis

The Kendall coefficient is used to measure how theevaluators (raters, respondents) have common degree of agreement on rankingsdelay factors. In other words, it is used to determine the agreement of ranks among the client, consultants and contractors. The agreement here meaning the results from one evaluator or another are in agreement, or they are concordant. The Kendall coefficient (W) analysis is done withnon-parametric methods for three or more

evaluators, to indicate how the three bodies do agree well enough to conclude they tend to have same agreement on delay factors' rankings. The W is computed using SPSS (version 20).

3.7. Reliability Test

Before the results obtained from Likert type questionnaires were analyzed,Cronbach Analysis of reliability of the questions was carried out to measure internal consistency. A rule of thumb for interpreting alpha for Likert scale questions is:

Cronbach's alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

3.8. Ethical Consideration

In this study ethical consideration was applied by maintaining confidentiality of information about the organization and respondents. In addition to this, the gathered data were only used for this study, not used for other purpose, or not transferred to other party. Furthermore, the respondents were ordered not to write any information like their name and other personal code while responding to the questionnaire.

CHAPTER IV: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. Introduction

This chapter presents the way the questionnaires are distributed, responses are retrieved and subsequent analysis of the data collected from professionals working for clients, consultants and contractors, who are involved in the Modjo Dry Port Construction Project, are made. The main purpose of this survey is to rank the already identified delay factors of the construction project and to find out the critical factors that are required to be given due attention in order to substantially minimize delay problems inthe port construction projects.

To this effect, the questionnaire was systematically designed so as to properly extract information on the causes of delay. The relative importance of the factors to the delay of the project from the viewpoints of client, contractor, and consultant are assessed; different sorts of ranking analysis is employed to discuss the results. The agreement between the responses of client, contractor and consultant on delay factors are also investigated.

Furthermore, interviews were conducted for further clarification on delay factors of dry port project to few key persons from client, contractor and consultant.

The findings of analysis are interpreted and their implications to delay are seriously examined under major headings as follow.

4.2. Survey Responses

Out of the total 40 questionnaires distributed, 35(87.5%) of questionnaires are filled and returned. The respondents constitute of 13(100%) client, 8(80%) consultants and 14(82.4%) contractors from which responses were retrieved. This indicates that sufficient responses are obtained to analyze the data. In addition, the interviews consist of 2 individuals from client, 3 from consultant and 3 from contractor.

Table 4.1. Questionnaire Distribution, Respondentsand Response

Respondents	Questionnaires Distributed (N)	Filled & Returned (N)	Response Rate (%)	Responses from total (%)
Client	13	13	100	37.1
Contractor	17	14	82.4	40.0
Consultant	10	8	80	22.9
Total	40	35	87.5	100

Source: survey data

The overall response rate is 87.5% (Table 4.1). As compared with that of the contractor and consultant, the response rate from the client is the highest (100%), most likely because the client staffs spend much time at office; whereas, contractor and consultant staffs are busy to meet the schedule. However, the contractor's and consultant's response rates for this survey are considered to be adequate for data analysis. In order for data to be acceptable for analysis, the response rate should be as much as possible above 40%; response rate that is lower than 30% can not be representative and the results of the analysis have little value for further interpretation (Moser and Kalton, 1993).

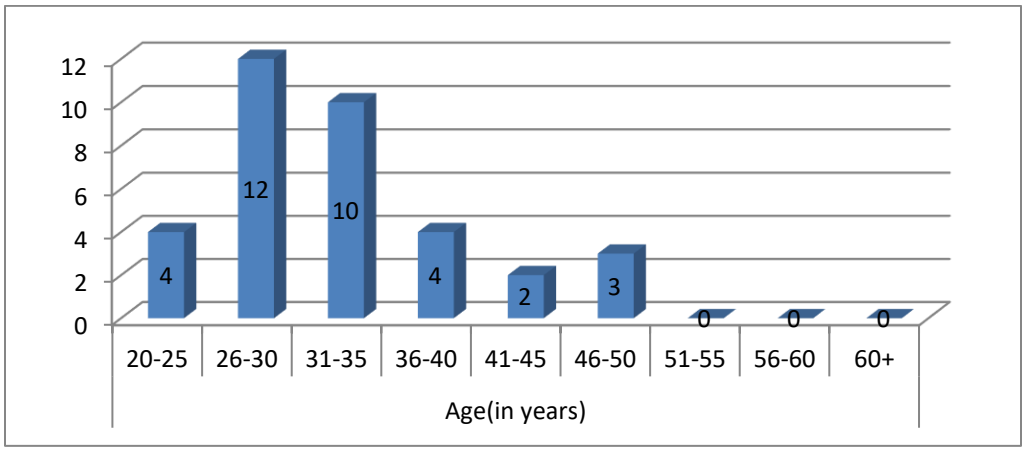
4.3. Demographic Characteristics of the Respondents

The demographic characteristics of the respondents surveyed in this research include gender, age, education background, experiences and professions (field of study) of the respondents in the project are presented below.

Concerning the gender, 31 (88.6%) of the respondents of the survey are male and the remaining 4(11.4%) of respondents are female. This indicates that the male participation is higher than females in port construction.

Regarding the age of respondents, 4(11.4%) of respondents' age are 20-25years, while 12(34.2%) of respondents are in the category of 30-35 and the age of 10(28.6%) respondents are in the range of 36-40 years. More than 74.2% of the respondents are in the age of 20-40 years. The respondents have adequate level of maturity to observe the causes of delay in the project.

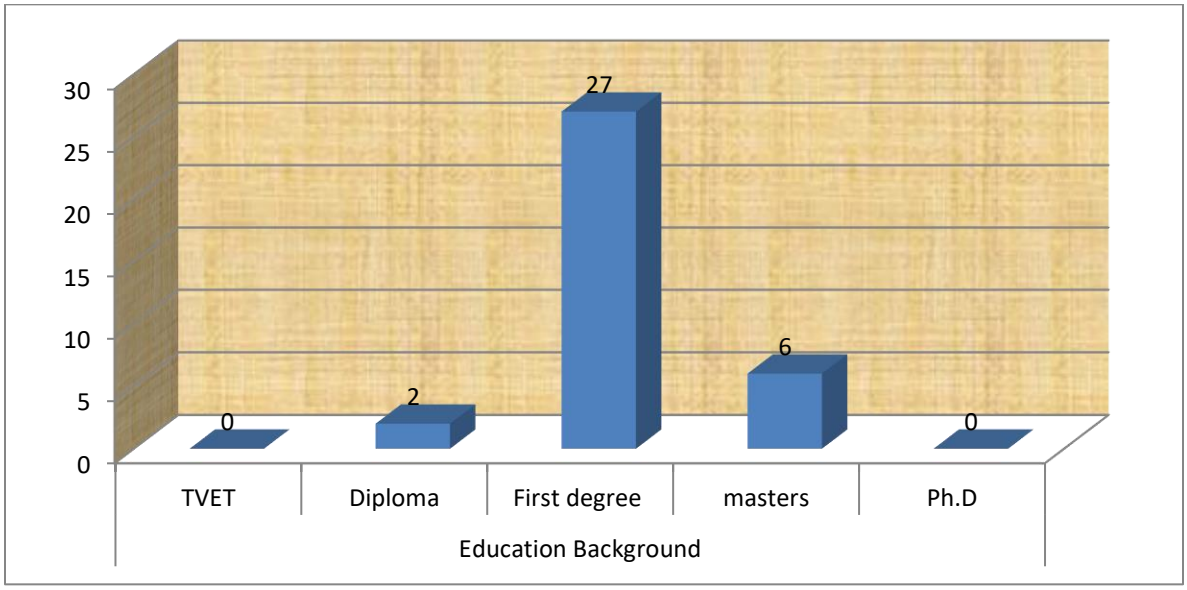
Figure 4.1. Age Range of Respondents



Source: Questionnaire

In addition, concerning the education background of the respondents, 27(77.1%) of the respondents have first degree in fields of engineering and social science. Whereas, 6(17%) of the respondents have master's degree in sanitary & water supply and civil fields of engineering, and 2(5.7%) have advanced Diploma in surveyor. It indicates that the respondents have relevant and sufficient education background totheproject.

Figure 4.2.Respondents' Education Background



Source: Questionnaire

The respondents have graduated in different fields of studies. Accordingly, 18(51.4%) of the respondents graduated incivil engineering, followed by others 8(22.9%) which were graduated in hydraulic, hydrologist, economist, and management, 2(5.7%) were graduate in sanitary&water supply, electrical and mechanical engineering. The remaining 2.9% of respondents were also graduated in contract administration & architects engineering and quantity surveyor.

Table. 4.2. Respondent Field of Studies

Respondents' field of study	Number	Percentage
Civil Engineer	18	51.4
Quantity Surveyor	01	2.9
Sanitary & water supply Engineer	02	5.7
Mechanical Engineer	02	5.7
Road Engineer	0	0.0
Electrical Engineer	02	5.7
Hydrologist	0	0.0
Architect Engineer	01	2.9
Electro mechanical	0	0.0
Contract Admin. Engineer	1	2.9
Other	08	22.9
Total	35	100

Source: questionnaire

Concerning the experiences of respondents in port construction projects are in generally low. As illustrated in table below, 16 (45.7%) respondents have only one year of experience in port construction project; while, 8(22.9%) of the respondents have 2 years of experiences. In addition, 4(11.4%) and 5(14.3%) of respondents have 3 and 5 years of experience in dry port construction project respectively. Majority of the respondents have indicated that they have low experiences in port construction, because the project is the first of its kind in Ethiopia.

Table 4.3. Year of Experience in Port Construction Project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1year	16	45.7	45.7	45.7
	2years	8	22.9	22.9	68.6
	3years	4	11.4	11.4	80.0
	4years	1	2.9	2.9	82.9
	5years	5	14.3	14.3	97.1
	6years	1	2.9	2.9	100.0
	Total	35	100.0	100.0	

Source: questionnaire and SPSS output

On the other hand, the client, contractor and consultant respondents do have experiences in building, road, water works and other (such as bridge, housingprojects,).Accordingl,21 (60%), of respondents have experience in building; while,5(14.3%) them also have experience in road construction.Whereas,4(11.4%)of respondents have experiences in water work construction and in others projects such as housingconstruction respectively.

Table 4.4. Experiences in other Constructions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Building	21	60.0	60.0	60.0
	Road	5	14.3	14.3	74.3
	Water Work	4	11.4	11.4	85.7
	Dam	1	2.9	2.9	88.6
	Others	4	11.4	11.4	100.0
	Total	35	100.0	100.0	

Source: questionnaireand SPSS output

4.4. Causes of Construction Project Delay Analysis

In data analysis, individual and grouped factors of delay have been ranked according to stakeholders' (contractors, consultants and owner) opinions to project delay factors. The analysis and discussion is made on the bases of severity, frequency and importance indices of delay factors identified and ranked by client, contractor and consultant. The Statistical Package for Social Science (SPSS version 20) was used to analyze Cronbach's, and Kendall Coefficient to test reliability and respondents agreement on ranking respectively.

4.4.1. Perception of the Respondents on Causes Delays

The perceptions of respondents on project delay factors are indicated by degree of impact, frequency of index and importance index. The degree of importance (impact) of factor to project delay is categorized into five Likertscales of rating factors and in to four rating scale for the frequency of occurrence of the delay factors. The weight for each rater has been assigned as follows:

5= strongly Agree,

4= Agree,

3= Neutral,

2 = Disagree, and

1=strongly Disagree

Similarly, the weightings for frequency of occurrence;

4= high

3= medium

2= low

1=never

4.4.1.1. The Severity Analysis of Causesof Delay

Using statistical method indicated in chapter three, the severity indices of causes of delay are analyzed using data presented in Appendix-B-1.The top five severefactors of delay according to client include:

- Under estimating project activity duration during planning by contractor;
- Inadequate activity sequencing by contractor;
- Lack of adequate and clear details for preparing drawings by consultant;
- Lack of contractor's experience in dry port construction;
- Poor communication between employer and consultant during designing stage;
- Deficiency in detailed early planning by client & consultant that in most cases have been result in change order(excessive quantity and variation order), rework, design change, change in expectation(scope creeping); and
- Difficulties in letter of credit for foreign procurement due to lack of foreign currency are the major severe factors in delaying the project.

Table.4.5. Severity Indices of Causes of Delay Identified by Client

Five most severe Causes of Delay	SI(%)	Rank	Related
Under estimating activity duration	96.67	1	Planning & scoping
Deficiencies in activity sequencing	90.77	2	Planning& Scoping
Inadequate and unclear details in drawings	90.77	2	Design
Lack of experience of dry port construction by the contractor	90.77	2	Contractor
Poor communication during designing stage	89.23	3	Consultant
Inadequate early planning of the project, which is later manifested in many change orders, redesigns and reworks.	87.69	4	Design
.Inadequate communication between owner and designer during the design phase	86.15	5	Planning& Scoping
Letter of Credit (LC) problem(foreign procurement)	86.15	5	External

Source: survey data

The sources of these delay factors are related to earlyplanning and scoping, design, contractor, consultant and external factors.

In addition, the top five severe causes of delay identified by the contractor are:

- Repeated design change;
- Late in revising and approving design document;
- Inadequate and unclear details in drawings;
- Inadequate early planning of the project, which is later manifested in many change orders, redesigns and reworks;
- Slow preparation and approval of drawings; and
- Delay in delivering project site to the contractor

Table 4.6. Severity Indices of Causes of Delay Identified by Contractor

Causes of Delay	SI(%)	Rank	Related to
Repeated design change	98.57	1	Design
Late in revising and approving design document	94.29	2	Design
Inadequate and unclear details in drawings	91.43	3	Design
Inadequate early planning of the project, which is later manifested in many change orders, redesigns and reworks.	90.00	4	planning & scoping
Slow preparation and approval of drawings.	90.00	4	Design
Delay in delivering project site to the contractor	88.57	5	client

Source: survey data

More factors of delay identified by the contractor are related to design. The remaining is related to planning and scoping and client.

The common severe causes of delays specified by both contractor and client are:

- ✓ Inadequate and unclear details in drawings ,and
- ✓ Inadequate early planning of the project, which is later manifested in many change orders, redesigns and reworks.

The consultant has also indicated several severities of factors of delay which many of them have the same ranks. They are:

- Unforeseen condition such as hard rocks that jeopardize the planned schedule of the project;
- Lack of properly defining project goal, scope and requirements (planning & scoping) of the project;
- Poor schedule management by contractor, repeated design change by the consultant; discrepancies and/or deficiencies in contract agreement document, inadequate or inefficient equipment or construction tools of the contractor, delay in foreign procurement, Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management of the project), inaccurate cost estimation, resource planning, and time management by the contractor;
- Late in revising and approving design document by the consultant, slowness in decision making process by owner, and lack of skilled manpower of contractor(hiring inexperienced technical staff),and
- Under estimating activity duration by the contractor, inadequate and unclear details in drawings, lack of skilled manpower to manage contract administration, unrealistic contract duration imposition to contractor by the client, delay in issuance of change orders (variation orders) by the owner, and delay in preparation of shop drawing by contractor.

Table 4.7.Severity Indices of Causes of Delay Identified by Consultant

Causes of Delay	SI	Rank	Related to
Facing Unforeseen conditions (such as hard rock,..)	95.00	1	External
Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks.	92.50	2	Planning & Scoping
Poor schedule management	90.00	3	contractor
Repeated design change	90.00	3	Design
Discrepancies and/or deficiencies in contract agreement document	90.00	3	Client
Inadequate or inefficient equipment or construction tools	90.00	3	contractor

Causes of Delay	SI	Rank	Related to
Delay in foreign procurement	90.00	3	contractor
Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management of the project).	90.00	3	contractor
Inaccurate cost estimation (pricing) of the project activity.	90.00	3	contractor
Late in revising and approving design document	87.50	4	Design
Slowness in decision making process by owner	87.50	4	Client
Lack of skilled manpower of contractor(hiring inexperienced technical staff)	87.50	4	contractor
Under estimating activity duration	85.00	5	Planning & Scoping
Deficiencies in activity sequencing	85.00	5	Planning & Scoping
Inadequate and unclear details in drawings	85.00	5	Design
Lack of skilled manpower that manage contract administration	85.00	5	Client
Unrealistic contract duration imposition to contractor by the client.	85.00	5	Client
Delay in issuance of change orders (Variation orders) by the owner	85.00	5	Client
Delay in preparation of shop drawing	85.00	5	contractor

Source: survey data

Most of theabove causes of delay identified by the consultant are related to contractor, design and client. In this case the consultant focused on blaming others to the causes of delay of the project.

Commonly identified causes of delay by the three parties are:

- ✓ Inadequate early planning of the project, and
- ✓ Inadequate and unclear details in drawings.

This means that delay factors which one party perceived to be the causes of the project delay is not also asserted by the other party member. This depicts that respondents have weak agreement on ranking factors of delay to the project.

4.4.1.2. The Frequency Occurrence of Causes of Delay

The frequency occurrence indices of causes of delay are employed to identify those factors that have occurred with significant frequency of occurrence during project life. Each party rates the occurrence of causes of delay; and index of each of this delay factor is used to rank the factors. From point of views of client, contractor and consultant the most frequentlyoccurring causes of delay are ranked (Appendix-B-1).

The frequency of occurrence of delay factors according to client viewpoint (in sequence, from higher to lower) are:

- Under estimating activity duration;
- Inaccurate cost estimation (pricing) of the project activity;
- Inadequate definition of project complete requirements; lack of complete definition of project scope; deficiencies in activity sequencing; lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in change orders, redesigns and reworks; lack of proper planning and scheduling by contractorincluding activity sequencing, resource planning, time management of the project ;inadequate supply of materials; and inadequate site inspection by the consultant;
- Late in revising and approving design document; delay in foreign procurement, and lack of experience of dry port construction by the contractor;
- Inadequate and unclear details in drawings; inadequate investigations by the designer during the design phase; and lack of skilled manpower of contractor (hiring inexperienced technical staff).

Table 4.8.Frequency Occurrence of Delay Factors in Project According to Client.

Causes of Delay	FI	Rank	Delay causes Related to
.Under estimating activity duration	92.3	1	Planning & Scoping
.Inaccurate cost estimation (pricing) of the project activity.	88.46	2	Contractor
Inadequate definition of project complete requirements.	86.54	3	Planning & Scoping
Lack of complete definition of project scope.	86.54	3	Planning & Scoping

Causes of Delay	FI	Rank	Delay causes Related to
Deficiencies in activity sequencing	86.54	3	Planning & Scoping
Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks.	86.54	3	Planning & Scoping
Slowness in decision making process by owner	86.54	3	Client
Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management, of the project).	86.54	3	Contractor
Inadequate supply of materials	86.54	3	Contractor
.Inadequate site inspection by the consultant.	86.54	3	consultant
Late in revising and approving design document	84.62	4	Design
Delay in foreign procurement	84.62	4	Contractor
Lack of experience of dry port construction by the contractor	84.62	4	Contractor
Inadequate and unclear details in drawings	82.69	5	Design
Inadequate investigations by the designer during the design phase	82.69	5	Design
Lack of skilled manpower of contractor(hiring inexperienced technical staff)	82.69	5	Contractor

Source: survey data

The first five ranks of frequently occurring factors of delays identified by the client are related to planning and scoping, which related to defining project scope and early planning(such as identifying requirements) and planning defect by contractors(such as estimating activity &sequencing activities). The other defects repeatedly occurring are estimating project cost, inadequate and slow supplying construction materials, delay in foreign procurement and lack of skilled manpower by the contractor. In addition, defects in preparing design based on sufficient information and tardy in revising and approving designdefect by the consultant. The client has also make decision slowly.

In addition, contractor also pointed out that the frequently occurring causing delays include:

- Inadequate and unclear details in drawings and repeated design change;
- Inadequate early planning of the project;
- Late in revising and approving design document; and late in approving major changes; and
- Poor communication during designing stage and slow preparation and approval of drawings.

Table4.9.Frequency Occurrence of Delay Factors According to Contractor

Causes of Delay	FI	Rank	Related to
Inadequate and unclear details in drawings	94.64	1	Design
Repeated design change	94.64	1	Design
Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks.	91.07	2	Planning& Scoping
Late in revising and approving design document	89.29	3	Design
Late in approving major change in scope of work	89.29	3	consultant
Unclear and inadequate details in drawings	87.5	4	consultant
poor communication during designing stage	87.5	4	consultant
Slow preparation and approval of drawings.	85.71	5	consultant

Source: survey data

The factors identified are related to design, consultant and planning problemsof the project.

Like the client and contractor, the consultant has also pointed out the following frequently occurring delayfactors:

- Unforeseen conditions;
- Repeated design change;
- Lack of properly defining project goal, scope and requirements (planning & scoping) of the project,unrealistic contract duration imposition to contractor by the client and lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management, of the project);

- Inadequate and unclear details in drawings, late in revising and approving design document, inadequate equipment or construction tools, and contractor's difficulties in financing the project and reworks required due to poor work or the wrong materials used for construction;
- Delay in issuance of change orders (variation orders) by the owner, lack of skilled manpower that manage contract administration, discrepancies and/or deficiencies in contract agreement document, improper construction techniques implemented by the contractor, delay in foreign procurement and inaccurate cost estimation (pricing) of the project activity.

Table 4.10.Frequency Occurrence of Causes of Delay According to Consultant

Causes of Delay	FI	Rank	Cause related to
Facing Unforeseen conditions (such as hard rock,..)	93.75	1	External (risk)
Repeated design change	90.625	2	design
Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks.	87.5	3	planning & scoping
Unrealistic contract duration imposition to contractor by the client.	87.5	3	client
Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management, of the project).	87.5	3	contractor
Inadequate and unclear details in drawings	84.375	4	design
Late in revising and approving design document	84.375	4	design
Inadequate or inefficient equipment or construction tools	84.375	4	contractor
Contractor's difficulties in financing the project	84.375	4	contractor
Reworks required due to poor work or the wrong materials used.	84.375	4	contractor
Delay in issuance of change orders (Variation orders) by the owner	81.25	5	client
Lack of skilled manpower that manage contract administration	81.25	5	client
Discrepancies and/or deficiencies in contract agreement document	81.25	5	client
Improper construction techniques implemented by the contractor	81.25	5	contractor
Delay in foreign procurement	81.25	5	contractor
Inaccurate cost estimation (pricing) of the project activity.	81.25	5	contractor

Source: survey data

The identified causes of delays are related to contractor, client, and design, planning & scoping project.

The common frequently occurring causes of delay identified by the three parties are;

- Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks;
- Late in revising and approving design document;
- Inadequate and unclear details in drawings.

Similarly, the three respondents do not have agreement of identifying most frequently occurring factors of delay to the project.

4.4.1.3. The Importance Index of Causes of Delay

To indicate the most significant causes of project delay, the importance index (II) of delay factor is computed for each (Appendix-B-2).This index is a product of severity andfrequency indices. The product indices of the causes of delay use to rank the combined important delay factors of the project.

The ten top important causes of construction project delay in the project are identified and ranked. These factors are:

- Repeated design change;
- Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks;
- Inadequate and unclear details in drawings;
- Late in revising and approving design document;
- Under estimating activity duration;
- Inadequate investigations by the designer during the design phase;
- poor communication during designing stage;
- Slow preparation and approval of drawings;
- Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management, of the project); and
- Late in approving major change in scope of work.

Table 4.11.Importance Index of Causes of Delay

Delay factors	Indices			Rank	Cause Related to
	SI	FI	II		
Repeated design change	90.857	88.571	80.473	1	Design
Lack of properly defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks.	89.714	88.571	79.461	2	Planning & Scoping
Inadequate and unclear details in drawings	89.714	87.857	78.820	3	Design
Late in revising and approving design document	89.143	86.429	77.045	4	Design
Under estimating activity duration	87.879	85.000	74.697	5	Planning & Scoping
Inadequate investigations by the designer during the design phase	84.571	82.143	69.469	6	Design
poor communication during designing stage	83.429	82.857	69.127	7	consultant
Slow preparation and approval of drawings.	84.000	80.714	67.800	8	consultant
Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management, of the project).	81.143	82.857	67.233	9	contractor
Late in approving major change in scope of work	81.714	82.1429	67.1224	10	consultant

Source: survey data

The above top ten important factors identified are the significant causes of delay of the project are related to design, planning & scoping, consultant and contractor. Design change relates to various causing factors, such as inability to prepare the first design based on detail information, design errors and change in client's expectation. Late in revising and approving the design by consultant is another factor that attributes to delay. In addition, much attention was not given to project planning by client as well as by the contractor. Project scope planning and requirements identification were not in detail and later the execution planning was also based not on adequate information.

In general the project has problems of early planning and defining project scope. With sucha project foundation problem, consultant's inability to prepare design on the basis of client expectation, detailed information and slow preparation and approval exacerbated the problem of delay. In addition, less attention to planning (such as activity duration estimation, cost estimation and activity sequencing) during executionof the project leads to change order and rework.

4.3.1.4. The Significance of Grouped Causes of Delay Analysis.

The detailed causes of delay of the project are summarized into six important major categories. They are ranked according to their importanceindex. This summary is used to fix the responsibility and to take remedial measures which could be taken to avoid the delay. For example the factors concerning the owner, contractor and consultant are attributed to their respective persons directly; the project managers and resident engineers can focus on the problems of planning, scoping, client, contractor and consultant related and external related factors as per the prevalent conditions (government).

Table 4.12.Grouped Causes of Delay

Grouped Delay factors	Importance Index	Rank
Design Related Delay	74.18	1
Planning and Scoping Related Delay	64.33	2
Consultant Related Causes of Delay	64.12	3
Contractor Related Causes of Delay	55.62	4
External Factors Related Causes of Delay	53.77	5
Client Related Cause of Delay	53.19	6

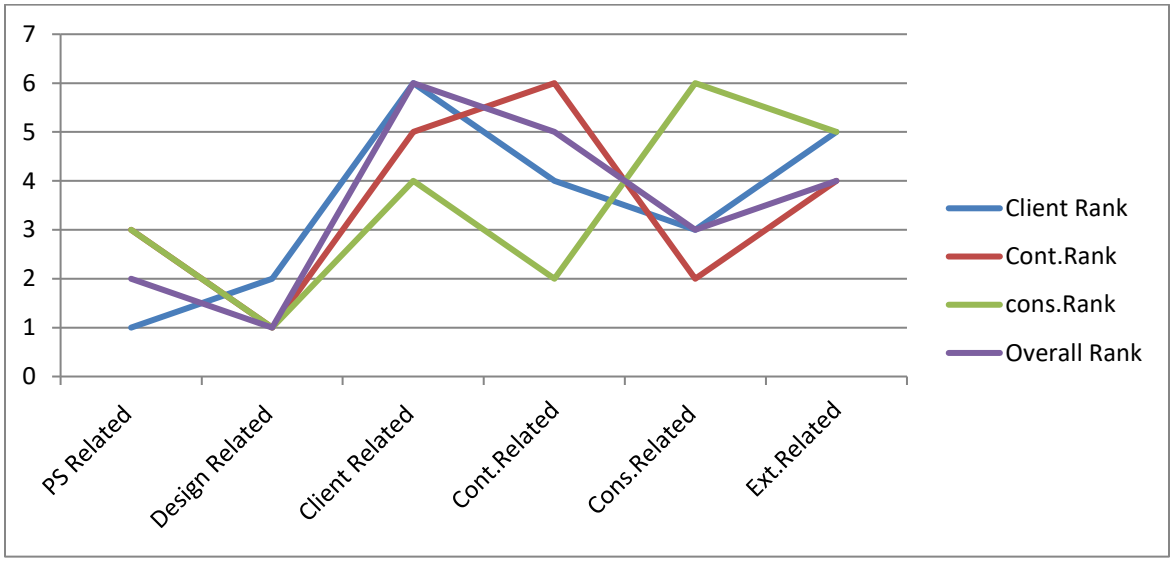
Source: survey data

The combined perceptions of client, contractor and consultant indicated the summary problems to project delay. The most frequently occurring and severe factors are combined to generate importance index that uses to rank the most important sources of project delayas follows:

- design related delay;
- planning & scoping related delay;
- Consultant related delay;
- contractor related delay;
- External Factors Related delay; and
- Client Related Delay

This identification of delay related causes in rank is a useful way of identifying the responsible bodies to project delay. The relative importance indices ranks for the six different factor categories as perceived by each of the three groups of respondents are shown below. It indicates that design related, planning & scoping related and consultant related factors have ranked the highest respectively.

Figure 4.3.Ranks of Grouped Categories



Source: survey data

4.3.1.6. The Agreement BetweenStakeholders in Rankings the Causes of Delay

The client, the contractor and the consultant have rated the causes of delay. The association/ agreement between client, contractor and consultant on ranking the causes of delayare estimated. The Kendall coefficient of concordance (w) is to determine whether there is agreement or disagreement between the three partieson ranking the causes of delay.

The SPSS result showed that the values of W for rankings of delay causes are found to be 0.101 (p-value=0.000) which indicates the agreement among the three respondents is weak. This means that the respondents have no similar perception on the causes of delay. In the analysis each party is observed to marginalize itself from menace.

Table.4.13. Test Statistics

• N	35
• Kendall's W[a]	0.101
• Chi-Square	170.061
• df	48
• Asymp. Sig.(p-value)	0.000

a. Kendall's Coefficient of Concordance

4.4. Reliability Test Result

The Cronbach's Alpha is the most common measure of internal consistency or reliability when we have multiple Likert questions in a survey questionnaire that form a scale and we wish to determine if the scale is reliable. The SPSS result shows that the internal consistency or reliability of the scale is 0.856, which categorized as "Good."

CHAPTER V: SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter focuses on summary and conclusion of the findings, conclusion and recommend-ation to the findings obtained in analysis. In recommendation, it presents how the causes of delays in dry port construction project can substantially be minimized.

5.1. Summary

Modjo dry port construction project has delayed due to various reasons related to frontline players of the project. The project isstill sufferingseverely from extensive delays, change work order (excessive quantity, variation orders), design changes, design error, quality problems, and unforeseen conditions.

Literatures show that a number of factors cause delay to a project. The delay factors are not common for all projects in all countries. In this study all possible delay factors identified in the literature are listed and 49 factors expected to be related to the project under study are incorporated in questionnaire. Out of distributed 40 questionnaires, 35(87.5%) questionnaires were filled and returned. The survey questionnaire consists of Likert scale (five point scale) to measure degree of impacts; andfour point scale rating is also used to measure frequency of occurrence of the delay factors. The internal consistency of the scale was tested and validated via Cronbach's alpha, which is found to be 0.856; confirmed that the internal consistency of the research design and the findings are reliable.

Accordingly, the major severecauses of delay of the project pointed out by the client, contractor and consultant are:

- Inadequate and ineffective early planning by client and consultant (such as defining project scope, and identifying requirements). The early planning and scoping stages, requirements of the project and expectation of the employer were not clearly identified. Often there was hope creeping and scope creeping by client.
- Defect in detailed planning and schedulingby the contractor of the project, related to under estimating activity duration, activity sequencing and cost estimation.
- Poor communication between employer and consultant during designing stage;
- Lack of adequate and clear details in preparing drawings(by consultant);

- Slow in preparing, revising and approving of drawings and design document by consultant;
- Repeated design change;
- Lack of contractor's experience in dry port construction;
- Difficulties in letter of credit for foreign procurement due to lack of foreign currency;
- Unforeseen condition such as hard rocks that jeopardize the planned schedule of the project;
- Shortage of adequate equipment or construction tools by the contractor;
- Slow in decision making(especially by client and consultant);
- Lack of skilled manpower by the contractor, and
- Unrealistic contract duration imposition by the client.

The major frequently occurring factors of delay in the project were identified by the client, contractor and consultant are inadequate early planning (inadequate definition of complete project requirements and lack of complete definition of project scope);repeated design change; inadequate and unclear details in drawings, late in revising and approving design document; poor communication during designing stage and slow preparation and approval of drawings; unrealistic contract duration imposition to contractor; ineffective planning and scheduling (include activity sequencing, resource planning, time management of the project);inadequate equipment or construction tools; contractor's difficulties in financing the project; change orders (variation orders); lack of skilled manpower; discrepancies and/or deficiencies in contract agreement document; improper construction techniques implemented by the contractor; delay in foreign procurement and unforeseen conditions.

The three parties (client, consultant and contractor) have commonly perceived the following causes of delay as severe problems are inadequate early planning of the project, which is later manifested in several change orders, redesigns and reworks, and inadequate and unclear details in drawings. The commonly identified frequently occurring causes of delay identified are also inadequate early planning of the project, late in revising and approving design document; and inadequate and unclear details in drawings

On the other hand, the top ten delay factors of the project ranked using the product of severity and frequency indices(importance index) are repeated design change, inadequate early planning

of the project, inadequate and unclear details in drawings, late in revising and approving design document, under estimating activity duration, inadequate investigations by the designer during the design phase, poor communication during designing stage, slow preparation and approval of drawings, and ineffective planning and scheduling of the project.

In general, the six grouped causes of delay in accordance of their importance are also ranked as design, planning & scoping, consultant, contractor, external and client related factors.

The strength of association (agreement) among the rankings of all parties is checked by using Kendall coefficient of concordance. The coefficient found to be 0.101, low values confirming that agreement among the three parties in ranking delay factors is weak.

5.2. Conclusion

The overall findings of study show that Modjo Dry Port construction project delay is originated from repeated design change, planning and scoping problems followed by consultant, contractor, external factors, and the client related factors of delays.

The causes of delay related to the clientisdefiningobjective (goal), scope and requirements of the project would affect the smooth operation of the project. This problem would be reflected during project execution as scope change, scope creeping and hope creeping, due to change in client expectation which is reveal as change orders, redesign and reworks of the project.

Moreover, design of the project was not prepared on the basis of detailed information; as a result frequent change is requested by client and/or contractor. As knowledge in the project via visiting and experience sharing increase over time, the probability of changing the existing design by the client is high. The contractor would also request design change due to unforeseen conditions or design error. In addition, the consultant is late in revising and approving the design quickly. In most cases, the contractor can rarely get the approval from the consultant in the project. Because the consultant's site staff does always not have confidence in issuing instructions until they discuss with their top managers at head office. Thus, it often takes time for contractor to receive instructions and responses from the consultant.

The ineffective planning and scheduling also the other problem causing delay to the project. The importance of activity duration estimation, activity sequencing and cost estimation was not given due attention by contractor.

5.3. Recommendations

Based on the major findings, the following recommendations are suggested to alleviate problem of delay by concerning stakeholders of the project.

- Department of Port and Facility Development (PFDD) and Port and Terminal Service Sector (PTSS) should develop a detailed scope document of the project by communicating senior management and other stakeholders to verify the actual owner requirements and needs. Sufficient time should be spent in preparing a statement of requirements at early stage of project planningto ensure that all the needs of owners are incorporated to avoid later scope creeping, hope creeping and interferences by the client.
- Project architects (designers) and resident engineers of consultant and client should be assured that detailed requirements and needs of the owner to translate project objectives into drawings are included. The consultant firm must appoint an experienced and qualified designer that could coordinate and communicate with project design team and other project stakeholder especially the client's architect to make sure that project objectives are very clear and can be achieved as per the client requirements. Full awareness of designer who deals directly with the client should be familiar with port project objective and future development (expansion and master plan) to manage and control the required changes and modifications of client during design development phase and during executions as well.
- The consultant must check the contract documents to eliminate all discrepancies before inviting tenders for biddings the projects. Consultant should confirm the client difficulties in design and tender documents andexecution of the projectto minimize the technical inquire which might be raised by the contractor during the execution. The resident engineer should make sure that the contractor construction methodology is submitted at very early stage from the date of signing the contract for early approval process to avoid any problem during execution. The consultant should be sure that shop drawings/template is prepared by the contractor is correct and interface to the design.

- The consultant should revise and approvedesign documents quickly submitted by the contractor.
- The consultant should assure that contractor's planning and schedulingis prepared on the basis of information almost near to fact.
- The contractor should effectively plan and strictly follow the schedule.
- The client should capacitate manpower in contract administration and decision making.
- The three parties should meet on scheduled way to communicate information on performanceof the project, problem encountered and solutions suggested.

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Annexes

Annex-A-1: Survey Questionnaire

Addis Ababa University

School of Commerce

Project Management Postgraduate Program

Survey Questionnaire

(For client, contractor and consultant)

Dear sir/Madam;

I am undertaking a research on the topic entitled "*Analyzing the Causes of Project Delay in Construction Project: Case study of Modjo Dry Port and Terminal Construction Project.* "as part of my MA degree partial fulfillment in Project Management at Addis Ababa University, School of Commerce. Delay is the most challenging problem of projects all over the world. Similarly, construction projects, in Ethiopia, are suffering a lot of delays for various reasons. One of the projects facing a serious problem of delay is Modjo Dry Port and Terminal construction project.

Consequently, the purpose of this study is to investigate the problems related to the causes of delay in Modjo dry port construction project. Identifying the factors/variables that contribute to delays in dry port construction projects and ranking them in their order of severity have paramount importance to conduct analysis and for the subsequent recommendation of the possible solutions towards minimizing the problems. To successfully undertake this research it is mandatory to look into the issues from different perspectives by involving professionals who have experience in project. Therefore, your transparency, and corrective and on time response make this study successful. I would like confirm you that your information will be strictly kept confidential and used for only for academic research purpose.

I thank you for your invaluable time sacrification and patience to complete all questions and returned backon time.

Yours, BeleteBoter(0911697424)

Section-I: General Background Information

Instruction: The questions below are related to your personal Information. Please indicate your response by marking (√) in the boxes provided in front of each question, and fill the blank spaces as appropriate.

1.1. Respondent Category: Client ☐ Contractor ☐ Consultant ☐

1.2. Gender: MaleFemale ☐ ☐

1.3. Age (in yrs.) 20-25 ☐ 26-30 ☐ 36-40 ☐ 41-454(☐ ☐

51-55 56-60 ☐ ove 60 ☐ ☐

1.4. Education Background: TVET ☐ Diploma ☐ First Degree ☐ Master's

Degree I ☐ ☐

1.5. Year(s) of experience in port construction: 1 year ☐ 2 years ☐ 3 years ☐ s

5 years ☐ 6 years ☐ ☐

1.6. Your organization's Experience (other than port construction)

Building constrRoad const.W ☐ vorkDam ☐ ☐ ☐ ☐

1.6. Your Profession in the Project: Other ☐

- Civil Engineer Me ☐ al Engineer ☐
- Road Engineer A ☐ t Engineer ☐
- Hydrologist S ☐ y& water supply Engineer ☐
- Electro mechanical C ☐ t Admin. Engineer ☐
- Surveyor Ele ☐ Engineer ☐
- Specify(if any)----------

Section-II: General Questions: Assessment of Degree of Causes of Delay

Instruction: Tick in the box provided in front of each suggested delay factors in accordance of your agreement /opinionas the causes of project delay.

Int.Q.Do you think that Modjo Dry Port Construction project has delayed?

a). Yes b). No

Delay factors	Degree of Agreement					Frequency of occurrence			
	Strongly Agree	agree	Neutral	Disagree	Strongly Disagree	High	Medium	Low	Never
1. Planning and Scoping Related	5	4	3	2	1	4	3	2	1
PSQ1.inadequate definition of project complete requirements.									
PSQ2.Lack of complete definition of project scope.									
PSQ3.Under estimating activity duration									
PSQ4. Deficiencies in activity sequencing									
PSQ5. Lack of proper defining project goal, scope and requirements (planning & scoping) of the project, which is later manifested in many change orders, redesigns and reworks.									
2. Design Related									
DisQ6.Inadequate and unclear details in drawings									
DisQ7.Inadequate communication between owner and designer during the design phase									
DisQ8.Inadequate investigations by the designer during the design phase									
DisQ9. Repeated design change									
DisQ10. Late in revising and approving design document									
3. Client Related									

Delay factors	Degree of Agreement					Frequency of occurrence			
	Strongly Agree	agree	Neutral	Disagree	Strongly Disagree	High	Medium	Low	Never
CliQ11.Delay in transferring(delivering) project site to the contractor									
CliQ12.Delay in issuance of change orders (Variation orders) by the owner									
CliQ13.Having no detailed Master plan of the project that indicates the overall aspect of the project.									
CliQ14.Indecisiveness of client senior Management to consultant's/contractor's request									
CliQ15. Lack of contractual agreement enforcement, i.e., inability to manage & administer the project on contractual basis.									
CliQ16. Selection of the lowest bidder contractor									
CliQ17. Lack of skilled manpower that manage contract administration									
CliQ18. Discrepancies and/or deficiencies in contract agreement document									
CliQ19. Changes in scope of the project									
CliQ20. Unrealistic contract duration imposition to contractor by the client.									
CliQ21., Owner's poor communication with construction parties									
CliQ22. Slowness in decision making process by owner									
CliQ23.Delay in progress payments by the client									
4. Contractor Related									
ConQ24.Inadequate or inefficient equipment or construction tools									
ConQ25.Contractor's difficulties in financing the project									
CliQ26. Poor site supervision and management by contractor									
CliQ27. Improper construction techniques implemented by the contractor									
ConQ28.Delay in foreign procurement									
ConQ29.Lack of skilled manpower of contractor(hiring inexperienced technical staff)									

Delay factors	Degree of Agreement					Frequency of occurrence			
	Strongly Agree	agree	Neutral	Disagree	Strongly Disagree	High	Medium	Low	Never
ConQ30.Lack of proper planning and scheduling by contractor (including ineffective activity sequencing, resource planning, time management, of the project).									
ConQ31.Inaccurate cost estimation (pricing) of the project activity.									
ConQ32.Delay in preparation of shop drawing									
ConQ33.Reworks required due to poor work or the wrong materials used.									
ConQ34.Poor schedule management									
ConQ35.Inadequate and slow supply of materials									
ConQ36.Shortage of Materials in the Market									
ConQ37.Lack of experience of dry port construction by the contractor									
5. Consultant Related									
ConsQ38.Inadequate site inspection by the consultant.									
ConsQ39.Unclear and inadequate details in drawings									
ConsQ40.Late in approving major change in scope of work									
ConsQ41.Lack of timely and at the spot decision									
ConsQ42.Change in type and spec during construction									
ConsQ43.poor communication during designing stage									
ConsQ44.slow preparation and approval of drawings.									
6. External Factors Related									
ExtQ45.Price escalation									
ExtQ46.Letter of Credit(LC) problem(foreign procurement)									
ExtQ47.Shortage of construction materials in the market									
ExtQ48. Facing Unforeseen conditions (such as hard rock,..)									
ExtQ49.Dependency on imported materials									

Section-III:-Mitigation Measures

MQ1. What should the client have to do to minimize project delay?

MQ2. What contractor should have to do to avoid project delay?

MQ3.What consultant should have to do to avoid project delay cause by itself?

Please, would you make sure that you haven't skipped any of the questions in all sections?

I Thank You!!!

Annex-A-2.Interview Questions

ADDIS ABABA UNIVERSITY

School of Commerce

Project Management Graduate Program

Thank you for are willing to come to this interview on the causes of project delay issues of Modjo dry port construction. The purpose of this interview is to know the main causes of project delay and to suggest pertinent solutions to minimize its consequence. This information will be used for academic purpose and kept in confidence. Therefore, we have to express our ideas without any reservation and suspicion.

I thank you again every body.

Questions

1. What are the main causes of delay for Modjo Dry port construction project?
2. What are the contributions of client, contractor and consultant to project delay?
3. What are the possible solutions to mitigate the delay problems?

Appendix-Statistical Index

Appendix-B-1.Client, Contractor& Consultant Severity & Frequency Indices

Code	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
	1. Planning and Scoping Related	87.64		87.692		77.16		78.57		82.50		76.88	
PSQ1	Inadequate definition of project complete requirements.	81.54	26	86.538	4	64.29	38.00	71.43	22	80.00	22	75.00	25
PSQ2	Lack of complete definition of project scope.	81.54	26	86.538	4	72.86	23.00	71.43	22	70.00	22	71.88	33
PSQ3	.Under estimating activity duration	96.67	1	92.308	1	81.54	13.00	82.14	11	85.00	11	78.13	17
PSQ4	Deficiencies in activity sequencing	90.77	2	86.538	4	77.14	16.00	76.79	14	85.00	14	71.88	33
PSQ5	Inadequate early planning defect of the project, which is later manifested in many change orders, redesigns and reworks.	87.69	6	86.538	4	90.00	4.00	91.07	3	92.50	3	87.50	3
	2. Design Related	86.46	0	82.308	0	90.86	0.00	87.86	0	83.00	0	83.13	0
DisQ6	Inadequate and unclear details in drawings	90.77	9	82.692	14	91.43	3.00	94.64	2	85.00	2	84.38	6
DisQ7	Inadequate communication between owner and designer during the design phase	86.15	10	80.769	17	82.86	12.00	76.79	14	77.50	14	78.13	17
DisQ8	Inadequate investigations by the designer during the design phase	87.69	6	82.692	14	87.14	8.00	83.93	9	75.00	9	78.13	17
DisQ9	Repeated design change	83.08	17	80.769	17	98.57	1.00	94.64	2	90.00	2	90.63	2
DisQ10	Late in revising and approving design document	84.62	11	84.615	11	94.29	2.00	89.29	4	87.50	4	84.38	6
	3. Client Related	76.33	0	72.781	0	69.12	0.00	69.92	0	78.85	0	72.60	0
CliQ11	.Delay in transferring(delivering) project site to the contractor	67.69	45	61.538	49	88.57	6.00	82.14	11	67.50	11	65.63	46

Appendix-B-1.Client, Contractor& Consultant Severity & Frequency Indices

Code	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
CliQ12	.Delay in issuance of change orders (Variation orders) by the owner	81.54	26	73.077	36	74.29	19.00	73.21	20	85.00	20	81.25	11
CliQ13	Having no detailed Master plan of the project that indicates the overall aspect of the project.	76.92	35	71.154	42	74.29	19.00	69.64	28	77.50	28	75.00	25
CliQ14	Indecisiveness of client senior Management to consultant's/contractor's request	84.62	11	80.769	17	71.43	27.00	60.71	45	82.50	45	71.88	33
CliQ15	Lack of contractual agreement enforcement, i.e., inability to manage & administer the project on contractual basis.	83.08	17	78.846	26	62.86	41.00	69.64	28	82.50	28	71.88	33
CliQ16	Selection of the lowest bidder contractor	80.00	32	73.077	36	48.57	49.00	58.93	47	70.00	47	62.50	47
CliQ17	Lack of skilled manpower that manage contract administration	76.92	35	73.077	36	54.29	45.00	69.64	28	85.00	28	81.25	11
CliQ18	Discrepancies and/or deficiencies in contract agreement document	72.31	42	65.385	46	60.00	42.00	60.71	45	90.00	45	81.25	11
CliQ19	Changes in scope of the project	72.31	42	63.462	36	70.00	30.00	62.50	42	80.00	42	68.75	41
CliQ20	Unrealistic contract duration imposition to contractor by the client.	83.08	17	80.769	17	67.14	34.00	73.21	20	85.00	20	87.50	3
CliQ21	Owner's poor communication with construction parties	75.38	40	75	33	84.29	11.00	82.14	11	67.50	11	71.88	33
CliQ22	Slowness in decision making process by owner	81.54	26	86.538	4	74.29	19.00	75.00	19	87.50	19	75.00	25
CliQ23	.Delay in progress payments by the client	56.92	49	63.462	36	68.57	33.00	71.43	22	65.00	22	50.00	49
	4. Contractor Related	80.44	0	80.357	0	63.47	0.00	67.22	0	82.86	0	78.79	0

Appendix-B-1.Client, Contractor& Consultant Severity & Frequency Indices

Code	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
ConQ24	Inadequate or inefficient equipment or construction tools	67.69	45	73.077	36	64.29	38.00	71.43	23	90.00	23	84.38	6
ConQ25	Contractor's difficulties in financing the project	86.15	8	76.923	31	54.29	45.00	64.29	38	80.00	38	84.38	6
ConQ26	Poor site supervision and management by contractor	81.54	26	78.846	26	51.43	48.00	62.50	42	77.50	42	68.75	41
ConQ27	Improper construction techniques implemented by the contractor	84.62	11	78.846	26	55.71	44.00	64.29	38	77.50	38	81.25	11
ConQ28	Delay in foreign procurement	83.08	17	84.615	11	65.71	37.00	64.29	38	90.00	38	81.25	11
ConQ29	Lack of skilled manpower of contractor(hiring inexperienced technical staff)	83.08	17	82.692	14	67.14	34.00	76.79	14	87.50	14	78.13	17
ConQ30	Ineffective planning and scheduling including activity sequencing, resource planning, time management, of the project.	84.62	11	86.538	3	72.86	23.00	76.79	14	90.00	14	87.50	3
ConQ31	.Inaccurate cost estimation (pricing) of the project activity.	84.62	11	88.462	2	67.14	34.00	67.86	33	90.00	33	81.25	11
ConQ32	Delay in preparation of shop drawing	76.92	35	80.769	17	64.29	38.00	62.50	42	85.00	42	75.00	25
ConQ33	Reworks required due to poor work or the wrong materials used.	72.31	42	67.308	45	58.57	43.00	55.36	49	77.50	49	84.38	6
ConQ34	Poor schedule management	83.08	17	80.769	17	71.43	27.00	76.79	14	92.50	14	75.00	25
ConQ35	Inadequate and slow supply of materials	81.54	26	86.538	3	70.00	30.00	71.43	22	75.00	22	78.13	17
ConQ36	Shortage of Materials in the Market	66.15	47	75	33	72.86	23.00	69.64	28	75.00	28	68.75	41

Appendix-B-1.Client, Contractor& Consultant Severity & Frequency Indices

Code	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
ConQ37	.Lack of experience of dry port construction by the contractor	90.77	2	84.615	11	52.86	47.00	57.14	48	72.50	48	75.00	25
	5. **Consultant Related**	82.24	0	79.945	0	82.86	0.00	81.63	0	74.64	0	74.11	0
ConsQ38	.Inadequate site inspection by the consultant.	84.62	11	86.538	11	71.43	27.00	71.43	22	60.00	22	68.75	41
ConsQ39	Unclear and inadequate details in drawings	83.08	17	76.923	31	88.57	6.00	87.50	6	75.00	6	75.00	25
ConsQ40	Late in approving major change in scope of work	76.92	35	80.769	17	87.14	8.00	89.29	4	80.00	4	71.88	33
ConsQ41	.Lack of timely and at the spot decision	83.08	17	80.769	17	85.71	10.00	83.93	9	75.00	9	71.88	33
ConsQ42	Change in type and spec during construction	75.71	40	75	33	75.71	17.00	66.07	35	80.00	35	78.13	17
ConsQ43	poor communication during designing stage	89.23	5	80.769	17	81.43	13.00	87.50	6	77.50	6	78.13	17
ConsQ44	slow preparation and approval of drawings.	83.08	17	78.846	26	90.00	4.00	85.71	8	75.00	8	75.00	25
	6. **External Factors Related**	77.54	0	72.692	0	74.29	0.00	66.79	0	76.50	0	74.38	0
ExtQ45	Price escalation	76.92	35	73.077	36	75.71	17.00	69.64	28	70.00	28	59.38	33
ExtQ46	Letter of Credit(LC) problem(foreign procurement)	86.15	8	78.846	26	70.00	30.00	67.86	33	70.00	33	71.88	33
ExtQ47	.Shortage of construction materials in the market	66.15	47	69.231	43	74.29	19.00	66.07	35	77.50	35	78.13	48
ExtQ48	Facing Unforeseen conditions (such as hard rock,..)	78.46	34	69.231	43	72.86	23.00	66.07	35	95.00	35	93.75	1
ExtQ49	Dependency on imported materials	80.00	32	73.077	36	78.57	15.00	64.29	38	70.00	38	68.75	41

Appendix-B.2 Importance Index

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
	1. Planning and Scoping Related	80.40	79.82	64.33		
PSQ1	inadequate definition of project complete requirements.	74.28571	77.85714286	57.8367	26	Planning & Scoping
PSQ2	.Lack of complete definition of project scope.	75.42857	77.14285714	58.1878	23	Planning & Scoping
PSQ3	.Under estimating activity duration	87.87879	85	74.6970	5	Planning & Scoping
PSQ4	Deficiencies in activity sequencing	84	79.28571429	66.6000	12	Planning & Scoping
PSQ5	Inadequate early planning defect of the project, which is later manifested in many change orders, redesigns and reworks.	89.71429	88.57142857	79.4612	2	Planning & Scoping
	2. Design Related	87.42857	84.71428571	74.182041		
DisQ6	.Inadequate and unclear details in drawings	89.71429	87.85714286	78.8204	3	Design
DisQ7	.Inadequate communication between owner and designer during the design phase	82.85714	78.57142857	65.1020	13	Design
DisQ8	.Inadequate investigations by the designer during the design phase	84.57143	82.14285714	69.4694	6	Design
DisQ9	Repeated design change	90.85714	88.57142857	80.4735	1	Design
DisQ10	. Late in revising and approving design document	89.14286	86.42857143	77.0449	4	Design
	3. Client Related	74.02198	71.59340659	53.190267	35	

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
CliQ11	.Delay in transferring(delivering) project site to the contractor	76	70.71428571	53.7429	33	client
CliQ12	.Delay in issuance of change orders (Variation orders) by the owner	79.42857	75	59.5714	22	client
CliQ13	Having no detailed Master plan of the project that indicates the overall aspect of the project.	76	71.42857143	54.2857	32	client
CliQ14	Indecisiveness of client senior Management to consultant's/contractor's request	78.85714	70.71428571	55.7633	28	client
CliQ15	Lack of contractual agreement enforcement, i.e., inability to manage & administer the project on contractual basis.	74.85714	73.57142857	55.0735	31	client
CliQ16	Selection of the lowest bidder contractor	65.14286	65	42.3429	48	client
CliQ17	Lack of skilled manpower that manage contract administration	69.71429	73.57142857	51.2898	40	client
CliQ18	Discrepancies and/or deficiencies in contract agreement document	71.42857	67.14285714	47.9592	45	client
CliQ19	Changes in scope of the project	73.14286	64.28571429	47.0204	46	client
CliQ20	Unrealistic contract duration imposition to contractor by the client.	77.14286	79.28571429	61.1633	19	client
CliQ21	Owner's poor communication with construction parties	77.14286	77.14285714	59.5102	21	client
CliQ22	Slowness in decision making process by owner	80	79.28571429	63.4286	15	client
CliQ23	.Delay in progress payments by the client	63.42857	63.57142857	40.3224	49	client

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
	4. Contractor Related	74.20408	74.74489796	55.623032		
ConQ24	Inadequate or inefficient equipment or construction tools	71.42857	75	53.5714	34	contractor
ConQ25	Contractor's difficulties in financing the project	72	73.57142857	52.9714	36	contractor
ConQ26	Poor site supervision and management by contractor	68.57143	70	48.0000	44	contractor
ConQ27	Improper construction techniques implemented by the contractor	71.42857	73.57142857	52.5510	38	contractor
ConQ28	Delay in foreign procurement	77.71429	75.71428571	58.8408	24	contractor
ConQ29	Lack of skilled manpower of contractor(hiring inexperienced technical staff)	77.71429	79.28571429	61.6163	18	contractor
ConQ30	Ineffective planning and scheduling including activity sequencing, resource planning, time management, of the project.	81.14286	82.85714286	67.2327	10	contractor
ConQ31	.Inaccurate cost estimation (pricing) of the project activity.	78.85714	78.57142857	61.9592	17	contractor
ConQ32	Delay in preparation of shop drawing	73.71429	72.14285714	53.1796	35	contractor
ConQ33	Reworks required due to poor work or the wrong materials used.	68	66.42857143	45.1714	47	contractor
ConQ34	Poor schedule management	80.57143	77.85714286	62.7306	16	contractor
ConQ35	Inadequate and slow supply of materials	75.42857	78.57142857	59.2653	22	contractor
ConQ36	Shortage of Materials in the Market	70.85714	71.42857143	50.6122	42	contractor

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
ConQ37	.Lack of experience of dry port construction by the contractor	71.42857	71.42857143	51.0204	41	contractor
	5. Consultant Related	80.7483	79.28571429	64.123518		
ConsQ38	.Inadequate site inspection by the consultant.	73.71429	76.42857143	56.3388	27	consultant
ConsQ39	Unclear and inadequate details in drawings	83.42857	80.71428571	67.3388	9	consultant
ConsQ40	Late in approving major change in scope of work	81.71429	82.14285714	67.1224	11	consultant
ConsQ41	.Lack of timely and at the spot decision	82.28571	80	65.8286	13	consultant
ConsQ42	Change in type and spec during construction	76.66667	72.14285714	55.3095	30	consultant
ConsQ43	poor communication during designing stage	83.42857	82.85714286	69.1265	7	consultant
ConsQ44	slow preparation and approval of drawings.	84	80.71428571	67.8000	8	consultant
	6. External Factors Related	76	70.71428571	53.771429		
ExtQ45	Price escalation	74.85714	68.57142857	51.3306	39	external
ExtQ46	Letter of Credit(LC) problem(foreign procurement)	76	72.85714286	55.3714	29	external
ExtQ47	.Shortage of construction materials in the market	72	70	50.4000	43	external
ExtQ48	Facing Unforeseen conditions (such as hard rock,..)	80	73.57142857	58.8571	23	external
ExtQ49	Dependency on imported materials	77.14286	68.57142857	52.8980	37	external

Appendix-B-3. Grouped Causes of Delay Ranking

Group Causes of Delay	II	Rank
Planning and Scoping Related Delay	64.33	2
Design Related Delay	74.18204	1
Client Related Cause of Delay	53.19027	6
Contractor Related Causes of Delay	55.62303	4
Consultant Related Causes of Delay	64.12352	3
External Factors Related Causes of Delay	53.77143	5